



ENTERPRISE PRODUCTS PARTNERS L.P.  
ENTERPRISE PRODUCTS HOLDINGS LLC  
(General Partner)

ENTERPRISE PRODUCTS OPERATING LLC

September 4, 2024

9589 0710 5270 0140 6145 91

Return Receipt Requested

New Mexico Environment Department  
Air Quality Bureau  
525 Camino de los Marquez, Suite 1  
Santa Fe, NM 87505-1816

**Re: Title V Permit No P282-M1 Title V Minor Modification and Renewal  
Enterprise Field Services, LLC – South Eddy Cryogenic Plant  
Eddy County, New Mexico**

Sir or Madam:

Enterprise Field Services, LLC (Enterprise) is submitting this Title V minor modification and renewal application to the current Title V Permit No. P282-M1 for the South Eddy Cryogenic Plant. This application is to renew the Title V permit, account for the modifications under NSR Permit No. 5945-M5R3, issued on February 15, 2022, and under NSR Permit No. 5945-M5R4, application dated June 20, 2023, and to remove Malfunction (Unit Malfunction) and the Emergency Power Generator (Unit GEN-SET1) emissions.

Enterprise would like to thank you in advance for your review and concurrence with this submission. If you have questions regarding the information presented in this letter and attachments, please do not hesitate to contact me at (713) 381-3669 or via email at [dmbissonnette@eprod.com](mailto:dmbissonnette@eprod.com) or Pranav Kulkarni at (713) 381-5830.

Thank you,  
***Enterprise Field Services, LLC***

Daniel Bissonnette  
Supervisor, Environmental Permitting

Pranav Kulkarni, Ph.D.  
Director, Environmental

/sed  
Enclosure



# ORIGINAL

## Air Permit Application Compliance History Disclosure Form

Pursuant to Subsection 74-2-7(S) of the New Mexico Air Quality Control Act ("AQCA"), NMSA §§ 74-2-1 to -17, the New Mexico Environment Department ("Department") may deny any permit application or revoke any permit issued pursuant to the AQCA if, within ten years immediately preceding the date of submission of the permit application, the applicant met any one of the criteria outlined below. In order for the Department to deem an air permit application administratively complete, or issue an air permit for those permits without an administrative completeness determination process, the applicant must complete this Compliance History Disclosure Form as specified in Subsection 74-2-7(P). An existing permit holder (permit issued prior to June 18, 2021) shall provide this Compliance History Disclosure Form to the Department upon request.

|                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                      |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <b>Permittee/Applicant Company Name</b>                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Expected Application Submittal Date</b>                           |
| Enterprise Field Services, LLC                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | August 2024                                                          |
| <b>Permittee/Company Contact</b>                                                                                        | <b>Phone</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Email</b>                                                         |
| Daniel Bissonnette                                                                                                      | (713) 381-3669                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <a href="mailto:dmbissonnette@eprod.com">dmbissonnette@eprod.com</a> |
| <b>Within the 10 years preceding the expected date of submittal of the application, has the permittee or applicant:</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                      |
| 1                                                                                                                       | Knowingly misrepresented a material fact in an application for a permit?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |
| 2                                                                                                                       | Refused to disclose information required by the provisions of the New Mexico Air Quality Control Act?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |
| 3                                                                                                                       | Been convicted of a felony related to environmental crime in any court of any state or the United States?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |
| 4                                                                                                                       | Been convicted of a crime defined by state or federal statute as involving or being in restraint of trade, price fixing, bribery, or fraud in any court of any state or the United States?                                                                                                                                                                                                                                                                                                                                                                                                                                     | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |
| 5a                                                                                                                      | Constructed or operated any facility for which a permit was sought, including the current facility, without the required air quality permit(s) under 20.2.70 NMAC, 20.2.72 NMAC, 20.2.74 NMAC, 20.2.79 NMAC, or 20.2.84 NMAC?                                                                                                                                                                                                                                                                                                                                                                                                  | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |
| 5b                                                                                                                      | If "No" to question 5a, go to question 6.<br>If "Yes" to question 5a, state whether each facility that was constructed or operated without the required air quality permit met at least one of the following exceptions:<br><br>a. The unpermitted facility was discovered after acquisition during a timely environmental audit that was authorized by the Department; or<br><br>b. The operator of the facility estimated that the facility's emissions would not require an air permit, and the operator applied for an air permit within 30 calendar days of discovering that an air permit was required for the facility. | <input type="checkbox"/> Yes <input type="checkbox"/> No             |
| 6                                                                                                                       | Had any permit revoked or permanently suspended for cause under the environmental laws of any state or the United States?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |
| 7                                                                                                                       | For each "yes" answer, please provide an explanation and documentation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                      |

SCIENCE | INNOVATION | COLLABORATION | COMPLIANCE

|                                                                                                                                                                                                                                                                                                      |                                                                                    |                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------|
| <b>Mail Application To:</b><br><br>New Mexico Environment Department<br>Air Quality Bureau<br>Permits Section<br>525 Camino de los Marquez, Suite 1<br>Santa Fe, New Mexico, 87505<br><br>Phone: (505) 476-4300<br>Fax: (505) 476-4375<br><a href="http://www.env.nm.gov/aqb">www.env.nm.gov/aqb</a> |  | <b>For Department use only:</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------|

## Universal Air Quality Permit Application

### Use this application for NOI, NSR, or Title V sources.

Use this application for: the initial application, modifications, technical revisions, and renewals. For technical revisions, complete Sections, 1-A, 1-B, 2-E, 3, 9 and any other sections that are relevant to the requested action; coordination with the Air Quality Bureau permit staff prior to submittal is encouraged to clarify submittal requirements and to determine if more or less than these sections of the application are needed. Use this application for streamline permits as well.

**This application is submitted as** (check all that apply): ☐ Request for a No Permit Required Determination (no fee)  
☐ **Updating** an application currently under NMED review. Include this page and all pages that are being updated (no fee required).  
 Construction Status: ☐ Not Constructed ☒ Existing Permitted (or NOI) Facility ☐ Existing Non-permitted (or NOI) Facility  
 Minor Source: ☐ a NOI 20.2.73 NMAC ☐ 20.2.72 NMAC application or revision ☐ 20.2.72.300 NMAC Streamline application  
 Title V Source: ☐ Title V (new) ☒ Title V renewal ☒ TV minor mod. ☐ TV significant mod. TV Acid Rain: ☐ New ☐ Renewal  
 PSD Major Source: ☐ PSD major source (new) ☐ minor modification to a PSD source ☐ a PSD major modification

### Acknowledgements:

- ☒ I acknowledge that a pre-application meeting is available to me upon request. ☒ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
- ☐ \$500 NSR application Filing Fee enclosed **OR** ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).
- ☐ Check No.: N/A
- ☒ I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.
- ☒ I acknowledge there is an annual fee for permits in addition to the permit review fee: [www.env.nm.gov/air-quality/permit-fees-2/](http://www.env.nm.gov/air-quality/permit-fees-2/).
- ☐ This facility qualifies for the small business fee reduction per 20.2.75.11.C. NMAC. The full \$500.00 filing fee is included with this application and I understand the fee reduction will be calculated in the balance due invoice. The Small Business Certification Form has been previously submitted or is included with this application. (Small Business Environmental Assistance Program Information: [www.env.nm.gov/air-quality/small-biz-eap-2/](http://www.env.nm.gov/air-quality/small-biz-eap-2/).)

**Citation:** Please provide the **low level citation** under which this application is being submitted: **20.2.70.300.B(2) NMAC and 20.2.70.404.B**

(e.g. application for a new minor source would be 20.2.72.200.A NMAC, one example for a Technical Permit Revision is 20.2.72.219.B.1.b NMAC, a Title V acid rain application would be: 20.2.70.200.C NMAC)

## Section 1 – Facility Information

### Section 1-A: Company Information

|   |                                                                                                                        |                                                                            |                                         |
|---|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------|
|   |                                                                                                                        | AI # if known (see 1 <sup>st</sup> 3 to 5 #s of permit IDEA ID No.): 34514 | Updating Permit/NOI #: P282-M1          |
| 1 | Facility Name: South Eddy Cryogenic Plant                                                                              |                                                                            | Plant primary SIC Code (4 digits): 1311 |
|   |                                                                                                                        |                                                                            | Plant NAIC code (6 digits): 211111      |
| a | Facility Street Address (If no facility street address, provide directions from a prominent landmark): See Section 1-D |                                                                            |                                         |
| 2 | Plant Operator Company Name: Enterprise Products Operating LLC                                                         |                                                                            | Phone/Fax: 713-381-6595 / 713-880-6660  |
| a | Plant Operator Address: PO Box 4324, Houston, TX 77210-4324                                                            |                                                                            |                                         |

|   |                                                                                                                                 |                                                                              |
|---|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| b | Plant Operator's New Mexico Corporate ID or Tax ID: 3289188                                                                     |                                                                              |
| 3 | Plant Owner(s) name(s): Enterprise Field Services, LLC                                                                          | Phone/Fax: 713-381-6595 / 713-880-6660                                       |
| a | Plant Owner(s) Mailing Address(s): PO Box 4324, Houston, TX 77210-4324                                                          |                                                                              |
| 4 | Bill To (Company): Enterprise Products Operating LLC                                                                            | Phone/Fax: 713-381-6595 / 713-880-6660                                       |
| a | Mailing Address: PO Box 4324, Houston, TX 77210-4324                                                                            | E-mail: <a href="mailto:environmental@eprod.com">environmental@eprod.com</a> |
| 5 | <input checked="" type="checkbox"/> Preparer: Daniel Bissonnette<br><input type="checkbox"/> Consultant:                        | Phone/Fax: 713-381-3669 / 713-759-3931                                       |
| a | Mailing Address: PO Box 4324, Houston, TX 77210-4324                                                                            | E-mail: <a href="mailto:dmbissonnette@eprod.com">dmbissonnette@eprod.com</a> |
| 6 | Plant Operator Contact: David Feather                                                                                           | Phone/Fax: 432-681-8951 / 713-759-3931                                       |
| a | Address: PO Box 4324, Houston, TX 77210-4324                                                                                    | E-mail: <a href="mailto:DFeather@eprod.com">DFeather@eprod.com</a>           |
| 7 | Air Permit Contact: Daniel Bissonnette                                                                                          | Title: Supervisor, Environmental                                             |
| a | E-mail: <a href="mailto:dmbissonnette@eprod.com">dmbissonnette@eprod.com</a>                                                    | Phone/Fax: 713-381-3669 / 713-880-6660                                       |
| b | Mailing Address: PO Box 4324, Houston, TX 77210-4324                                                                            |                                                                              |
| c | The designated Air permit Contact will receive all official correspondence (i.e. letters, permits) from the Air Quality Bureau. |                                                                              |

## Section 1-B: Current Facility Status

|     |                                                                                                                                                                                                                             |                                                                                                                                                                                                                |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.a | Has this facility already been constructed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                             | 1.b If yes to question 1.a, is it currently operating in New Mexico? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                                                                       |
| 2   | If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application?<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No           | If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 3   | Is the facility currently shut down? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                                                                    | If yes, give month and year of shut down (MM/YY): N/A                                                                                                                                                          |
| 4   | Was this facility constructed before 8/31/1972 and continuously operated since 1972? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                    |                                                                                                                                                                                                                |
| 5   | If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972?<br><input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A |                                                                                                                                                                                                                |
| 6   | Does this facility have a Title V operating permit (20.2.70 NMAC)?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                                                                                   | If yes, the permit No. is: P-282M1                                                                                                                                                                             |
| 7   | Has this facility been issued a No Permit Required (NPR)?<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                                            | If yes, the NPR No. is: N/A                                                                                                                                                                                    |
| 8   | Has this facility been issued a Notice of Intent (NOI)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                                                 | If yes, the NOI No. is: N/A                                                                                                                                                                                    |
| 9   | Does this facility have a construction permit (20.2.72/20.2.74 NMAC)?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                                                                                | If yes, the permit No. is: NSR 5945-M5R4                                                                                                                                                                       |
| 10  | Is this facility registered under a General permit (GCP-1, GCP-2, etc.)?<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                             | If yes, the register No. is: N/A                                                                                                                                                                               |

## Section 1-C: Facility Input Capacity & Production Rate

|   |                                                                                                                                            |                  |                  |                        |
|---|--------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|------------------------|
| 1 | What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)  |                  |                  |                        |
| a | Current                                                                                                                                    | Hourly: 10 MMscf | Daily: 240 MMscf | Annually: 87,600 MMscf |
| b | Proposed                                                                                                                                   | Hourly: 10 MMscf | Daily: 240 MMscf | Annually: 87,600 MMscf |
| 2 | What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required) |                  |                  |                        |
| a | Current                                                                                                                                    | Hourly: 10 MMscf | Daily: 240 MMscf | Annually: 87,600 MMscf |

|   |          |                  |                  |                        |
|---|----------|------------------|------------------|------------------------|
| b | Proposed | Hourly: 10 MMscf | Daily: 240 MMscf | Annually: 87,600 MMscf |
|---|----------|------------------|------------------|------------------------|

### Section 1-D: Facility Location Information

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |               |                                                                                                                   |                       |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------|-------------------------------------------------------------------------------------------------------------------|-----------------------|
| 1  | Section: 01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Range: 30E | Township: 25S | County: Eddy                                                                                                      | Elevation (ft): 3,407 |
| 2  | UTM Zone: <input type="checkbox"/> 12 or <input checked="" type="checkbox"/> 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |               | Datum: <input type="checkbox"/> NAD 27 <input type="checkbox"/> NAD 83 <input checked="" type="checkbox"/> WGS 84 |                       |
| a  | UTM E (in meters, to nearest 10 meters): 610,480 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |               | UTM N (in meters, to nearest 10 meters): 3,558,920 m                                                              |                       |
| b  | AND Latitude (deg., min., sec.): 32°9'40.64"N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |               | Longitude (deg., min., sec.): 103°49'42.09"W                                                                      |                       |
| 3  | Name and zip code of nearest New Mexico town: Loving, NM 88256                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |               |                                                                                                                   |                       |
| 4  | Detailed Driving Instructions from nearest NM town (attach a road map if necessary): From the intersection of County Road 712 and NM-31, which is approximately 1 mile north of Loving, head east on NM-31. After 4.5 miles, turn right onto NM-128E. Follow for 19.6 miles and turn right onto Buck Johnson Road. Follow for 8.1 miles and the facility will be on your left.                                                                                                                                                                                           |            |               |                                                                                                                   |                       |
| 5  | The facility is ~18 miles southeast of Loving, NM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |               |                                                                                                                   |                       |
| 6  | Status of land at facility (check one): <input checked="" type="checkbox"/> Private <input type="checkbox"/> Indian/Pueblo <input type="checkbox"/> Federal BLM <input type="checkbox"/> Federal Forest Service <input type="checkbox"/> Other (specify)                                                                                                                                                                                                                                                                                                                 |            |               |                                                                                                                   |                       |
| 7  | List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: Municipalities: None; Indian Tribes: None; Counties: Eddy County, NM and Lea County, NM                                                                                                                                                                                                                                                                                       |            |               |                                                                                                                   |                       |
| 8  | 20.2.72 NMAC applications <b>only</b> : Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see <a href="http://www.env.nm.gov/air-quality/modeling-publications/">www.env.nm.gov/air-quality/modeling-publications/</a> )? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: N/A                                                             |            |               |                                                                                                                   |                       |
| 9  | Name nearest Class I area: Carlsbad Caverns National Park                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |               |                                                                                                                   |                       |
| 10 | Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): 51.14 km                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |               |                                                                                                                   |                       |
| 11 | Distance (meters) from the perimeter of the Area of Operations (AO is defined as the plant site inclusive of all disturbed lands, including mining overburden removal areas) to nearest residence, school or occupied structure: >10,000m                                                                                                                                                                                                                                                                                                                                |            |               |                                                                                                                   |                       |
| 12 | Method(s) used to delineate the Restricted Area: Continuous fencing<br><br>"Restricted Area" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area. |            |               |                                                                                                                   |                       |
| 13 | Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC?<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.                                                                                                       |            |               |                                                                                                                   |                       |
| 14 | Will this facility operate in conjunction with other air regulated parties on the same property? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes<br>If yes, what is the name and permit number (if known) of the other facility? N/A                                                                                                                                                                                                                                                                                                                 |            |               |                                                                                                                   |                       |

### Section 1-E: Proposed Operating Schedule (The 1-E.1 & 1-E.2 operating schedules may become conditions in the permit.)

|   |                                                                                                                                     |                                          |                                                            |                                                                        |
|---|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------|
| 1 | Facility <b>maximum</b> operating ( $\frac{\text{hours}}{\text{day}}$ ): 24                                                         | ( $\frac{\text{days}}{\text{week}}$ ): 7 | ( $\frac{\text{weeks}}{\text{year}}$ ): 52                 | ( $\frac{\text{hours}}{\text{year}}$ ): 8,760                          |
| 2 | Facility's maximum daily operating schedule (if less than 24 $\frac{\text{hours}}{\text{day}}$ )? Start: N/A                        |                                          | <input type="checkbox"/> AM<br><input type="checkbox"/> PM | End: N/A<br><input type="checkbox"/> AM<br><input type="checkbox"/> PM |
| 3 | Month and year of anticipated start of construction: N/A                                                                            |                                          |                                                            |                                                                        |
| 4 | Month and year of anticipated construction completion: N/A                                                                          |                                          |                                                            |                                                                        |
| 5 | Month and year of anticipated startup of new or modified facility: N/A                                                              |                                          |                                                            |                                                                        |
| 6 | Will this facility operate at this site for more than one year? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |                                          |                                                            |                                                                        |

**Section 1-F: Other Facility Information**

|   |                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                                |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------|
| 1 | Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, specify: N/A                                                                                                                                                              |                      |                                                |
| a | If yes, NOV date or description of issue: N/A                                                                                                                                                                                                                                                                                                                                                      | NOV Tracking No: N/A |                                                |
| b | Is this application in response to any issue listed in 1-F, 1 or 1a above? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, provide the 1c & 1d info below:                                                                                                                                                                                                             |                      |                                                |
| c | Document Title: N/A                                                                                                                                                                                                                                                                                                                                                                                | Date: N/A            | Requirement # (or page # and paragraph #): N/A |
| d | Provide the required text to be inserted in this permit: N/A                                                                                                                                                                                                                                                                                                                                       |                      |                                                |
| 2 | Is air quality dispersion modeling or modeling waiver being submitted with this application? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                                                                                                                                                                                   |                      |                                                |
| 3 | Does this facility require an "Air Toxics" permit under 20.2.72.400 NMAC & 20.2.72.502, Tables A and/or B? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                                                                                                                                                                     |                      |                                                |
| 4 | Will this facility be a source of federal Hazardous Air Pollutants (HAP)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                                                                                                                                      |                      |                                                |
| a | If Yes, what type of source? <input type="checkbox"/> <b>Major</b> ( <input type="checkbox"/> ≥10 tpy of any single HAP <b>OR</b> <input type="checkbox"/> ≥25 tpy of any combination of HAPS) <input checked="" type="checkbox"/> <b>Minor</b> ( <input checked="" type="checkbox"/> <10 tpy of any single HAP <b>AND</b> <input checked="" type="checkbox"/> <25 tpy of any combination of HAPS) |                      |                                                |
| 5 | Is any unit exempt under 20.2.72.202.B.3 NMAC? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                                                                                                                                                                                                                                                                                 |                      |                                                |
| a | If yes, include the name of company providing commercial electric power to the facility: N/A<br>Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user.                                                                                                                                     |                      |                                                |

**Section 1-G: Streamline Application** (This section applies to 20.2.72.300 NMAC Streamline applications only)

|   |                                                                                                                                                                                |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <input type="checkbox"/> I have filled out Section 18, "Addendum for Streamline Applications." <input checked="" type="checkbox"/> N/A (This is not a Streamline application.) |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Section 1-H: Current Title V Information - Required for all applications from TV Sources**

(Title V-source required information for all applications submitted pursuant to 20.2.72 NMAC (Minor Construction Permits), or 20.2.74/20.2.79 NMAC (Major PSD/NNSR applications), and/or 20.2.70 NMAC (Title V))

|   |                                                                                                                                                                                                                                                                                                                               |                                                                                      |                       |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------|
| 1 | Responsible Official (R.O.)<br>(20.2.70.300.D.2 NMAC): Graham Bacon                                                                                                                                                                                                                                                           |                                                                                      | Phone: (713) 381-6595 |
| a | R.O. Title: EVP & Chief Operating Officer                                                                                                                                                                                                                                                                                     | R.O. e-mail: <a href="mailto:environmental@eprod.com">environmental@eprod.com</a>    |                       |
| b | R. O. Address: P.O. Box 4324, Houston, TX 77210-4324                                                                                                                                                                                                                                                                          |                                                                                      |                       |
| 2 | Alternate Responsible Official<br>(20.2.70.300.D.2 NMAC): Bradley J. Cooley                                                                                                                                                                                                                                                   |                                                                                      | Phone: (713) 381-6595 |
| a | A. R.O. Title: Senior Director                                                                                                                                                                                                                                                                                                | A. R.O. e-mail: <a href="mailto:environmental@eprod.com">environmental@eprod.com</a> |                       |
| b | A. R. O. Address: P.O. Box 4324, Houston, TX 77210-4324                                                                                                                                                                                                                                                                       |                                                                                      |                       |
| 3 | Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship): Enterprise Field Services, LLC and Enterprise Products Operating LLC |                                                                                      |                       |
| 4 | Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.): Enterprise Product Partners, LP                                                                                                                                                |                                                                                      |                       |
| a | Address of Parent Company: 1100 Louisiana St., Houston, TX 77002                                                                                                                                                                                                                                                              |                                                                                      |                       |
| 5 | Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.): N/A                                                                                                                                     |                                                                                      |                       |
| 6 | Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: Daniel Bissonnette (713) 381-3669 / David Feather (432) 681-8951                                                                                                                                                            |                                                                                      |                       |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 | Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes: Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B)? If yes, state which ones and provide the distances in kilometers: Texas (~17.7 km) |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Section 1-I – Submittal Requirements

Each 20.2.73 NMAC (NOI), a 20.2.70 NMAC (Title V), a 20.2.72 NMAC (NSR minor source), or 20.2.74 NMAC (PSD) application package shall consist of the following:

### Hard Copy Submittal Requirements:

- 1) One hard copy **original signed and notarized application package printed double sided 'head-to-toe' 2-hole punched** as we bind the document on top, not on the side; except Section 2 (landscape tables), which should be **head-to-head**. Please use **numbered tab separators** in the hard copy submittal(s) as this facilitates the review process. For NOI submittals only, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required. **Please include a copy of the check on a separate page.**
- 2) If the application is for a minor NSR, PSD, NNSR, or Title V application, include one working hard **copy** for Department use. This **copy** should be printed in book form, 3-hole punched, and **must be double sided**. Note that this is in addition to the head-to-toe 2-hole punched copy required in 1) above. Minor NSR Technical Permit revisions (20.2.72.219.B NMAC) only need to fill out Sections 1-A, 1-B, 3, and should fill out those portions of other Section(s) relevant to the technical permit revision. TV Minor Modifications need only fill out Sections 1-A, 1-B, 1-H, 3, and those portions of other Section(s) relevant to the minor modification. NMED may require additional portions of the application to be submitted, as needed.
- 3) The entire NOI or Permit application package, including the full modeling study, should be submitted electronically. Electronic files for applications for NOIs, any type of General Construction Permit (GCP), or technical revisions to NSRs must be submitted with compact disk (CD) or digital versatile disc (DVD). For these permit application submittals, **two CD** copies are required (in sleeves, not crystal cases, please), with additional CD copies as specified below. NOI applications require only a **single CD** submittal. Electronic files for other New Source Review (construction) permits/permit modifications or Title V permits/permit modifications can be submitted on CD/DVD or sent through AQB's secure file transfer service.

### Electronic files sent by (check one):

☐ CD/DVD attached to paper application

☒ secure electronic transfer. Air Permit Contact Name\_ Daniel Bissonnette\_, Email\_ [dmbissonnette@eprod.com](mailto:dmbissonnette@eprod.com)\_, Phone number (713) 381-3669 .

a. If the file transfer service is chosen by the applicant, after receipt of the application, the Bureau will email the applicant with instructions for submitting the electronic files through a secure file transfer service. Submission of the electronic files through the file transfer service needs to be completed within 3 business days after the invitation is received, so the applicant should ensure that the files are ready when sending the hard copy of the application. The applicant will not need a password to complete the transfer. **Do not use the file transfer service for NOIs, any type of GCP, or technical revisions to NSR permits.**

- 4) Optionally, the applicant may submit the files with the application on compact disk (CD) or digital versatile disc (DVD) following the instructions above and the instructions in 5 for applications subject to PSD review.
- 5) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver** and/or electronic air dispersion modeling report, input, and output files. The dispersion modeling **summary report only** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau.
- 6) If the applicant submits the electronic files on CD and the application is subject to PSD review under 20.2.74 NMAC (PSD) or NNSR under 20.2.79 NMC include,
  - a. one additional CD copy for US EPA,
  - b. one additional CD copy for each federal land manager affected (NPS, USFS, FWS, USDI) and,
  - c. one additional CD copy for each affected regulatory agency other than the Air Quality Bureau.

If the application is submitted electronically through the secure file transfer service, these extra CDs do not need to be submitted.

### Electronic Submittal Requirements [in addition to the required hard copy(ies)]:

- 1) All required electronic documents shall be submitted as 2 separate CDs or submitted through the AQB secure file transfer service. Submit a single PDF document of the entire application as submitted and the individual documents comprising the application.

- 2) The documents should also be submitted in Microsoft Office compatible file format (Word, Excel, etc.) allowing us to access the text and formulas in the documents (copy & paste). Any documents that cannot be submitted in a Microsoft Office compatible format shall be saved as a PDF file from within the electronic document that created the file. If you are unable to provide Microsoft office compatible electronic files or internally generated PDF files of files (items that were not created electronically: i.e. brochures, maps, graphics, etc.), submit these items in hard copy format. We must be able to review the formulas and inputs that calculated the emissions.
- 3) It is preferred that this application form be submitted as 4 electronic files (**3 MSWord docs**: Universal Application section 1 [UA1], Universal Application section 3-19 [UA3], and Universal Application 4, the modeling report [UA4]) and **1 Excel file** of the tables (Universal Application section 2 [UA2]). Please include as many of the 3-19 Sections as practical in a single MS Word electronic document. Create separate electronic file(s) if a single file becomes too large or if portions must be saved in a file format other than MS Word.
- 4) The **electronic file names** shall be a maximum of 25 characters long (including spaces, if any). The format of the electronic Universal Application shall be in the format: "A-3423-FacilityName". The "A" distinguishes the file as an application submittal, as opposed to other documents the Department itself puts into the database. Thus, all electronic application submittals should begin with "A-". Modifications to existing facilities should use the **core permit number** (i.e. '3423') the Department assigned to the facility as the next 4 digits. Use 'XXXX' for new facility applications. The format of any separate electronic submittals (additional submittals such as non-Word attachments, re-submittals, application updates) and Section document shall be in the format: "A-3423-9-description", where "9" stands for the **section #** (in this case Section 9-Public Notice). Please refrain, as much as possible, from submitting any scanned documents as this file format is extremely large, which uses up too much storage capacity in our database. Please take the time to fill out the **header information** throughout all submittals as this will identify any loose pages, including the Application Date (date submitted) & Revision number (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. Do not use special symbols (#, @, etc.) in file names. The footer information should not be modified by the applicant.

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**Table 2-A: Regulated Emission Sources**

Unit and stack numbering must correspond throughout the application package. If applying for a NOI under 20.2.73 NMAC, equipment exemptions under 2.72.202 NMAC do not apply.

| Unit Number <sup>1</sup> | Source Description                                                         | Make          | Model #       | Serial #                | Manufacturer's Rated Capacity <sup>3</sup><br>(Specify Units) | Requested Permitted Capacity <sup>3</sup><br>(Specify Units) | Date of Manufacture <sup>2</sup>                 | Controlled by Unit #        | Source Classification Code (SCC) | For Each Piece of Equipment, Check One                                                                                                         | RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB) <sup>4</sup>                                                                                | Replacing Unit No. |
|--------------------------|----------------------------------------------------------------------------|---------------|---------------|-------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------|-----------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
|                          |                                                                            |               |               |                         |                                                               |                                                              | Date of Construction/Reconstruction <sup>2</sup> | Emissions vented to Stack # |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| RC-1                     | Inlet Reciprocating Compressor                                             | Ariel         | JGC/4         | F-51357                 | 3350 hp                                                       | 3350 hp                                                      | 7/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| RC-2                     | Inlet Reciprocating Compressor                                             | Ariel         | JGC/4         | F-51370                 | 3350 hp                                                       | 3350 hp                                                      | 7/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| RC-3                     | Inlet Reciprocating Compressor                                             | Ariel         | JGC/4         | F-51407                 | 3350 hp                                                       | 3350 hp                                                      | 7/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| RC-4                     | Train 1 Residue Reciprocating Compressor                                   | Ariel         | JGC/4         | F-51525                 | 700 hp                                                        | 700 hp                                                       | 8/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| RC-5                     | Residue Reciprocating Compressor                                           | Ariel         | JGC/4         | F-51466                 | 700 hp                                                        | 700 hp                                                       | 8/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| RC-6                     | Residue Reciprocating Compressor                                           | Ariel         | JGC/4         | F-51413                 | 700 hp                                                        | 700 hp                                                       | 7/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| CC-1                     | Refrigeration Centrifugal Compressor with Dry Seal                         | Howden        | Screw Type    | MK1CS/WR VI36516542/097 | 3250 hp                                                       | 3250 hp                                                      | 6/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| CC-2                     | Refrigeration Centrifugal Compressor with Dry Seal                         | Howden        | Screw Type    | MK1CS/WR VI36516542/096 | 3250 hp                                                       | 3250 hp                                                      | 5/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | VENT                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| CO-1011                  | Stabilizer overhead gas compressor (VRU-1)                                 | Ariel         | JGR/2         | F-51080                 | 300 hp                                                        | 300 hp                                                       | 6/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | TBD                                              | N/A                         |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| CO-1012                  | Stabilizer overhead gas compressor (VRU-2)                                 | Ariel         | JGR/2         | F-51081                 | 300 hp                                                        | 300 hp                                                       | 6/1/2015                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | TBD                                              | N/A                         |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| CO-1015                  | Stabilizer overhead gas compressor (VRU-3)                                 | Ariel         | JGJ/2         | F-41177                 | 250 hp                                                        | 250 hp                                                       | 3/1/2013                                         | N/A                         | 31000203                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 3/1/2013                                         | N/A                         |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| Amine-1                  | Amine Sweetening Unit                                                      | TBD           | TBD           | TBD                     | 240 MMscf/d                                                   | 240 MMscf/d                                                  | TBD                                              | TO-1                        | 31000305                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | TO-1                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| Dehy-1                   | Triethylene Glycol Dehydrator Unit                                         | TBD           | TBD           | TBD                     | 240 MMscf/d                                                   | 240 MMscf/d                                                  | TBD                                              | TO-1                        | 31000305                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | TO-1                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| H-1                      | Mole Sieve Dehydrator Regeneration Heater with Low-NO <sub>x</sub> Burners | TBD           | TBD           | TBD                     | 8.82 MMBtu/hr                                                 | 8.82 MMBtu/hr                                                | TBD                                              | N/A                         | 31000404                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | H-1                         |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| H-2                      | Heat Medium Heater                                                         | Tulsa Heaters | HO Heater     | 10865                   | 83 MMBtu/hr                                                   | 83 MMBtu/hr                                                  | 2015                                             | N/A                         | 31000404                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | H-2                         |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| H-3                      | Thermal Evaporator                                                         | TBD           | TBD           | TBD                     | 4.5 MMBtu/hr                                                  | 4.5 MMBtu/hr                                                 | TBD                                              | N/A                         | 31000404                         | <input type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified            | <input checked="" type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | H-3                         |                                  |                                                                                                                                                |                                                                                                                                           |                    |
| TO-1                     | Thermal Oxidizer with Low-NO <sub>x</sub> burner                           | John Zink     | DBY-20 Burner | 9156400                 | 42 MMBtu/hr                                                   | 42 MMBtu/hr                                                  | 2015                                             | N/A                         | 30609903                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                |
|                          |                                                                            |               |               |                         |                                                               |                                                              | 5/25/2016                                        | TO-1                        |                                  |                                                                                                                                                |                                                                                                                                           |                    |

| Unit Number <sup>1</sup> | Source Description                        | Make          | Model #      | Serial #   | Manufacturer's Rated Capacity <sup>3</sup><br>(Specify Units) | Requested Permitted Capacity <sup>3</sup><br>(Specify Units) | Date of Manufacture <sup>2</sup>                 | Controlled by Unit #        | Source Classification Code (SCC) | For Each Piece of Equipment, Check One                                                                                                         | RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB) <sup>4</sup>                                                                                | Replacing Unit No. |     |
|--------------------------|-------------------------------------------|---------------|--------------|------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------|-----------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|
|                          |                                           |               |              |            |                                                               |                                                              | Date of Construction/Reconstruction <sup>2</sup> | Emissions vented to Stack # |                                  |                                                                                                                                                |                                                                                                                                           |                    |     |
| HAUL                     | Haul Road Emissions                       | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | N/A                         | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| LOAD                     | Condensate Loadout Emissions              | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | N/A                         | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| FUG                      | Facility Fugitive Emissions               | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | N/A                         | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| FL-1                     | Facility Flare                            | John Zink     | TBD          | 9156977    | 2.23 MMscf/hr                                                 | 0.92 MMscf/hr                                                | 2015                                             | FL-1                        | 30600904                         | <input type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified            | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input checked="" type="checkbox"/> To Be Replaced | N/A                | N/A |
| FL-1                     | Facility Flare                            | TBD           | TBD          | TBD        | 2.23 MMscf/hr                                                 | 0.92 MMscf/hr                                                | TBD                                              | FL-1                        | 30600904                         | <input type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified            | <input type="checkbox"/> To Be Removed<br><input checked="" type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced | N/A                | N/A |
| FL-1 (SSM)               | Emissions due to TO downtime flaring      | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | FL-1                        | 30600904                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| FL-1 (BS SSM)            | Emissions due to blowdown flaring         | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | FL-1                        | 30600904                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| FL-1 (PT SSM)            | Emissions due to plant turnaround flaring | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | FL-1                        | 30600904                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| SSM Blowdown Venting     | Emissions due to blowdown venting         | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | N/A                         | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| Malfunction              | Malfunction emissions                     | N/A           | N/A          | N/A        | N/A                                                           | N/A                                                          | N/A                                              | FL-1                        | 30600904                         | <input type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified            | <input checked="" type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced | N/A                | N/A |
| GC-1                     | Gas Chromatograph                         | ABB Totalflow | 8206         | Varies     | N/A                                                           | N/A                                                          | 8/15/2015                                        | FL-1                        | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| GC-2                     | Gas Chromatograph                         | ABB Totalflow | 8206         | Varies     | N/A                                                           | N/A                                                          | 8/15/2015                                        | FL-1                        | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| GC-3                     | Gas Chromatograph                         | ABB Totalflow | 8206         | Varies     | N/A                                                           | N/A                                                          | 8/15/2015                                        | FL-1                        | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| GC-4                     | Gas Chromatograph                         | ABB Totalflow | 8206         | Varies     | N/A                                                           | N/A                                                          | 8/15/2015                                        | FL-1                        | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| GC-5                     | Gas Chromatograph                         | ABB Totalflow | 8206         | Varies     | N/A                                                           | N/A                                                          | 1/16/2016                                        | FL-1                        | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| GC-6                     | Gas Chromatograph                         | ABB Totalflow | 8206         | Varies     | N/A                                                           | N/A                                                          | 3/1/2016                                         | FL-1                        | 31088811                         | <input checked="" type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified | <input type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced            | N/A                | N/A |
| GEN-SET1                 | Emergency Power Generator                 | Generac       | RG03015GN AX | 3000165328 | 40.2 hp                                                       | 40.2 hp                                                      | 3/28/2016                                        | GEN-SET1                    | 20200402                         | <input type="checkbox"/> Existing (unchanged)<br><input type="checkbox"/> New/Additional<br><input type="checkbox"/> To Be Modified            | <input checked="" type="checkbox"/> To Be Removed<br><input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Replaced | SI                 | N/A |

<sup>1</sup> Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.

<sup>2</sup> Specify dates required to determine regulatory applicability.

<sup>3</sup> To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.

<sup>4</sup> "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

**Table 2-B: Insignificant Activities<sup>1</sup> (20.2.70 NMAC) OR Exempted Equipment (20.2.72 NMAC)**

All 20.2.70 NMAC (Title V) applications must list all Insignificant Activities in this table. All 20.2.72 NMAC applications must list Exempted Equipment in this table. If equipment listed on this table is exempt under 20.2.72.202.B.5, include emissions calculations and emissions totals for 202.B.5 "similar functions" units, operations, and activities in Section 6, Calculations. Equipment and activities exempted under 20.2.72.202 NMAC may not necessarily be Insignificant under 20.2.70 NMAC (and vice versa). Unit & stack numbering must be consistent throughout the application package. Per Exemptions Policy 02-012.00 (see [http://www.env.nm.gov/aqb/permit/aqb\\_pol.html](http://www.env.nm.gov/aqb/permit/aqb_pol.html)), 20.2.72.202.B NMAC Exemptions do not apply, but 20.2.72.202.A NMAC exemptions do apply to NOI facilities under 20.2.73 NMAC. List 20.2.72.301.D.4 NMAC Auxiliary Equipment for Streamline applications in Table 2-A. The List of Insignificant Activities (for TV) can be found online at <https://www.env.nm.gov/wp-content/uploads/sites/2/2017/10/InsignificantListTitleV.pdf>. TV sources may elect to enter both TV Insignificant Activities and Part 72 Exemptions on this form.

| Unit Number        | Source Description                     | Manufacturer | Model No.  | Max Capacity   | List Specific 20.2.72.202 NMAC Exemption<br>(e.g. 20.2.72.202.B.5) | Date of Manufacture<br>/Reconstruction <sup>2</sup> | For Each Piece of Equipment, Check One                                                                                                                               |
|--------------------|----------------------------------------|--------------|------------|----------------|--------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                        |              | Serial No. | Capacity Units | Insignificant Activity citation (e.g. IA List Item #1.a)           | Date of Installation<br>/Construction <sup>2</sup>  |                                                                                                                                                                      |
| Nitrogen Generator | Nitrogen Generator                     | TBD          | TBD        | TBD            | Not a source of emissions                                          | TBD                                                 | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | TBD        | TBD            | Insignificant Activity #1a                                         | 2015                                                | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| NGL Tanks          | Pressurized Tanks                      | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | 2015                                                | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| TK-A1              | Amine Make-up Tank                     | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | TBD                                                 | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| TK-M1              | Methanol Tank                          | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | 3/1/2007                                            | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| TK-M2              | Methanol Tank                          | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | 11/1/2001                                           | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| TK-O1              | Oil Make-up Tank                       | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | 8/4/2015                                            | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| TK-S1              | Slop Tank                              | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | 8/13/2015                                           | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| TK-S2              | Slop Tank                              | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | 8/14/2015                                           | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| LOAD-PW            | Produced Water Loadout                 | N/A          | N/A        | N/A            | 20.2.72.202.B(5) NMAC                                              | N/A                                                 | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | N/A        | N/A            | Insignificant Activity #1a                                         | N/A                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| Mole-1             | Mole Sieve Dehydrator                  | TBD          | TBD        | TBD            | 20.2.72.202.B(5) NMAC                                              | 2015                                                | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | TBD        | TBD            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| Mole-2             | Mole Sieve Dehydrator                  | TBD          | TBD        | TBD            | 20.2.72.202.B(5) NMAC                                              | 2015                                                | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | TBD        | TBD            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| Mole-3             | Mole Sieve Dehydrator                  | TBD          | TBD        | TBD            | 20.2.72.202.B(5) NMAC                                              | 2015                                                | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | TBD        | TBD            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| PIGGING            | Pig Receiver and Launcher Emissions    | TBD          | TBD        | TBD            | 20.2.72.202.B(5) NMAC                                              | TBD                                                 | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | TBD        | TBD            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| S&P                | Sandblasting and Partswasher Emissions | TBD          | TBD        | TBD            | 20.2.72.202.B(5) NMAC                                              | TBD                                                 | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | TBD        | TBD            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |
| TK-TEG             | TEG Tank                               | TBD          | TBD        | TBD            | 20.2.72.202.B(5) NMAC                                              | TBD                                                 | <input checked="" type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed                                                                      |
|                    |                                        |              | TBD        | TBD            | Insignificant Activity #1a                                         | TBD                                                 | <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit<br><input type="checkbox"/> To Be Modified <input type="checkbox"/> To Be Replaced |

<sup>1</sup> Insignificant activities exempted due to size or production rate are defined in 20.2.70.300.D.6, 20.2.70.7.Q NMAC, and the NMED/AQB List of Insignificant Activities, dated September 15, 2008. Emissions from these insignificant activities do not need to be reported, unless specifically requested.

<sup>2</sup> Specify date(s) required to determine regulatory applicability.

### Table 2-C: Emissions Control Equipment

Unit and stack numbering must correspond throughout the application package. Only list control equipment for TAPs if the TAP's maximum uncontrolled emissions rate is over its respective threshold as listed in 20.2.72 NMAC, Subpart V, Tables A and B. In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (c) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions.

[illegible]

<sup>1</sup> List each control device on a separate line. For each control device, list all emission units controlled by the control device.

**Table 2-D: Maximum Emissions** (under normal operating conditions)

☐ This Table was intentionally left blank because it would be identical to Table 2-E

Maximum Emissions are the emissions at maximum capacity and prior to (in the absence of) pollution control, emission-reducing process equipment, or any other emission reduction. Calculate the hourly emissions using the worst case hourly emissions for each pollutant. For each pollutant, calculate the annual emissions as if the facility were operating at maximum plant capacity without pollution controls for 8760 hours per year, unless otherwise approved by the Department. List Hazardous Air Pollutants (HAP) & Toxic Air Pollutants (TAPs) in Table 2-I. Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "--" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

| Unit No.          | NOx   |        | CO    |        | VOC      |          | SOx    |        | PM <sup>1</sup> |        | PM10 <sup>1</sup> |        | PM2.5 <sup>1</sup> |        | H <sub>2</sub> S |          | Lead  |        |
|-------------------|-------|--------|-------|--------|----------|----------|--------|--------|-----------------|--------|-------------------|--------|--------------------|--------|------------------|----------|-------|--------|
|                   | lb/hr | ton/yr | lb/hr | ton/yr | lb/hr    | ton/yr   | lb/hr  | ton/yr | lb/hr           | ton/yr | lb/hr             | ton/yr | lb/hr              | ton/yr | lb/hr            | ton/yr   | lb/hr | ton/yr |
| Amine-1           | -     | -      | -     | -      | 121.54   | 532.34   | -      | -      | -               | -      | -                 | -      | -                  | -      | 2.76             | 12.09    | -     | -      |
| Dehy-1            | -     | -      | -     | -      | 137.61   | 602.71   | -      | -      | -               | -      | -                 | -      | -                  | -      | 0.036            | 0.16     | -     | -      |
| H-1               | 0.86  | 3.79   | 0.73  | 3.18   | 0.05     | 0.21     | 0.12   | 0.53   | 0.066           | 0.29   | 0.066             | 0.29   | 0.066              | 0.29   | -                | -        | -     | -      |
| H-2               | 4.07  | 17.82  | 6.84  | 29.94  | 0.45     | 1.96     | 1.13   | 4.95   | 0.62            | 2.71   | 0.62              | 2.71   | 0.62               | 2.71   | -                | -        | -     | -      |
| TO-1              | 3.36  | 14.72  | 2.52  | 11.04  | 0.23     | 0.99     | 0.57   | 2.50   | 0.84            | 3.68   | 0.84              | 3.68   | 0.84               | 3.68   | -                | -        | -     | -      |
| HAUL              | -     | -      | -     | -      | -        | -        | -      | -      | 2.07            | 7.56   | 0.53              | 1.93   | 0.053              | 0.19   | -                | -        | -     | -      |
| LOAD              | -     | -      | -     | -      | 0.23     | 0.51     | -      | -      | -               | -      | -                 | -      | -                  | -      | -                | -        | -     | -      |
| FUG               | -     | -      | -     | -      | 13.05    | 57.14    | -      | -      | -               | -      | -                 | -      | -                  | -      | 0.0048           | 0.021    | -     | -      |
| FL-1 <sup>2</sup> | 0.029 | 0.13   | 0.13  | 0.58   | 0.010    | 0.023    | 0.0061 | 0.027  | -               | -      | -                 | -      | -                  | -      | -                | -        | -     | -      |
| GC-1              | -     | -      | -     | -      | 0.038    | 0.17     | -      | -      | -               | -      | -                 | -      | -                  | -      | 9.71E-07         | 4.25E-06 | -     | -      |
| GC-2              | -     | -      | -     | -      | 0.21     | 0.90     | -      | -      | -               | -      | -                 | -      | -                  | -      | 9.71E-07         | 4.25E-06 | -     | -      |
| GC-3              | -     | -      | -     | -      | 0.17     | 0.76     | -      | -      | -               | -      | -                 | -      | -                  | -      | 9.71E-07         | 4.25E-06 | -     | -      |
| GC-4              | -     | -      | -     | -      | 0.18     | 0.77     | -      | -      | -               | -      | -                 | -      | -                  | -      | 9.71E-07         | 4.25E-06 | -     | -      |
| GC-5              | -     | -      | -     | -      | 0.036    | 0.16     | -      | -      | -               | -      | -                 | -      | -                  | -      | 9.71E-07         | 4.25E-06 | -     | -      |
| GC-6              | -     | -      | -     | -      | 6.28E-05 | 2.75E-04 | -      | -      | -               | -      | -                 | -      | -                  | -      | 9.71E-07         | 4.25E-06 | -     | -      |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
|                   |       |        |       |        |          |          |        |        |                 |        |                   |        |                    |        |                  |          |       |        |
| <b>Totals</b>     | 8.32  | 36.45  | 10.21 | 44.73  | 273.78   | 1198.64  | 1.83   | 8.00   | 3.59            | 14.24  | 2.05              | 8.60   | 1.58               | 6.87   | 2.80             | 12.27    | -     | -      |

<sup>1</sup>**Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but PM is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

<sup>2</sup>The total FL-1 emissions were calculated taking the sum of the following emissions: FL-1 (pilot), FL-1 (process), and FL-1 (purge) for controlled emissions and FL-1 (pilot), FL-1 and FL-1 (purge) for uncontrolled emissions.

**Table 2-E: Requested Allowable Emissions**

Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "--" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E<sup>-4</sup>).

| Unit No.          | NOx                                                                                         |        | CO     |        | VOC    |        | SOx   |        | PM <sup>1</sup> |        | PM10 <sup>1</sup> |        | PM2.5 <sup>1</sup> |        | H <sub>2</sub> S |        | Lead  |        |
|-------------------|---------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|-------|--------|-----------------|--------|-------------------|--------|--------------------|--------|------------------|--------|-------|--------|
|                   | lb/hr                                                                                       | ton/yr | lb/hr  | ton/yr | lb/hr  | ton/yr | lb/hr | ton/yr | lb/hr           | ton/yr | lb/hr             | ton/yr | lb/hr              | ton/yr | lb/hr            | ton/yr | lb/hr | ton/yr |
| Amine-1           | -                                                                                           | -      | -      | -      | -      | -      | -     | -      | -               | -      | -                 | -      | -                  | -      | -                | -      | -     | -      |
| Dehy-1            | -                                                                                           | -      | -      | -      | -      | -      | -     | -      | -               | -      | -                 | -      | -                  | -      | -                | -      | -     | -      |
| H-1               | 0.86                                                                                        | 3.79   | 0.73   | 3.18   | 0.048  | 0.21   | 0.12  | 0.53   | 0.066           | 0.29   | 0.066             | 0.29   | 0.066              | 0.29   | -                | -      | -     | -      |
| H-2               | 4.07                                                                                        | 17.82  | 6.84   | 29.94  | 0.45   | 1.96   | 1.13  | 4.95   | 0.62            | 2.71   | 0.62              | 2.71   | 0.62               | 2.71   | -                | -      | -     | -      |
| TO-1              | 3.36                                                                                        | 14.72  | 2.52   | 11.04  | 1.09   | 4.77   | 5.81  | 25.44  | 0.84            | 3.68   | 0.84              | 3.68   | 0.84               | 3.68   | 0.014            | 0.061  | -     | -      |
| HAUL              | -                                                                                           | -      | -      | -      | -      | -      | -     | -      | 0.41            | 1.51   | 0.11              | 0.39   | 0.011              | 0.039  | -                | -      | -     | -      |
| LOAD              | -                                                                                           | -      | -      | -      | 0.23   | 0.51   | -     | -      | -               | -      | -                 | -      | -                  | -      | -                | -      | -     | -      |
| FUG               | -                                                                                           | -      | -      | -      | 13.05  | 57.14  | -     | -      | -               | -      | -                 | -      | -                  | -      | 0.0048           | 0.021  | -     | -      |
| FL-1 <sup>2</sup> | 113.79                                                                                      | 21.63  | 518.75 | 98.61  | 926.80 | 174.71 | 1.56  | 0.45   | -               | -      | -                 | -      | -                  | -      | 0.017            | 0.0046 | -     | -      |
| GC-1              | All controlled GC-1 through GC-6 emissions are associated with the process flare, unit FL-1 |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
| GC-2              |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
| GC-3              |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
| GC-4              |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
| GC-5              |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
| GC-6              |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
|                   |                                                                                             |        |        |        |        |        |       |        |                 |        |                   |        |                    |        |                  |        |       |        |
| Totals            | 122.08                                                                                      | 57.96  | 528.83 | 142.77 | 941.67 | 239.30 | 8.62  | 31.37  | 1.94            | 8.19   | 1.63              | 7.06   | 1.53               | 6.71   | 0.04             | 0.09   | -     | -      |

<sup>1</sup> **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

<sup>2</sup> The total FL-1 emissions were calculated taking the sum of the following emissions: FL-1 (pilot), FL-1 (process), and FL-1 (purge) for controlled emissions and FL-1 (pilot), FL-1 and FL-1 (purge) for uncontrolled emissions.

**Table 2-F: Additional Emissions during Startup, Shutdown, and Routine Maintenance (SSM)**

☐ This table is intentionally left blank since all emissions at this facility due to routine or predictable startup, shutdown, or scheduled maintenance are no higher than those listed in Table 2-E and a malfunction emission limit is not already permitted or requested. If you are required to report GHG emissions as described in Section 6a, include any GHG emissions during Startup, Shutdown, and/or Scheduled Maintenance (SSM) in Table 2-P. Provide an explanations of SSM emissions in Section 6 and 6a.

All applications for facilities that have emissions during routine or predictable startup, shutdown or scheduled maintenance (SSM)<sup>1</sup>, including NOI applications, must include in this table the Maximum Emissions during routine or predictable startup, shutdown and scheduled maintenance (20.2.7 NMAC, 20.2.72.203.A.3 NMAC, 20.2.73.200.D.2 NMAC). In Section 6 and 6a, provide emissions calculations for all SSM emissions reported in this table. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications ([https://www.env.nm.gov/aqb/permit/aqb\\_pol.html](https://www.env.nm.gov/aqb/permit/aqb_pol.html)) for more detailed instructions. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

| Unit No.         | NOx   |        | CO     |        | VOC     |        | SOx   |         | PM <sup>2</sup> |        | PM10 <sup>2</sup> |        | PM2.5 <sup>2</sup> |        | H <sub>2</sub> S |          | Lead  |        |
|------------------|-------|--------|--------|--------|---------|--------|-------|---------|-----------------|--------|-------------------|--------|--------------------|--------|------------------|----------|-------|--------|
|                  | lb/hr | ton/yr | lb/hr  | ton/yr | lb/hr   | ton/yr | lb/hr | ton/yr  | lb/hr           | ton/yr | lb/hr             | ton/yr | lb/hr              | ton/yr | lb/hr            | ton/yr   | lb/hr | ton/yr |
| FL-1 (TO SSM)    | 9.45  | 0.47   | 43.09  | 2.15   | 2.08    | 0.10   | 5.16  | 0.26    | -               | -      | -                 | -      | -                  | -      | 0.056            | 2.80E-03 | -     | -      |
| FL-1 (BDD SSM)   | 23.61 | 0.53   | 107.64 | 2.42   | 30.58   | 0.69   | 0.20  | 0.0024  | -               | -      | -                 | -      | -                  | -      | 0.0022           | 4.98E-05 | -     | -      |
| FL-1 (PT SSM)    | 18.11 | 0.036  | 82.55  | 0.17   | 33.82   | 0.068  | 0.15  | 0.00029 | -               | -      | -                 | -      | -                  | -      | 0.0016           | 3.15E-06 | -     | -      |
| Blowdown Venting | -     | -      | -      | -      | 2670.50 | 6.84   | -     | -       | -               | -      | -                 | -      | -                  | -      | 0.030            | 1.48E-04 | -     | -      |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
|                  |       |        |        |        |         |        |       |         |                 |        |                   |        |                    |        |                  |          |       |        |
| Totals           | 23.61 | 1.04   | 107.64 | 4.74   | 2670.50 | 7.70   | 5.16  | 0.26    | -               | -      | -                 | -      | -                  | -      | 0.056            | 0.00     | -     | -      |

<sup>1</sup> **For instance**, if the short term steady-state Table 2-E emissions are 5 lb/hr and the SSM rate is 12 lb/hr, enter 7 lb/hr in this table. If the annual steady-state Table 2-E emissions are 21.9 TPY, and the number of scheduled SSM events result in annual emissions of 31.9 TPY, enter 10.0 TPY in the table below.

<sup>2</sup> **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for PM unless PM is set equal to PM10 and PM2.5. Particulate matter (PM) is not subject to an ambient air quality standard, but it is a regulated air pollutant under PSD (20.2.74 NMAC) and Title V (20.2.70 NMAC).

☒ I have elected to leave this table blank because this facility does not have any stacks/vents that split emissions from a single source or combine emissions from more than one source listed in table 2-A. Additionally, the emission rates of all stacks match the Requested allowable emission rates stated in Table 2-E.

[illegible]

### Table 2-H: Stack Exit Conditions

Unit and stack numbering must correspond throughout the application package. Include the stack exit conditions for each unit that emits from a stack, including blowdown venting parameters and tank emissions. If the facility has multiple operating scenarios, complete a separate Table 2-H for each scenario and, for each, type scenario name here:

[illegible]

**Table 2-I: Stack Exit and Fugitive Emission Rates for HAPs and TAPs**

In the table below, report the Potential to Emit for each HAP from each regulated emission unit listed in Table 2-A, only if the entire facility emits the HAP at a rate greater than or equal to one (1) ton per year. For each such emission unit, HAPs shall be reported to the nearest 0.1 tpy. Each facility-wide Individual HAP total and the facility-wide Total HAPs shall be the sum of all HAP sources calculated to the nearest 0.1 ton per year. Per 20.2.72.403.A.1 NMAC, facilities not exempt [see 20.2.72.402.C NMAC] from TAP permitting shall report each TAP that has an uncontrolled emission rate in excess of its pounds per hour screening level specified in 20.2.72.502 NMAC. TAPs shall be reported using one more significant figure than the number of significant figures shown in the pound per hour threshold corresponding to the substance. Use the HAP nomenclature as it appears in Section 112 (b) of the 1990 CAAA and the TAP nomenclature as it listed in 20.2.72.502 NMAC. Include tank-flashing emissions estimates of HAPs in this table. For each HAP or TAP listed, fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected or the pollutant is emitted in a quantity less than the threshold amounts described above.

| Stack No.             | Unit No.(s)          | Total HAPs |        | n-hexane<br><input checked="" type="checkbox"/> HAP or <input type="checkbox"/> TAP |          | Provide Pollutant Name<br>Here <input type="checkbox"/> HAP<br>or <input type="checkbox"/> TAP |        | Provide Pollutant Name<br>Here <input type="checkbox"/> HAP<br>or <input type="checkbox"/> TAP |        | Provide Pollutant Name<br>Here <input type="checkbox"/> HAP<br>or <input type="checkbox"/> TAP |        | Provide Pollutant Name<br>Here <input type="checkbox"/> HAP<br>or <input type="checkbox"/> TAP |        | Provide Pollutant Name<br>Here <input type="checkbox"/> HAP<br>or <input type="checkbox"/> TAP |        |
|-----------------------|----------------------|------------|--------|-------------------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------|--------|
|                       |                      | lb/hr      | ton/yr | lb/hr                                                                               | ton/yr   | lb/hr                                                                                          | ton/yr | lb/hr                                                                                          | ton/yr | lb/hr                                                                                          | ton/yr | lb/hr                                                                                          | ton/yr | lb/hr                                                                                          | ton/yr |
| TO-1                  | Amine-1 & Dehy-1     | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| H-1                   | H-1                  | 7.29E-03   | 0.032  | 3.98E-05                                                                            | 1.74E-04 |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| H-2                   | H-2                  | 0.050      | 0.22   | 3.74E-04                                                                            | 0.00     |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| TO-1                  | TO-1                 | 0.21       | 0.93   | 1.62E-02                                                                            | 7.10E-02 |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| HAUL                  | HAUL                 | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| LOAD                  | LOAD                 | 0.051      | 0.11   | 0.012                                                                               | 0.026    |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| FUG                   | FUG                  | 0.56       | 2.45   | 0.16                                                                                | 0.68     |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| FL-1 <sup>1</sup>     | Flare                | 9.02       | 2.08   | 8.49                                                                                | 1.73     |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| N/A                   | GC-1                 | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| N/A                   | GC-2                 | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| N/A                   | GC-3                 | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| N/A                   | GC-4                 | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| N/A                   | GC-5                 | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| N/A                   | GC-6                 | -          | -      | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| Routine SSM Emissions |                      |            |        |                                                                                     |          |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| FL-1                  | FL-1 (TO SSM)        | 0.065      | 0.0033 | 0.065                                                                               | 0.0033   |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| FL-1                  | FL-1 (BD SSM)        | 4.34       | 0.098  | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| FL-1                  | FL-1 (PT SSM)        | 4.86       | 0.0097 | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| SSM Blowdown Venting  | SSM Blowdown Venting | 308.01     | 0.73   | -                                                                                   | -        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
|                       |                      |            |        |                                                                                     |          |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
|                       |                      |            |        |                                                                                     |          |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
|                       |                      |            |        |                                                                                     |          |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |
| <b>Totals:</b>        |                      | 327.18     | 6.66   | 8.74                                                                                | 2.51     |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |                                                                                                |        |

**Table 2-J: Fuel**

Specify fuel characteristics and usage. Unit and stack numbering must correspond throughout the application package.

| Unit No. | Fuel Type (low sulfur Diesel, ultra low sulfur diesel, Natural Gas, Coal, ...) | Fuel Source: purchased commercial, pipeline quality natural gas, residue gas, raw/field natural gas, process gas (e.g. SRU tail gas) or other | Specify Units       |              |               |                                       |       |
|----------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------|---------------|---------------------------------------|-------|
|          |                                                                                |                                                                                                                                               | Lower Heating Value | Hourly Usage | Annual Usage  | % Sulfur                              | % Ash |
| H-1      | Natural Gas                                                                    | Pipeline quality natural gas                                                                                                                  | 950 But/scf         | 8.8 Mscf     | 73.6 Mscf     | 5 gr S/100 scf                        | -     |
| H-2      | Natural Gas                                                                    | Pipeline quality natural gas                                                                                                                  | 950 But/scf         | 79.0 Mscf    | 692.5 MMscf   | 5 gr S/100 scf                        | -     |
| TO-1     | Natural Gas                                                                    | Firebox and process gas from amine unit                                                                                                       | 950 Btu/scf         | 40.0 Mscf    | 350.4 MMscf   | 5 gr S/100 scf                        | -     |
| FL-1     | Natural Gas                                                                    | Process flaring                                                                                                                               | 1824 Btu/scf        | 917.2 Mscf   | 346,750 MMscf | 5 gr S/100 scf & Plant Flare Analysis | -     |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |
|          |                                                                                |                                                                                                                                               |                     |              |               |                                       |       |

**Table 2-K: Liquid Data for Tanks Listed in Table 2-L**

For each tank, list the liquid(s) to be stored in each tank. If it is expected that a tank may store a variety of hydrocarbon liquids, enter "mixed hydrocarbons" in the Composition column for that tank and enter the corresponding data of the most volatile liquid to be stored in the tank. If tank is to be used for storage of different materials, list all the materials in the "All Calculations" attachment, run the newest version of TANKS on each, and use the material with the highest emission rate to determine maximum uncontrolled and requested allowable emissions rate. The permit will specify the most volatile category of liquids that may be stored in each tank. Include appropriate tank-flashing modeling input data. Use additional sheets if necessary. Unit and stack numbering must correspond throughout the application package.

| Tank No.                                                                              | SCC Code | Material Name | Composition | Liquid Density (lb/gal) | Vapor Molecular Weight (lb/lb*mol) | Average Storage Conditions |                            | Max Storage Conditions |                            |
|---------------------------------------------------------------------------------------|----------|---------------|-------------|-------------------------|------------------------------------|----------------------------|----------------------------|------------------------|----------------------------|
|                                                                                       |          |               |             |                         |                                    | Temperature (°F)           | True Vapor Pressure (psia) | Temperature (°F)       | True Vapor Pressure (psia) |
| There are no regulated tanks at this facility. See Table 2-B for specific exemptions. |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |
|                                                                                       |          |               |             |                         |                                    |                            |                            |                        |                            |

**Table 2-L: Tank Data**

Include appropriate tank-flashing modeling input data. Use an addendum to this table for unlisted data categories. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary. See reference Table 2-L2. Note: 1.00 bbl = 10.159 M3 = 42.0 gal

There are no regulated tanks at this facility. See Table 2-B for specific exemptions.

**Table 2-L2: Liquid Storage Tank Data Codes Reference Table**

| Roof Type                                        | Seal Type, Welded Tank Seal Type |                               | Seal Type, Riveted Tank Seal Type |                                  | Roof, Shell Color       | Paint Condition |
|--------------------------------------------------|----------------------------------|-------------------------------|-----------------------------------|----------------------------------|-------------------------|-----------------|
| FX: Fixed Roof                                   | Mechanical Shoe Seal             | Liquid-mounted resilient seal | Vapor-mounted resilient seal      | Seal Type                        | WH: White               | Good            |
| IF: Internal Floating Roof                       | A: Primary only                  | A: Primary only               | A: Primary only                   | A: Mechanical shoe, primary only | AS: Aluminum (specular) | Poor            |
| EF: External Floating Roof                       | B: Shoe-mounted secondary        | B: Weather shield             | B: Weather shield                 | B: Shoe-mounted secondary        | AD: Aluminum (diffuse)  |                 |
| P: Pressure                                      | C: Rim-mounted secondary         | C: Rim-mounted secondary      | C: Rim-mounted secondary          | C: Rim-mounted secondary         | LG: Light Gray          |                 |
| Note: 1.00 bbl = 0.159 M <sup>3</sup> = 42.0 gal |                                  |                               |                                   |                                  | MG: Medium Gray         |                 |
|                                                  |                                  |                               |                                   |                                  | BL: Black               |                 |
|                                                  |                                  |                               |                                   |                                  | OT: Other (specify)     |                 |

Note:  $1.00 \text{ bbl} = 0.159 \text{ M}^3 = 42.0 \text{ gal}$

**Table 2-M: Materials Processed and Produced** (Use additional sheets as necessary.)

[illegible]

### Table 2-N: CEM Equipment

Enter Continuous Emissions Measurement (CEM) Data in this table. If CEM data will be used as part of a federally enforceable permit condition, or used to satisfy the requirements of a state or federal regulation, include a copy of the CEM's manufacturer specification sheet in the Information Used to Determine Emissions attachment. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

[illegible]

**Table 2-O: Parametric Emissions Measurement Equipment**

Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

| Unit No.                                  | Parameter/Pollutant Measured | Location of Measurement | Unit of Measure | Acceptable Range | Frequency of Maintenance | Nature of Maintenance | Method of Recording | Averaging Time |
|-------------------------------------------|------------------------------|-------------------------|-----------------|------------------|--------------------------|-----------------------|---------------------|----------------|
| N/A - There are no PEMs at this facility. |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
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|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |
|                                           |                              |                         |                 |                  |                          |                       |                     |                |

**Table 2-P: Greenhouse Gas Emissions**

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total CO<sub>2</sub>e emissions are less than 75,000 tons per year.

|                  |                   | CO <sub>2</sub><br>ton/yr | N <sub>2</sub> O<br>ton/yr | CH <sub>4</sub><br>ton/yr | SF <sub>6</sub><br>ton/yr | PFC/HFC<br>ton/yr <sup>2</sup> |  |  |  |  |  |  |  | Total<br>GHG Mass<br>Basis ton/yr <sup>4</sup> | Total<br>CO <sub>2</sub> e<br>ton/yr <sup>5</sup> |
|------------------|-------------------|---------------------------|----------------------------|---------------------------|---------------------------|--------------------------------|--|--|--|--|--|--|--|------------------------------------------------|---------------------------------------------------|
| Unit No.         | GWPs <sup>1</sup> | 1                         | 298                        | 25                        | 22,800                    | footnote 3                     |  |  |  |  |  |  |  |                                                |                                                   |
| Amine-1          | mass GHG          | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
|                  | CO <sub>2</sub> e | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
| Dehy-1           | mass GHG          | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
|                  | CO <sub>2</sub> e | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
| H-1              | mass GHG          | 4,519.02                  | 8.52E-03                   | 0.085                     |                           |                                |  |  |  |  |  |  |  | 4,519.11                                       | -                                                 |
|                  | CO <sub>2</sub> e | 4,519.02                  | 2.54                       | 2.13                      |                           |                                |  |  |  |  |  |  |  | -                                              | 4,523.69                                          |
| H-2              | mass GHG          | 42,525.92                 | 0.080                      | 0.80                      |                           |                                |  |  |  |  |  |  |  | 42,526.80                                      | -                                                 |
|                  | CO <sub>2</sub> e | 42,525.92                 | 23.88                      | 20.04                     |                           |                                |  |  |  |  |  |  |  | -                                              | 42,569.84                                         |
| TO-1             | mass GHG          | 183,207.20                | 0.041                      | 2.31                      |                           |                                |  |  |  |  |  |  |  | 183,209.55                                     | -                                                 |
|                  | CO <sub>2</sub> e | 183,207.20                | 12.09                      | 57.85                     |                           |                                |  |  |  |  |  |  |  | -                                              | 183,277.13                                        |
| HAUL             | mass GHG          | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
|                  | CO <sub>2</sub> e | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
| LOAD             | mass GHG          | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
|                  | CO <sub>2</sub> e | -                         | -                          | -                         |                           |                                |  |  |  |  |  |  |  | -                                              | -                                                 |
| FUG              | mass GHG          | 4.99                      | -                          | 83.42                     |                           |                                |  |  |  |  |  |  |  | 88.41                                          | -                                                 |
|                  | CO <sub>2</sub> e | 4.99                      | -                          | 2,085.50                  |                           |                                |  |  |  |  |  |  |  | -                                              | 2,090.49                                          |
| FL-1             | mass GHG          | 866.62                    | 0.070                      | 0.80                      |                           |                                |  |  |  |  |  |  |  | 867.50                                         | -                                                 |
|                  | CO <sub>2</sub> e | 866.62                    | 20.98                      | 20.10                     |                           |                                |  |  |  |  |  |  |  | -                                              | 907.710                                           |
| FL-1 (TO<br>SSM) | mass GHG          | 6,409.62                  | 3.02E-05                   | 11.10                     |                           |                                |  |  |  |  |  |  |  | 6,420.72                                       | -                                                 |
|                  | CO <sub>2</sub> e | 6,409.62                  | 9.00E-03                   | 277.50                    |                           |                                |  |  |  |  |  |  |  | -                                              | 6,687.13                                          |
| FL-1 (BD<br>SSM) | mass GHG          | 234.95                    | 2.87E-04                   | 43.43                     |                           |                                |  |  |  |  |  |  |  | 278.38                                         | -                                                 |
|                  | CO <sub>2</sub> e | 234.95                    | 0.086                      | 1,085.64                  |                           |                                |  |  |  |  |  |  |  | -                                              | 1,320.68                                          |
| FL-1 (PT<br>SSM) | mass GHG          | 65.21                     | 0.00012                    | 0.29                      |                           |                                |  |  |  |  |  |  |  | 65.50                                          | -                                                 |
|                  | CO <sub>2</sub> e | 65.21                     | 0.035                      | 7.20                      |                           |                                |  |  |  |  |  |  |  | -                                              | 72.45                                             |
|                  | mass GHG          |                           |                            |                           |                           |                                |  |  |  |  |  |  |  |                                                |                                                   |
|                  | CO <sub>2</sub> e |                           |                            |                           |                           |                                |  |  |  |  |  |  |  |                                                |                                                   |
| Total            | mass GHG          | 237,833.53                | 0.20                       | 142.24                    |                           |                                |  |  |  |  |  |  |  | 237,975.97                                     | -                                                 |
|                  | CO <sub>2</sub> e | 237,833.53                | 59.62                      | 3,555.96                  |                           |                                |  |  |  |  |  |  |  | -                                              | 241,449.11                                        |

<sup>1</sup> GWP (Global Warming Potential): Applicants must use the most current GWPs codified in Table A-1 of 40 CFR part 98. GWPs are subject to change, therefore, applicants need to check 40 CFR 98 to confirm GWP values.

<sup>2</sup> For HFCs or PFCs describe the specific HFC or PFC compound and use a separate column for each individual compound.

<sup>3</sup> For each new compound, enter the appropriate GWP for each HFC or PFC compound from Table A-1 in 40 CFR 98.

<sup>4</sup> Green house gas emissions on a **mass basis** is the ton per year green house gas emission before adjustment with its GWP.

<sup>5</sup> CO<sub>2</sub>e means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the green house gas by its GWP.

# Section 3

## Application Summary

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The **Application Summary** shall include a brief description of the facility and its process, the type of permit application, the applicable regulation (i.e. 20.2.72.200.A.X, or 20.2.73 NMAC) under which the application is being submitted, and any air quality permit numbers associated with this site. If this facility is to be collocated with another facility, provide details of the other facility including permit number(s). In case of a revision or modification to a facility, provide the lowest level regulatory citation (i.e. 20.2.72.219.B.1.d NMAC) under which the revision or modification is being requested. Also describe the proposed changes from the original permit, how the proposed modification will affect the facility's operations and emissions, debottlenecking impacts, and changes to the facility's major/minor status (both PSD & Title V).

The **Process Summary** shall include a brief description of the facility and its processes.

**Startup, Shutdown, and Maintenance (SSM) routine or predictable emissions:** Provide an overview of how SSM emissions are accounted for in this application. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications ([http://www.env.nm.gov/aqb/permit/app\\_form.html](http://www.env.nm.gov/aqb/permit/app_form.html)) for more detailed instructions on SSM emissions.

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The South Eddy Cryo Plant is currently permitted under NSR 5945-M5R4 (application dated June 20, 2023) and Title V P282-M1 which was issued on May 28, 2021. Pursuant to 20.2.70.300.B.(2) NMAC, Enterprise Field Services, LLC (Enterprise) is submitting this Title V operating permit renewal application. Under NSR 5945-M5R4, the facility is currently permitted for the following equipment:

- Inlet Compressors (Units RC-1 through RC-3)
- Electric Residue Compressors (Units RC-4 through RC-6)
- Refrigeration Compressors (Units CC-1 and CC-2)
- VRU Compressors (Units CO-1011, CO-1012, and CO-1015)
- Amine Sweetening Unit (Unit Amine-1)
- Triethylene Glycol Dehydrator Unit (Unit Dehy-1)
- Mole Sieve Dehydrator Regeneration Heater (Unit H-1)
- Heat Medium Heater (Unit H-2)
- Thermal Oxidizer (Unit TO-1)
- Haul Road Emissions (Unit HAUL)
- Condensate Loadout (Unit LOAD)
- Flare (Unit FL-1)
- Gas Chromatographs (Units GC-1 through GC-6)

Other regulated emissions at the facility include facility fugitives (Unit FUG), and startup, shutdown and maintenance (Units FL-1 SSM, FL-1 BS SSM, FL-1 PT SSM and SSM Blowdown Venting).

Enterprise is also submitting this application for a Title V Minor Permit Modification pursuant to 20.2.70.404.B NMAC. Enterprise is submitting a Title V Minor Permit Modification so that the Title V Permit will incorporate changes to the facility that were incorporated in NSR Permits 5945-M5R3 and 5945-M5R4. Below is a discussion of the Title V permitting action since the initial Title V application and the updates made in the NSR revision applications.

Lastly, Enterprise is submitting this application to remove Malfunction (Unit Malfunction) and the Emergency Power Generator (Unit GEN-SET1) emissions. It was determined that malfunction emissions shall not be included in the Title V permit (EPA Order dated November 16, 2022).

### Title V Operating Permit No. P282-M1 Administrative Revision

The following are changes made in the application for Title V Operating Permit 282-M1:

- A typo correction was made in section A109A. The correction changes the six-month reporting period from the periods beginning September 1<sup>st</sup> and February 1<sup>st</sup> to September 1<sup>st</sup> and March 1<sup>st</sup> of each year.

**NSR Permit 5945-M5R3 Revisions**

The following are changes made in the application for NSR Permit 5945-M5R3:

- This permitting action consisted of adding an operating scenario to route amine flash emissions to the thermal oxidizer (Unit TO). In addition, this modification removes the thermal evaporator (H-3).

**NSR Permit 5945-M5R4 Revision**

The following are changes made in the application for NSR Permit 5945-M5R4:

- This permitting action consisted of installing a substitute flare that replaced the existing permitted flare which was damaged.

# Section 4

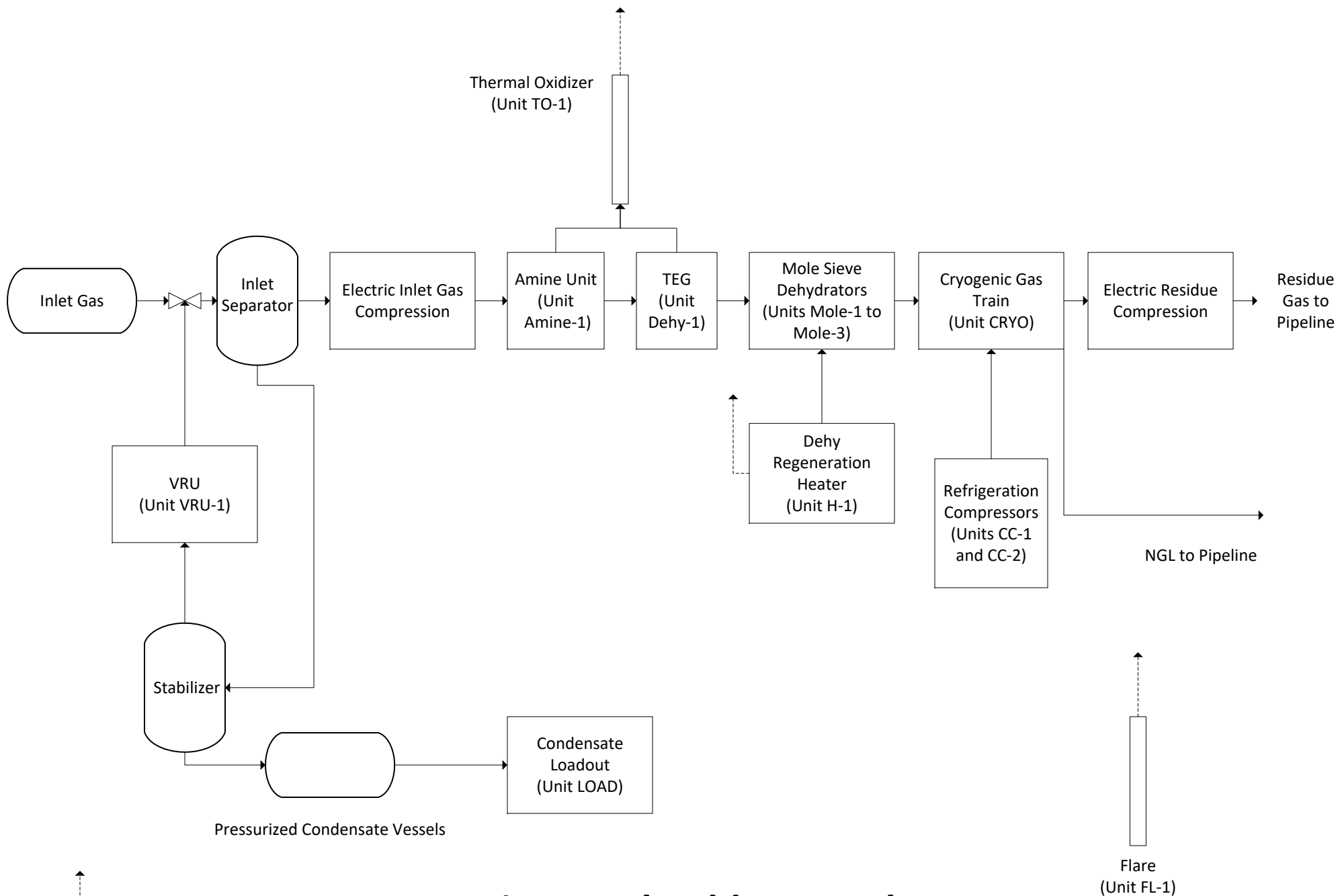
## Process Flow Sheet

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A **process flow sheet** and/or block diagram indicating the individual equipment, all emission points and types of control applied to those points. The unit numbering system should be consistent throughout this application.

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A process flow diagram is attached.



# Enterprise South Eddy Cryo Plant

## Process Flow Diagram

# Section 5

## Plot Plan Drawn To Scale

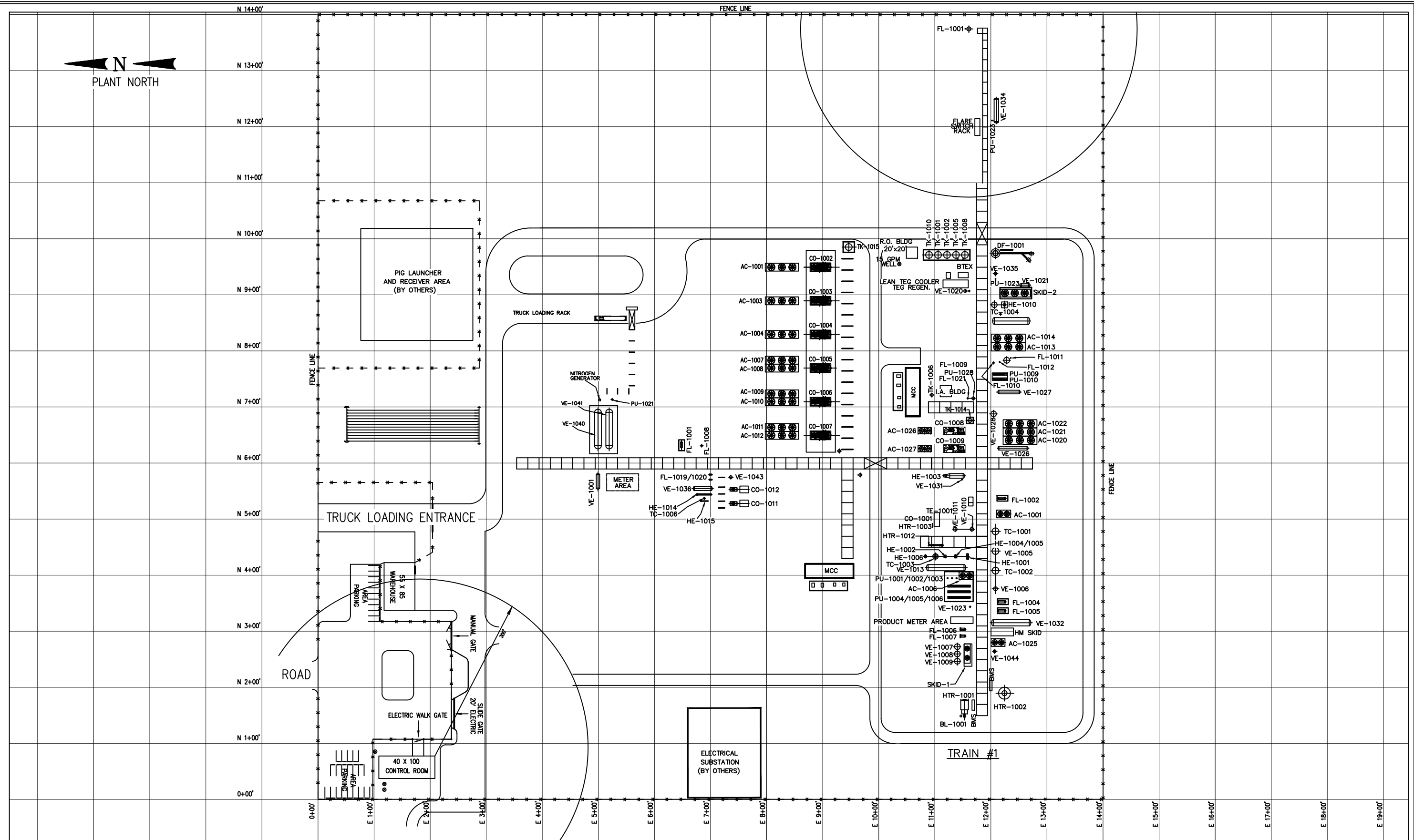
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A **plot plan drawn to scale** showing emissions points, roads, structures, tanks, and fences of property owned, leased, or under direct control of the applicant. This plot plan must clearly designate the restricted area as defined in UA1, Section 1-D.12. The unit numbering system should be consistent throughout this application.

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A plot plan is attached.

H:\300\0\0\Drawings\Plant Plans\Plot Plans\300\0 Plot Plan - 2.dwg



| REFERENCE DRAWINGS |       |
|--------------------|-------|
| NUMBER             | TITLE |
|                    |       |
|                    |       |
|                    |       |
|                    |       |
|                    |       |
|                    |       |
|                    |       |
|                    |       |
|                    |       |

**OPTIMIZED PROCESS DESIGNS**  
ENGINEERS AND CONSTRUCTORS  
KATY, TEXAS

PH. 281-371-7500  
OPD JOB #13070

| NO. | REVISION                        | DRAWN | CHECKED | APPRVD | DATE     |
|-----|---------------------------------|-------|---------|--------|----------|
| A   | ISSUED FOR BID - OPD JOB #13070 | RS    | MG      | BJB    | 11/07/14 |

SYMBOLS AND LEGEND SHEET #3  
PIPING & INSTRUMENTATION DIAGRAM  
SOUTH EDDY GAS PROCESSING PLANT  
EDDY COUNTY, NEW MEXICO

**Enterprise Products**

|                    |      |                      |                 |
|--------------------|------|----------------------|-----------------|
| DRAWING SCALE      | NONE | ENTERPRISE APPROVED  | EW              |
| DRAWN BY           | RS   | DATE                 | 11/01/14        |
| CHECKED BY         | MG   | DATE                 | 11/01/14        |
| APPROVED BY        | BJB  | DATE                 | 11/01/14        |
| DOCUMENT CONTROL # |      | ENTERPRISE PROJECT # | AFE 18288       |
|                    |      | DRAWING NUMBER       | 10096-XXXX-0001 |

# Section 6

## All Calculations

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**Show all calculations** used to determine both the hourly and annual controlled and uncontrolled emission rates. All calculations shall be performed keeping a minimum of three significant figures. Document the source of each emission factor used (if an emission rate is carried forward and not revised, then a statement to that effect is required). If identical units are being permitted and will be subject to the same operating conditions, submit calculations for only one unit and a note specifying what other units to which the calculations apply. All formulas and calculations used to calculate emissions must be submitted. The "Calculations" tab in the UA2 has been provided to allow calculations to be linked to the emissions tables. Add additional "Calc" tabs as needed. If the UA2 or other spread sheets are used, all calculation spread sheet(s) shall be submitted electronically in Microsoft Excel compatible format so that formulas and input values can be checked. Format all spread sheets and calculations such that the reviewer can follow the logic and verify the input values. Define all variables. If calculation spread sheets are not used, provide the original formulas with defined variables. Additionally, provide subsequent formulas showing the input values for each variable in the formula. All calculations, including those calculations are imbedded in the Calc tab of the UA2 portion of the application, the printed Calc tab(s), should be submitted under this section.

**Tank Flashing Calculations:** The information provided to the AQB shall include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., NOI, permit, or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis. If Hysis is used, all relevant input parameters shall be reported, including separator pressure, gas throughput, and all other relevant parameters necessary for flashing calculation.

**SSM Calculations:** It is the applicant's responsibility to provide an estimate of SSM emissions or to provide justification for not doing so. In this Section, provide emissions calculations for Startup, Shutdown, and Routine Maintenance (SSM) emissions listed in the Section 2 SSM and/or Section 22 GHG Tables and the rational for why the others are reported as zero (or left blank in the SSM/GHG Tables). Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications ([http://www.env.nm.gov/aqb/permit/app\\_form.html](http://www.env.nm.gov/aqb/permit/app_form.html)) for more detailed instructions on calculating SSM emissions. If SSM emissions are greater than those reported in the Section 2, Requested Allowables Table, modeling may be required to ensure compliance with the standards whether the application is NSR or Title V. Refer to the Modeling Section of this application for more guidance on modeling requirements.

**Glycol Dehydrator Calculations:** The information provided to the AQB shall include the manufacturer's maximum design recirculation rate for the glycol pump. If GRI-Glycalc is used, the full input summary report shall be included as well as a copy of the gas analysis that was used.

**Road Calculations:** Calculate fugitive particulate emissions and enter haul road fugitives in Tables 2-A, 2-D and 2-E for:

1. If you transport raw material, process material and/or product into or out of or within the facility and have PER emissions greater than 0.5 tpy.
2. If you transport raw material, process material and/or product into or out of the facility more frequently than one round trip per day.

### Significant Figures:

**A.** All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.

**B.** At least 5 significant figures shall be retained in all intermediate calculations.

**C.** In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

- (1) If the first digit to be discarded is less than the number 5, the last digit retained shall not be changed;
- (2) If the first digit discarded is greater than the number 5, or if it is the number 5 followed by at least one digit other than the number zero, the last figure retained shall be increased by one unit; **and**
- (3) If the first digit discarded is exactly the number 5, followed only by zeros, the last digit retained shall be rounded upward if it is an odd number, but no adjustment shall be made if it is an even number.
- (4) The final result of the calculation shall be expressed in the units of the standard.

**Control Devices:** In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the

application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

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## Steady-State Emission Calculations

### Dehydrator Regeneration Heater (unit H-1)

Emission rates of NO<sub>x</sub>, CO, VOC and particulates were calculated using AP-42 Tables 1.4-1 and 1.4-2, using the emission factors for low-NO<sub>x</sub> burners. The emission factors were adjusted from a lb/MMscf emission rate to a lb/MMBtu emission rate, in accordance with AP-42 Table 1.4-1, footnote a. The SO<sub>2</sub> emissions were calculated assuming a maximum sulfur content of 5 grains per 100 standard cubic feet. HAP emissions were calculated using emission factors from the California Air Resources Board (CARB).

### Heat Medium Heater (unit H-2)

Emission rates of NO<sub>x</sub>, CO, VOC and particulates were calculated using AP-42 Tables 1.4-1 and 1.4-2, using the emission factors for low-NO<sub>x</sub> burners. The emission factors were adjusted from a lb/MMscf emission rate to a lb/MMBtu emission rate, in accordance with AP-42 Table 1.4-1, footnote a. The SO<sub>2</sub> emissions were calculated assuming a maximum sulfur content of 5 grains per 100 standard cubic feet. HAP emissions were calculated using emission factors from the California Air Resources Board (CARB).

### Amine Unit (unit Amine-1)

Uncontrolled emissions for the amine unit were calculated using the Dow Oil and Gas simulation software. The maximum rated capacity for this amine unit is 240 MMscf/day although the requested permitted capacity is 216.4 MMscf/day feeding the amine contactor. All flash gas is captured by an electric VRU (unit VRU-3). The still vent vapors are routed to the thermal oxidizer (unit TO-1), where they are incinerated.

### TEG Dehydrator Unit (unit Dehy-1)

Uncontrolled VOC and HAP emissions for the dehydrator unit were calculated using GRI-GlyCalc Version 4.0. Permitted emissions are based on a simulation with a throughput of 240 MMscf/day of inlet gas. All emissions are routed to the thermal oxidizer (unit TO-1), where they are incinerated.

### Thermal Oxidizer (unit TO-1)

Emissions from the amine unit are routed to the thermal oxidizer. Based on the manufacturer guarantee, all hydrocarbons are assumed to be controlled by 99.5%. The firebox emissions on the thermal oxidizers will be equipped with low-NO<sub>x</sub> burners. The emissions of NO<sub>x</sub>, CO, VOC and particulates from the firebox were calculated using AP-42 Tables 1.4-1 and 1.4-2. The SO<sub>2</sub> emissions were calculated assuming a maximum sulfur content of 5 grains per 100 standard cubic feet. The sum of the combusted amine emissions and the firebox emissions were added together to determine the total emissions from the thermal oxidizer. HAP emissions from the firebox were calculated using CARB Guidance.

### FL-1 [pilot and purge] (unit FL-1)

The flare at the facility is designed to have three separate pilots, each rated at 50 scf/hr. For NO<sub>x</sub> and CO, emission factors from AP-42 Tables 13.5-1 and 13.5-2 were used. VOC emissions were calculated using a flare gas composition. The SO<sub>2</sub> emissions were calculated assuming a maximum sulfur content of 5 grains per 100 standard cubic feet. HAP emissions were assumed to be negligible, as it is expected that a majority of the gas combusted would be lighter hydrocarbons (C1 – C4).

### FL-1 [process] (unit FL-1)

The process flare will be used to control truck degassing. Additionally, the flare will be used to control amine flash as an alternate scenario to unit VRU-3 or unit H-2. The gas analyses for any gases expected to be routed to the flare were evaluated to determine the worst-case process flaring emissions for criteria pollutants.

The NO<sub>x</sub> factor from TNRCC RG-109 guidance and the CO emission factor from AP-42 Table 13.5-1 were used. For VOC, the maximum VOC flow of any gas composition was used and assumed to be controlled by 98%. HAP emissions were calculated using the maximum HAP content in representative gas analyses.

### Haul Roads (unit HAUL)

Unpaved haul road emissions were estimated based on Equation 2 of AP-42 Section 13.2.2 (11/06). The maximum number of trucks expected in an hour was used to calculate the hourly emissions. Annual emissions were calculated using the maximum expected number of trucks per day, extrapolated out to a full year.

**Condensate Loadout emissions (unit LOAD)**

Fugitive VOC emissions will occur when the hose is disconnected from the truck once the truck unloading operation is completed. These emissions were calculated based on the physical parameters of the hose as well as the pressure used to push the condensate out of the truck. Hourly fugitive VOC emissions were calculated based on the VOC emissions per truck and the number of trucks unloaded per hour. Annual fugitive VOC emissions were calculated based on VOC emissions per truck and the number of trucks unloaded per year.

**Facility-Wide Fugitives (unit FUG)**

Facility fugitive emissions were calculated using the field confirmed inventory of valves, flanges, pumps, etc. and the corresponding service provided by these components with the emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emissions Estimates (1995), and a facility gas analysis. A 10% safety factor was added to the component count. It was assumed that the light liquid is 100% VOC and 5% HAPs by weight. The 5% of HAPs associated with the light liquid was assumed to be composed of equal weight percentages of n-hexane, benzene, toluene, xylenes, and ethylbenzene (each 1% of total light liquid).

**Gas Chromatographs (units GC-1 through GC-6)**

The gas chromatograph emissions were calculated using stream analyses for each unit and assuming a gas flow of 400 cm<sup>3</sup>/min. Total HAPs emissions were assumed to be equal to total Hexanes+ emissions. All emissions are controlled by the flare, unit FL-01.

## **Startup, Shutdown, and Maintenance Emission Calculations**

**Blowdown Flaring (unit FL-1 [BD SSM])**

The currently permitted flaring events are refined to the number of compressors associated with inlet gas, residue gas and off-gas blowdown, their volume per event and an estimated number of 15 events blowdown per year. All gas analyses expected to be routed to the flare were evaluated to determine the worst-case blowdown emissions for criteria pollutants. Since worst-case emissions were represented, Enterprise has requested a maximum hourly and annual volume, rather than permitting a specific number of events.

NO<sub>x</sub> and CO emission factors from AP-42 Tables 13.5-1 and 13.5-2 were used. For VOC flow of each blowdown volume and gas composition was used and assumed to be controlled by 98%.

HAP emissions were calculated using the Hexanes+ content of each gas stream and the blowdown volumes.

**Plant Turnaround Flaring (unit FL-1 [PT SSM])**

Facility turnarounds are scheduled events wherein the entire South Eddy facility is taken offline for an extended period for major maintenance activities. The events usually only occur once every 5-10 years. During a turnaround event, all of the gas in the facility is blown down to the flare. Enterprise is including emission estimates of these flaring events in this application. The emission estimates are based on a conservative plant volume, flaring event duration, and the inlet gas composition.

NO<sub>x</sub> and CO emission factors from AP-42 Tables 13.5-1 and 13.5-2 were used. For VOC, the maximum VOC composition of the inlet gas composition was used and assumed to be controlled by 98%.

HAP emissions were calculated using the Hexanes+ content from the inlet gas stream.

**Thermal Oxidizer Downtime Flaring (unit FL-1 [TO SSM])**

Flaring during thermal oxidizer (unit TO-1) downtime events was calculated assuming 10 hours per event and 10 events per year.

NO<sub>x</sub> and CO emission factors from AP-42 Tables 13.5-1 and 13.5-2 were used. For VOC, the VOC gas composition sent from the thermal oxidizer was used and assumed to be controlled by 98%.

HAP emissions were calculated using the HAP content in the gas that is sent to the thermal oxidizer.

**SSM Blowdown Venting (unit SSM Blowdown Venting)**

Emissions due to blowdown venting of various process vessels were estimated based on a maximum annual and hourly blowdown volume vented for various vessels and compressors. The maximum annual blowdown volume was calculated using the individual blowdown volume per vessel and the number of events per year. The maximum hourly volume vented was calculated using the maximum annual blowdown volume and the assumption that an event lasted an hour. VOC, Total HAP, and H<sub>2</sub>S emissions were based on the off-gas analysis for all the vessels except compressors. VOC, Total HAP, and H<sub>2</sub>S emissions for various compressors were based on the amine contactor analysis. Though actual blowdown venting is due to a variety of process streams, the off-gas and amine contactor analyses were used for conservative purposes. Total HAP emissions were calculated using the Hexanes+ content of the gas streams. These emissions are proposed under an alternative operating scenario for periods of when the flare cannot be operated.

# Section 6.a

## Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

**Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC)** applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>).

### Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO<sub>2</sub>e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO<sub>2</sub>e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO<sub>2</sub>e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO<sub>2</sub>e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following ☐ By checking this box, the applicant acknowledges the total CO<sub>2</sub>e emissions are less than 75,000 tons per year.

### Sources for Calculating GHG Emissions:

- Manufacturer's Data
- AP-42 Compilation of Air Pollutant Emission Factors at <http://www.epa.gov/ttn/chief/ap42/index.html>
- EPA's Internet emission factor database WebFIRE at <http://cfpub.epa.gov/webfire/>
- 40 CFR 98 Mandatory Green House Gas Reporting except that tons should be reported in short tons rather than in metric tons for the purpose of PSD applicability.
- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry. August 2009 or most recent version.
- Sources listed on EPA's NSR Resources for Estimating GHG Emissions at <http://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases>:

### Global Warming Potentials (GWP):

Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO<sub>2</sub> over a specified time period.

**"Greenhouse gas"** for the purpose of air permit regulations is defined as the aggregate group of the following six gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. **(20.2.70.7 NMAC, 20.2.74.7 NMAC)**. You may also find GHGs defined in 40 CFR 86.1818-12(a).

### Metric to Short Ton Conversion:

Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.

1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

## **Emission Calculations for Greenhouse Gas Emissions**

**Thermal Oxidizer (unit TO-1), Flare – Pilot {unit FL-1 (pilot)}, Flare – Process {unit FL-1 (process)}, Facility Flare Purge {unit FL-1(purge)}, Dehydrator Regeneration Heater (unit H-1), Heat Medium Heater (unit H-2), Thermal Evaporator (unit H-3)**

Greenhouse gas emissions were calculated using 40 CFR 98 Tables C-1 and C-2, and A-1.

**Blowdown Flaring (unit FL-1 [BD SSM]), Plant Turnaround Flaring (unit FL-1 [PT SSM]), Thermal Oxidizer Downtime Flaring (unit FL-1 [TO SSM])**

Greenhouse gases emissions were calculated using equations W-19, W-20, W-21, W-36, W-40 and Table A-1 from, 40 CFR 98.

GHG emission calculations for all the above emission units have been included in the following pages.

## Emission Summary

### Uncontrolled Process Emissions

| Unit              | Description                  | NO <sub>x</sub> |              | CO           |              | VOC           |                | SO <sub>2</sub> |             | TSP         |              | PM <sub>10</sub> |             | PM <sub>2.5</sub> |             | H <sub>2</sub> S |                |
|-------------------|------------------------------|-----------------|--------------|--------------|--------------|---------------|----------------|-----------------|-------------|-------------|--------------|------------------|-------------|-------------------|-------------|------------------|----------------|
|                   |                              | lb/hr           | tons/yr      | lb/hr        | tons/yr      | lb/hr         | tons/yr        | lb/hr           | tons/yr     | lb/hr       | tons/yr      | lb/hr            | tons/yr     | lb/hr             | tons/yr     | lb/hr            | tons/yr        |
| Amine-1           | Amine unit                   | -               | -            | -            | -            | 121.54        | 532.34         | -               | -           | -           | -            | -                | -           | -                 | -           | 2.76             | 12.09          |
| Dehy-1            | TEG dehydrator               | -               | -            | -            | -            | 137.61        | 602.71         | -               | -           | -           | -            | -                | -           | -                 | -           | 0.036            | 0.16           |
| H-1               | Mole sieve dehy regen heater | 0.86            | 3.79         | 0.73         | 3.18         | 0.048         | 0.21           | 0.12            | 0.53        | 0.066       | 0.29         | 0.066            | 0.29        | 0.066             | 0.29        | -                | -              |
| H-2               | Heat medium heater           | 4.07            | 17.82        | 6.84         | 29.94        | 0.45          | 1.96           | 1.13            | 4.95        | 0.62        | 2.71         | 0.62             | 2.71        | 0.62              | 2.71        | -                | -              |
| TO-1              | Thermal oxidizer             | 3.36            | 14.72        | 2.52         | 11.04        | 0.23          | 0.99           | 0.57            | 2.50        | 0.84        | 3.68         | 0.84             | 3.68        | 0.84              | 3.68        | -                | -              |
| HAUL              | Haul road                    | -               | -            | -            | -            | -             | -              | -               | -           | 2.07        | 7.56         | 0.53             | 1.93        | 0.053             | 0.19        | -                | -              |
| LOAD              | Condensate loadout           | -               | -            | -            | -            | 0.23          | 0.51           | -               | -           | -           | -            | -                | -           | -                 | -           | -                | -              |
| FUG               | Facility fugitives           | -               | -            | -            | -            | 13.05         | 57.14          | -               | -           | -           | -            | -                | -           | -                 | -           | 4.79E-03         | 0.021          |
| FL-1 <sup>1</sup> | Facility flare               | 0.029           | 0.13         | 0.13         | 0.58         | 0.010         | 0.023          | 0.0061          | 0.027       | -           | -            | -                | -           | -                 | -           | -                | -              |
| GC-1              | Gas Chromatograph            | -               | -            | -            | -            | 0.038         | 0.17           | -               | -           | -           | -            | -                | -           | -                 | -           | 9.71E-07         | 4.25E-06       |
| GC-2              | Gas Chromatograph            | -               | -            | -            | -            | 0.21          | 0.90           | -               | -           | -           | -            | -                | -           | -                 | -           | 9.71E-07         | 4.25E-06       |
| GC-3              | Gas Chromatograph            | -               | -            | -            | -            | 0.17          | 0.76           | -               | -           | -           | -            | -                | -           | -                 | -           | 9.71E-07         | 4.25E-06       |
| GC-4              | Gas Chromatograph            | -               | -            | -            | -            | 0.18          | 0.77           | -               | -           | -           | -            | -                | -           | -                 | -           | 9.71E-07         | 4.25E-06       |
| GC-5              | Gas Chromatograph            | -               | -            | -            | -            | 0.036         | 0.16           | -               | -           | -           | -            | -                | -           | -                 | -           | 9.71E-07         | 4.25E-06       |
| GC-6              | Gas Chromatograph            | -               | -            | -            | -            | 6.28E-05      | 2.75E-04       | -               | -           | -           | -            | -                | -           | -                 | -           | 9.71E-07         | 4.25E-06       |
| <b>Totals</b>     | <b>Table 2-D</b>             | <b>8.32</b>     | <b>36.45</b> | <b>10.21</b> | <b>44.73</b> | <b>273.78</b> | <b>1198.64</b> | <b>1.83</b>     | <b>8.00</b> | <b>3.59</b> | <b>14.24</b> | <b>2.05</b>      | <b>8.60</b> | <b>1.58</b>       | <b>6.87</b> | <b>2.801</b>     | <b>12.2666</b> |

### Controlled Process Emissions

| Unit              | Description                  | NO <sub>x</sub>                                                                              |              | CO            |               | VOC           |               | SO <sub>2</sub> |              | TSP         |             | PM <sub>10</sub> |             | PM <sub>2.5</sub> |             | H <sub>2</sub> S |              |
|-------------------|------------------------------|----------------------------------------------------------------------------------------------|--------------|---------------|---------------|---------------|---------------|-----------------|--------------|-------------|-------------|------------------|-------------|-------------------|-------------|------------------|--------------|
|                   |                              | lb/hr                                                                                        | tons/yr      | lb/hr         | tons/yr       | lb/hr         | tons/yr       | lb/hr           | tons/yr      | lb/hr       | tons/yr     | lb/hr            | tons/yr     | lb/hr             | tons/yr     | lb/hr            | tons/yr      |
| Amine-1           | Amine unit                   | -                                                                                            | -            | -             | -             | -             | -             | -               | -            | -           | -           | -                | -           | -                 | -           | -                | -            |
| Dehy-1            | TEG dehydrator               | -                                                                                            | -            | -             | -             | -             | -             | -               | -            | -           | -           | -                | -           | -                 | -           | -                | -            |
| H-1               | Mole sieve dehy regen heater | 0.86                                                                                         | 3.79         | 0.73          | 3.18          | 0.048         | 0.21          | 0.12            | 0.53         | 0.066       | 0.29        | 0.066            | 0.29        | 0.066             | 0.29        | -                | -            |
| H-2               | Heat medium heater           | 4.07                                                                                         | 17.82        | 6.84          | 29.94         | 0.45          | 1.96          | 1.13            | 4.95         | 0.62        | 2.71        | 0.62             | 2.71        | 0.62              | 2.71        | -                | -            |
| TO-1              | Thermal oxidizer             | 3.36                                                                                         | 14.72        | 2.52          | 11.04         | 1.09          | 4.77          | 5.81            | 25.44        | 0.84        | 3.68        | 0.84             | 3.68        | 0.84              | 3.68        | 0.014            | 0.061        |
| HAUL              | Haul road                    | -                                                                                            | -            | -             | -             | -             | -             | -               | -            | 0.41        | 1.51        | 0.11             | 0.39        | 0.011             | 0.039       | -                | -            |
| LOAD              | Condensate loadout           | -                                                                                            | -            | -             | -             | 0.23          | 0.51          | -               | -            | -           | -           | -                | -           | -                 | -           | -                | -            |
| FUG               | Facility fugitives           | -                                                                                            | -            | -             | -             | 13.05         | 57.14         | -               | -            | -           | -           | -                | -           | -                 | -           | 0.0048           | 0.021        |
| FL-1 <sup>1</sup> | Facility flare               | 113.79                                                                                       | 21.63        | 518.75        | 98.61         | 926.80        | 174.71        | 1.56            | 0.45         | -           | -           | -                | -           | -                 | -           | 0.017            | 0.0046       |
| GC-1              | Gas Chromatograph            | All controlled GC-1 through GC-6 emissions are associated with the process flare, unit FL-1. |              |               |               |               |               |                 |              |             |             |                  |             |                   |             |                  |              |
| GC-2              | Gas Chromatograph            |                                                                                              |              |               |               |               |               |                 |              |             |             |                  |             |                   |             |                  |              |
| GC-3              | Gas Chromatograph            |                                                                                              |              |               |               |               |               |                 |              |             |             |                  |             |                   |             |                  |              |
| GC-4              | Gas Chromatograph            |                                                                                              |              |               |               |               |               |                 |              |             |             |                  |             |                   |             |                  |              |
| GC-5              | Gas Chromatograph            |                                                                                              |              |               |               |               |               |                 |              |             |             |                  |             |                   |             |                  |              |
| GC-6              | Gas Chromatograph            |                                                                                              |              |               |               |               |               |                 |              |             |             |                  |             |                   |             |                  |              |
| <b>Totals</b>     | <b>Table 2-E</b>             | <b>122.08</b>                                                                                | <b>57.96</b> | <b>528.83</b> | <b>142.77</b> | <b>941.67</b> | <b>239.30</b> | <b>8.61</b>     | <b>31.36</b> | <b>1.94</b> | <b>8.19</b> | <b>1.63</b>      | <b>7.06</b> | <b>1.53</b>       | <b>6.71</b> | <b>0.036</b>     | <b>0.087</b> |

### Routine Startup, Shutdown, and Maintenance (SSM) Emissions

| Unit             | Description              | NO <sub>x</sub> |             | CO            |             | VOC            |             | SO <sub>2</sub> |             | TSP      |          | PM <sub>10</sub> |          | PM <sub>2.5</sub> |          | H <sub>2</sub> S |             |
|------------------|--------------------------|-----------------|-------------|---------------|-------------|----------------|-------------|-----------------|-------------|----------|----------|------------------|----------|-------------------|----------|------------------|-------------|
|                  |                          | lb/hr           | tons/yr     | lb/hr         | tons/yr     | lb/hr          | tons/yr     | lb/hr           | tons/yr     | lb/hr    | tons/yr  | lb/hr            | tons/yr  | lb/hr             | tons/yr  | lb/hr            | tons/yr     |
| FL-1 (TO SSM)    | TO downtime flaring      | 13.52           | 0.68        | 61.63         | 3.08        | 2.23           | 0.11        | 5.16            | 0.26        | -        | -        | -                | -        | -                 | -        | 0.056            | 2.80E-03    |
| FL-1 (BD SSM)    | Blowdown flaring         | 23.61           | 0.53        | 107.64        | 2.42        | 30.58          | 0.69        | 0.20            | 2.44E-03    | -        | -        | -                | -        | -                 | -        | 2.21E-03         | 4.98E-05    |
| FL-1 (PT SSM)    | Plant turnaround flaring | 18.11           | 0.036       | 82.55         | 0.17        | 33.82          | 0.068       | 0.145           | 2.90E-04    | -        | -        | -                | -        | -                 | -        | 1.57E-03         | 3.15E-06    |
| Blowdown Venting | Blowdown venting         | -               | -           | -             | -           | 2670.50        | 6.84        | -               | -           | -        | -        | -                | -        | -                 | -        | 0.030            | 1.48E-04    |
| <b>Totals</b>    | <b>Table 2-F</b>         | <b>23.61</b>    | <b>1.24</b> | <b>107.64</b> | <b>5.67</b> | <b>2670.50</b> | <b>7.71</b> | <b>5.16</b>     | <b>0.26</b> | <b>-</b> | <b>-</b> | <b>-</b>         | <b>-</b> | <b>-</b>          | <b>-</b> | <b>0.056</b>     | <b>0.00</b> |

<sup>1</sup> The total FL-1 emissions were calculated taking the sum of the following emissions: FL-1 (pilot), FL-1 (process), and FL-1 (purge) for controlled emissions and FL-1 (pilot), FL-1 and FL-1 (purge) for uncontrolled emissions.

\* Denotes an hourly emission rate is not appropriate

“-” indicates emissions of this pollutant are not expected.

## HAP Emission Summary

### Controlled HAP Emissions

| Stack                 | Unit                 | Total HAPs    |             | HCHO            |                 | Acetaldehyde    |                 | Acrolein        |                 | Benzene     |             | Toluene     |             | e-Benzene    |             | Xylenes     |             | n-Hexane    |             |
|-----------------------|----------------------|---------------|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|
|                       |                      | lb/hr         | tons/yr     | lb/hr           | tons/yr         | lb/hr           | tons/yr         | lb/hr           | tons/yr         | lb/hr       | tons/yr     | lb/hr       | tons/yr     | lb/hr        | tons/yr     | lb/hr       | tons/yr     | lb/hr       | tons/yr     |
| TO-1                  | Amine-1 & Dehy-1     | -             | -           | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| H-1                   | H-1                  | 7.29E-03      | 0.032       | 1.47E-04        | 6.44E-04        | 3.72E-05        | 1.63E-04        | 2.33E-05        | 1.02E-04        | 6.92E-05    | 3.03E-04    | 3.16E-04    | 1.39E-03    | 8.21E-05     | 3.60E-04    | 2.35E-04    | 1.03E-03    | 3.98E-05    | 1.74E-04    |
| H-2                   | H-2                  | 0.050         | 0.22        | 1.00E-03        | 4.38E-03        | 2.52E-04        | 1.10E-03        | 2.20E-04        | 9.62E-04        | 4.72E-04    | 2.07E-03    | 2.16E-03    | 9.44E-03    | 5.61E-04     | 2.46E-03    | 1.60E-03    | 7.02E-03    | 3.74E-04    | 1.64E-03    |
| TO-1                  | TO-1                 | 0.21          | 0.93        | 4.92E-04        | 2.15E-03        | -               | -               | -               | -               | 7.59E-02    | 3.33E-01    | 7.93E-02    | 3.47E-01    | -            | -           | -           | -           | 1.62E-02    | 7.10E-02    |
| HAUL                  | HAUL                 | -             | -           | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| LOAD                  | LOAD                 | 0.051         | 0.11        | -               | -               | -               | -               | -               | -               | 1.17E-02    | 0.026       | 1.17E-02    | 0.026       | 4.67E-03     | 0.010       | 1.17E-02    | 0.026       | 1.17E-02    | 0.026       |
| FUG                   | FUG                  | 0.56          | 2.45        | -               | -               | -               | -               | -               | -               | 0.11        | 0.47        | 0.11        | 0.47        | 0.095        | 0.42        | 0.095       | 0.42        | 0.16        | 0.68        |
| FL-1 <sup>1</sup>     | Flare                | 9.02          | 2.08        | -               | -               | -               | -               | -               | -               | 0.22        | 0.00        | 0.12        | 0.00        | -            | -           | -           | -           | 1.73        | 0.00        |
| N/A                   | GC-1                 | 1.11E-04      | 5.54E-03    | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| N/A                   | GC-2                 | 9.32E-04      | 0.047       | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| N/A                   | GC-3                 | 4.84E-04      | 0.024       | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| N/A                   | GC-4                 | 4.94E-04      | 0.025       | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| N/A                   | GC-5                 | 9.47E-05      | 4.73E-03    | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| N/A                   | GC-6                 | 0.00          | 0.00        | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| Routine SSM Emissions |                      |               |             |                 |                 |                 |                 |                 |                 |             |             |             |             |              |             |             |             |             |             |
| FL-1                  | FL-1 (TO SSM)        | 0.065         | 3.25E-03    | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | 0.065       | 3.25E-03    |
| FL-1                  | FL-1 (BD SSM)        | 4.34          | 0.098       | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| FL-1                  | FL-1 (PT SSM)        | 4.86          | 9.73E-03    | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| SSM Blowdown Venting  | SSM Blowdown venting | 308.01        | 0.73        | -               | -               | -               | -               | -               | -               | -           | -           | -           | -           | -            | -           | -           | -           | -           | -           |
| <b>Totals</b>         |                      | <b>327.19</b> | <b>6.77</b> | <b>1.64E-03</b> | <b>7.18E-03</b> | <b>2.89E-04</b> | <b>1.27E-03</b> | <b>2.43E-04</b> | <b>1.06E-03</b> | <b>0.42</b> | <b>0.83</b> | <b>0.32</b> | <b>0.85</b> | <b>0.100</b> | <b>0.43</b> | <b>0.11</b> | <b>0.45</b> | <b>1.98</b> | <b>0.78</b> |

<sup>1</sup> The total FL-1 emissions were calculated taking the sum of the following emissions: FL-1 (pilot), FL-1 (process), and FL-1 (purge)

Unit(s): Amine-1

Description: Amine treater used for removal of CO<sub>2</sub>

Criteria Pollutant Emissions - Uncontrolled<sup>1</sup>

| Component        | MW <sup>2</sup> | Still Vent | Flash Gas |
|------------------|-----------------|------------|-----------|
|                  |                 | lb/hr      | lb/hr     |
| Water            | 18.015          | 903.9      | 21.6      |
| CO <sub>2</sub>  | 44.01           | 24942.5    | 134.2     |
| Hydrogen Sulfide | 34.08           | 2.760      | 0.0087    |
| Nitrogen         | 28.013          | 6.9E-02    | 3.7       |
| Methane          | 16.043          | 20.4       | 274.6     |
| Ethane           | 30.07           | 8.63       | 81.7      |
| Propane          | 44.097          | 4.64       | 47.6      |
| n-Butane         | 58.124          | 2.45       | 20.1      |
| i-Butane         | 58.124          | 7.0        | 18.8      |
| n-Pentane        | 72.151          | 3.1E-01    | 3.5       |
| i-Pentane        | 72.151          | 3.0E-01    | 3.4       |
| CycloPentane     | 72.1            | 7.1E-03    | 0.16      |
| n-Hexane         | 86.178          | 7.4E-02    | 0.72      |
| Benzene          | 78.11           | 5.70       | 0.94      |
| n-Heptane        | 100.205         | 6.4E-02    | 0.44      |
| Toluene          | 92.14           | 3.48       | 0.46      |
| n-Octane         | 114.232         | 5.1E-02    | 0.21      |
| m-Xylene         | 106.16          | 4.8E-01    | 3.9E-02   |
| p-Xylene         | 106.16          | 4.8E-01    | 3.9E-02   |
| n-Nonane         | 128.2           | 2.9E-02    | 6.4E-02   |
| Total            |                 | 25903.4    | 612.3     |
| VOC Total        |                 | 33.72      | 178.19    |

Total Uncontrolled Criteria Pollutant Emissions

| VOC   |                    |
|-------|--------------------|
| 211.9 | lb/hr <sup>3</sup> |
| 928.2 | tpy <sup>4</sup>   |

Total Controlled Emissions

Still Vent emissions are controlled by the TO and are associated with these units.

Amine Flash Emissions are controlled by an electric vapor recovery unit (VRU-3). During VRU downtime amine flash will be sent to the flare (unit FL-1)

Notes

<sup>1</sup> Uncontrolled emissions from Dow Oil & Gas ProComp Report

<sup>2</sup> From "Physical Properties of Hydrocarbons"

<sup>3</sup> Total emissions (lb/hr) = still vent emissions (lb/hr) + flash gas emissions (lb/hr)

<sup>4</sup> Total emissions (tpy) = total emissions (lb/hr) x 8760 hr/yr x 1 ton/2000 lb

<sup>5</sup> tons/yr CO<sub>2</sub>e = ton/yr \* GWP

Uncontrolled Greenhouse Gas Calculations

| CO <sub>2</sub> | CH <sub>4</sub> | CO <sub>2</sub> e |                                        |
|-----------------|-----------------|-------------------|----------------------------------------|
| 25076.7         | 3.8             |                   | lb/hr <sup>3</sup>                     |
| 1               | 25              |                   | GWP                                    |
| 109836.1        | 16.7            |                   | tons/yr <sup>4</sup>                   |
| 109836.1        | 416.7           | 110252.9          | tons/yr CO <sub>2</sub> e <sup>5</sup> |

Unit(s): Dehy-1  
Description: TEG dehydration unit  
Flow Rate: 240 MMscf/d

Criteria Pollutant Emissions - Uncontrolled<sup>1</sup>

| Component         | Regen<br>lb/hr | Flash Gas<br>lb/hr |
|-------------------|----------------|--------------------|
| Water             | 5.3            | 0.45               |
| CO2               | 12.1           | 12.90              |
| Nitrogen          | 0.011          | 0.14               |
| Hydrogen Sulfide  | 0.030          | 0.0056             |
| Methane           | 4.4            | 55.55              |
| Ethane            | 9.6            | 37.47              |
| Propane           | 15.9           | 27.20              |
| n-Butane          | 13.0           | 12.59              |
| i-Butane          | 6.4            | 7.90               |
| n-Pentane         | 4.25           | 3.75               |
| i-Pentane         | 4.37           | 4.55               |
| Cyclopentane      | 1.41           | 0.39               |
| n-Hexane          | 1.82           | 1.29               |
| Cyclohexane       | 1.50           | 0.35               |
| Other hexanes     | 2.52           | 2.03               |
| n-Heptane         | 2.57           | 1.77               |
| Methylcyclohexane | 0.86           | 0.26               |
| 2,2,4-TMP         | 0.03           | 0.04               |
| Benzene           | 6.92           | 0.24               |
| Toluene           | 10.25          | 0.52               |
| Xylenes           | 2.16           | 0.14               |
| n-Octane          | 0.03           | 0.52               |
| <b>Total</b>      | <b>105.5</b>   | <b>170.0</b>       |
| <b>VOC Total</b>  | <b>74.08</b>   | <b>63.53</b>       |

Total Uncontrolled Criteria Pollutant Emissions

| VOC   | Total HAP | H <sub>2</sub> S |                    |
|-------|-----------|------------------|--------------------|
| 137.6 | 23.41     | 0.036            | lb/hr <sup>2</sup> |
| 602.7 | 102.5     | 0.16             | tpy <sup>3</sup>   |

Total Controlled Emissions

Emissions are controlled by the TO and are associated with these units.

Notes

- <sup>1</sup> Uncontrolled emissions from GRI-GLYCalc output. non-condensables from dehy regen stream  
<sup>2</sup> Total emissions (lb/hr) = still vent emissions (lb/hr) + flash gas emissions (lb/hr)  
<sup>3</sup> Total emissions (tpy) = total emissions (lb/hr) x 8760 hr/yr x 1 ton/2000 lb  
<sup>4</sup> tons/yr CO<sub>2</sub>e = ton/yr \* GWP

Uncontrolled Greenhouse Gas Calculations

| CO <sub>2</sub> | CH <sub>4</sub> | CO <sub>2</sub> e |                                        |
|-----------------|-----------------|-------------------|----------------------------------------|
| 25.0            | 60.0            |                   | lb/hr <sup>2</sup>                     |
| 1               | 25              |                   | GWP                                    |
| 109.5           | 262.7           |                   | tons/yr <sup>3</sup>                   |
| 109.5           | 6568.4          | 6677.9            | tons/yr CO <sub>2</sub> e <sup>4</sup> |

## Dehy Regenerator Heater Emissions

Unit(s): H-1  
Description: Dehy regenerator heater

### Heater Information

|                   |               |                                                              |
|-------------------|---------------|--------------------------------------------------------------|
| Fuel consumption: | 8.82 MMBtu/hr | Design                                                       |
| Fuel heat value:  | 1050 Btu/scf  | Nominal lower heating value                                  |
| Fuel usage:       | 8.4 Mscf/hr   | Fuel consumption (MMBtu/hr) / LHV (Btu/scf) * 1000Mscf/MMscf |
| Fuel usage:       | 73.6 MMscf/yr | Fuel usage (Mscf/hr) * Operating hours * MMscf/1000Mscf      |
| Operating hours:  | 8760 hr/yr    |                                                              |

### Criteria Pollutant Emission Calculations

| NO <sub>x</sub> | CO    | VOC    | SO <sub>2</sub> | TSP    | PM <sub>10</sub> | PM <sub>2.5</sub> |                      |                              |
|-----------------|-------|--------|-----------------|--------|------------------|-------------------|----------------------|------------------------------|
| 100             | 84    | 5.5    |                 | 7.6    | 7.6              | 7.6               | lb/MMscf             | AP-42 Tables 1.4-1 and 1.4-2 |
| 0.098           | 0.082 | 0.0054 |                 | 0.0075 | 0.0075           | 0.0075            | lb/MMBtu             | lb/MMscf / 1020Btu/scf       |
|                 |       |        | 5               |        |                  |                   | gr/100scf            | Pipeline specification       |
| 0.86            | 0.73  | 0.048  | 0.12            | 0.066  | 0.066            | 0.066             | lb/hr <sup>1</sup>   |                              |
| 3.79            | 3.18  | 0.21   | 0.53            | 0.29   | 0.29             | 0.29              | tons/yr <sup>2</sup> |                              |

### HAP Emission Calculations

| HCHO     | Acetaldehyde | Acrolein | Benzene  | Toluene  | e-Benzene | Xylenes  | n-Hexane | Total HAPs |                      |                        |
|----------|--------------|----------|----------|----------|-----------|----------|----------|------------|----------------------|------------------------|
| 1.70E-02 | 4.30E-03     | 2.70E-03 | 8.00E-03 | 3.66E-02 | 9.50E-03  | 2.72E-02 | 0.0046   | 0.84       | lb/MMscf             | CARB Guidance          |
| 1.67E-05 | 4.22E-06     | 2.65E-06 | 7.84E-06 | 3.59E-05 | 9.31E-06  | 2.67E-05 | 4.51E-06 | 8.27E-04   | lb/MMBtu             | lb/MMscf / 1020Btu/scf |
| 1.47E-04 | 3.72E-05     | 2.33E-05 | 6.92E-05 | 3.16E-04 | 8.21E-05  | 2.35E-04 | 3.98E-05 | 7.29E-03   | lb/hr <sup>1</sup>   |                        |
| 6.44E-04 | 1.63E-04     | 1.02E-04 | 3.03E-04 | 1.39E-03 | 3.60E-04  | 1.03E-03 | 1.74E-04 | 0.032      | tons/yr <sup>2</sup> |                        |

### Notes

<sup>1</sup> lb/hr emissions calculated as follows:

For SO<sub>2</sub>, lb/hr = 5gr S/100scf \* 1lb/7000gr \* Fuel consumption (MMBtu/hr) \* 10<sup>6</sup>Btu/MMBtu / LHV (Btu/scf) \* (64g/mol SO<sub>2</sub> / 32g/mol S)

For other pollutants, lb/hr = EF (lb/MMBtu) \* Fuel consumption (MMBtu/hr)

<sup>2</sup> tons/yr = lb/hr \* Hours of operation (hr/yr) \* 1ton/2000lb

<sup>3</sup> GHG ton/yr = EF (kg/MMBtu) \* Fuel consumption (MMBtu/hr) \* 1tonne/1000kg \* Hours of operation (hr/yr) \* 1.1023ton/tonne

<sup>4</sup> tons/yr CO<sub>2</sub>e = ton/yr \* GWP

### Greenhouse Gas Calculations

| CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e |                                        |
|-----------------|------------------|-----------------|-------------------|----------------------------------------|
| 53.06           | 1.0E-04          | 1.0E-03         |                   | kg/MMBtu 40 CFR 98 Tables C-1 and C-2  |
| 1               | 298              | 25              |                   | GWP 40 CFR 98 Table A-1                |
| 4519.02         | 8.52E-03         | 0.085           |                   | tons/yr <sup>3</sup>                   |
| 4519.02         | 2.54             | 2.13            | 4523.69           | tons/yr CO <sub>2</sub> e <sup>4</sup> |

### Stack Parameters

|             |         |        |
|-------------|---------|--------|
| Velocity    | 50 ft/s | Design |
| Temperature | 550 F   | Design |
| Height      | 25 ft   | Design |
| Diameter    | 31 in   | Design |

## Heat Medium Heater Emissions

Unit(s): H-2  
Description: Heat medium heater

### Heater Information

|                   |                |                                                              |
|-------------------|----------------|--------------------------------------------------------------|
| Fuel consumption: | 83.0 MMBtu/hr  | Design                                                       |
| Fuel heat value:  | 950 Btu/scf    | Nominal lower heating value                                  |
| Fuel usage:       | 87.4 Mscf/hr   | Fuel consumption (MMBtu/hr) / LHV (Btu/scf) * 1000Mscf/MMscf |
| Fuel usage:       | 765.3 MMsfc/yr | Fuel usage (Mscf/hr) * Operating hours * MMsfc/1000Mscf      |
| Operating hours:  | 8760 hr/yr     |                                                              |

### Criteria Pollutant Emission Calculations

| NO <sub>x</sub> | CO    | VOC    | SO <sub>2</sub> | TSP    | PM <sub>10</sub> | PM <sub>2.5</sub> |                      |                              |
|-----------------|-------|--------|-----------------|--------|------------------|-------------------|----------------------|------------------------------|
| 50              | 84    | 5.5    |                 | 7.6    | 7.6              | 7.6               | lb/MMscf             | AP-42 Tables 1.4-1 and 1.4-2 |
| 0.049           | 0.082 | 0.0054 |                 | 0.0075 | 0.0075           | 0.0075            | lb/MMBtu             | lb/MMscf / 1020Btu/scf       |
|                 |       |        | 5               |        |                  |                   | gr/100scf            | Pipeline specification       |
| 4.1             | 6.8   | 0.45   | 1.2             | 0.62   | 0.62             | 0.62              | lb/hr <sup>1</sup>   |                              |
| 17.8            | 29.9  | 2.0    | 5.5             | 2.71   | 2.71             | 2.71              | tons/yr <sup>2</sup> |                              |

### HAP Emission Calculations

| HCHO     | Acetaldehyde | Acrolein | Benzene  | Toluene  | e-Benzene | Xylenes  | n-Hexane | Total HAPs |                      |                        |
|----------|--------------|----------|----------|----------|-----------|----------|----------|------------|----------------------|------------------------|
| 1.23E-02 | 3.10E-03     | 2.70E-03 | 5.80E-03 | 2.65E-02 | 6.90E-03  | 1.97E-02 | 0.0046   | 0.61       | lb/MMscf             | CARB Guidance          |
| 1.21E-05 | 3.04E-06     | 2.65E-06 | 5.69E-06 | 2.60E-05 | 6.76E-06  | 1.93E-05 | 4.51E-06 | 6.00E-04   | lb/MMBtu             | lb/MMscf / 1020Btu/scf |
| 1.0E-03  | 2.5E-04      | 2.2E-04  | 4.7E-04  | 2.2E-03  | 5.6E-04   | 1.6E-03  | 3.7E-04  | 0.050      | lb/hr <sup>1</sup>   |                        |
| 4.4E-03  | 1.1E-03      | 9.6E-04  | 2.1E-03  | 9.4E-03  | 2.5E-03   | 7.0E-03  | 1.6E-03  | 0.22       | tons/yr <sup>2</sup> |                        |

### Notes

<sup>1</sup> lb/hr emissions calculated as follows:

For SO<sub>2</sub>, lb/hr = 5gr S/100scf \* 1lb/7000gr \* Fuel consumption (MMBtu/hr) \* 10<sup>6</sup>Btu/MMBtu / LHV (Btu/scf) \* (64g/mol SO<sub>2</sub> / 32g/mol S)

For other pollutants, lb/hr = EF (lb/MMBtu) \* Fuel consumption (MMBtu/hr)

<sup>2</sup> tons/yr = lb/hr \* Hours of operation (hr/yr) \* 1ton/2000lb

<sup>4</sup> GHG ton/yr = EF (kg/MMBtu) \* Fuel consumption (MMBtu/hr) \* 1tonne/1000kg \* Hours of operation (hr/yr) \* 1.1023ton/tonne

<sup>5</sup> tons/yr CO<sub>2</sub>e = ton/yr \* GWP

### Greenhouse Gas Calculations

| CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e |                                        |
|-----------------|------------------|-----------------|-------------------|----------------------------------------|
| 53.06           | 1.0E-04          | 1.0E-03         |                   | kg/MMBtu 40 CFR 98 Tables C-1 and C-2  |
| 1               | 298              | 25              |                   | GWP 40 CFR 98 Table A-1                |
| 42525.9         | 0.080            | 0.80            |                   | tons/yr <sup>4</sup>                   |
| 42525.9         | 23.9             | 20.0            | 42569.8           | tons/yr CO <sub>2</sub> e <sup>5</sup> |

### Stack Parameters

|             |         |        |
|-------------|---------|--------|
| Velocity    | 50 ft/s | Design |
| Temperature | 550 F   | Design |
| Height      | 85 ft   | Design |
| Diameter    | 52 in   | Design |

## Thermal Oxidizer Emissions

Unit(s): TO-1  
Description: Thermal oxidizer

### Thermal Oxidizer Information

Heat input rate: 42 MMBtu/hr Firebox design  
Fuel heat value: 1050 Btu/scf Nominal  
Fuel usage: 40.0 Mscf/hr Fuel consumption (MMBtu/hr) / LHV (Btu/scf) \* 1000Mscf/MMscf  
Fuel usage: 350.4 MMscf/yr Fuel usage (Mscf/hr) \* Operating hours \* MMscf/1000Mscf  
Unit DRE: 99.5% Manufacturer guarantee  
Operating hours: 8760 hr/yr  
Still vent safety factor: 40%

| Mass Flow to Thermal Oxidizer |                        |                             |                                     |                       |
|-------------------------------|------------------------|-----------------------------|-------------------------------------|-----------------------|
| Component                     | Amine Still<br>(lb/hr) | Amine Still<br>w/SF (lb/hr) | Dehy Regen<br>(lb/hr) <sup>16</sup> | Dehy Flash<br>(lb/hr) |
| Water                         | 903.9                  | 1265.4                      | 5.3                                 | 0.45                  |
| CO2                           | 24942.5                | 34919.5                     | 12.1                                | 12.90                 |
| Hydrogen Sulfide              | 2.8E+00                | 2.8                         | 0.03                                | 0.01                  |
| Nitrogen                      | 6.9E-02                | 0.1                         | 0.011                               | 0.14                  |
| Methane                       | 20.4                   | 28.6                        | 4.4                                 | 55.55                 |
| Ethane                        | 8.63                   | 12.1                        | 9.6                                 | 37.47                 |
| Propane                       | 4.64                   | 6.5                         | 15.9                                | 27.20                 |
| n-Butane                      | 2.45                   | 3.4                         | 13.0                                | 12.59                 |
| i-Butane                      | 7.0                    | 9.8                         | 6.4                                 | 7.90                  |
| n-Pentane                     | 3.1E-01                | 0.4                         | 4.2                                 | 3.75                  |
| i-Pentane                     | 3.0E-01                | 0.4                         | 4.4                                 | 4.55                  |
| CycloPentane                  | 7.1E-03                | 0.0                         | 1.4                                 | 0.39                  |
| n-Hexane                      | 7.4E-02                | 0.1                         | 1.8                                 | 1.29                  |
| Cyclohexane                   | -                      | -                           | 1.5                                 | 0.35                  |
| Other Hexanes                 | -                      | -                           | 2.5                                 | 2.03                  |
| Benzene                       | 5.7E+00                | 8.0                         | 6.9                                 | 0.24                  |
| n-Heptane                     | 6.4E-02                | 0.1                         | 2.6                                 | 1.77                  |
| Methylcyclohexane             | -                      | -                           | 0.9                                 | 0.26                  |
| 2,2,4-TMP                     | -                      | -                           | 0.03                                | 0.04                  |
| Toluene                       | 3.5E+00                | 4.9                         | 10.2                                | 0.52                  |
| n-Octane                      | 5.1E-02                | 0.1                         | 0.03                                | 0.52                  |
| m-Xylene                      | 4.8E-01                | 0.7                         | 2.2                                 | 0.14                  |
| p-Xylene                      | 4.8E-01                | 0.7                         | -                                   | -                     |
| n-Nonane                      | 2.9E-02                | 0.0                         | -                                   | -                     |
| <b>Total</b>                  | <b>25903.40</b>        | <b>36263.662</b>            | <b>105.53</b>                       | <b>170.04</b>         |

| Specific Vol.     |         |                           |                       |                       |                            |                     |
|-------------------|---------|---------------------------|-----------------------|-----------------------|----------------------------|---------------------|
| Component         | MW      | Flow (lb/hr) <sup>1</sup> | Weight % <sup>2</sup> | (scf/lb) <sup>3</sup> | Flow (scf/hr) <sup>4</sup> | Mole % <sup>5</sup> |
| Water             | 18.015  | 1271.1608                 | 3.48%                 | 21.06                 | 26770.65                   | 8.06%               |
| CO2               | 44.01   | 34944.5436                | 95.64%                | 8.623                 | 301326.80                  | 90.74%              |
| Hydrogen Sulfide  | 34.08   | 2.7958                    | 0.008%                | 11.136                | 31.13                      | 0.00938%            |
| Nitrogen          | 28.013  | 0.2498                    | 0.00%                 | 13.547                | 3.38                       | 0.00%               |
| Methane           | 16.043  | 88.6134                   | 0.24%                 | 23.65                 | 2095.71                    | 0.63%               |
| Ethane            | 30.07   | 59.1416                   | 0.16%                 | 12.62                 | 746.37                     | 0.22%               |
| Propane           | 44.097  | 49.6462                   | 0.14%                 | 8.606                 | 427.26                     | 0.13%               |
| n-Butane          | 58.124  | 29.0232                   | 0.08%                 | 6.529                 | 189.49                     | 0.06%               |
| i-Butane          | 58.124  | 24.1693                   | 0.07%                 | 6.529                 | 157.80                     | 0.05%               |
| n-Pentane         | 72.151  | 8.4227                    | 0.02%                 | 5.26                  | 44.30                      | 0.01%               |
| i-Pentane         | 72.151  | 9.3402                    | 0.03%                 | 5.26                  | 49.13                      | 0.01%               |
| Cyclopentane      | 72.1    | 1.8043                    | 0.00%                 | 5.411                 | 9.76                       | 0.00%               |
| n-Hexane          | 86.178  | 3.2064                    | 0.01%                 | 4.404                 | 14.12                      | 0.00%               |
| Cyclohexane       | 84.162  | 1.8512                    | 0.01%                 | 4.509                 | 8.35                       | 0.00%               |
| Other Hexanes     | 86.178  | 4.5418                    | 0.01%                 | 4.404                 | 20.00                      | 0.01%               |
| Benzene           | 78.11   | 15.1423                   | 0.04%                 | 4.858                 | 73.56                      | 0.02%               |
| n-Heptane         | 100.205 | 4.4371                    | 0.01%                 | 3.787                 | 16.80                      | 0.01%               |
| Methylcyclohexane | 98.189  | 1.1130                    | 0.00%                 | 3.865                 | 4.30                       | 0.00%               |
| 2,2,4-TMP         | 114.23  | 0.0755                    | 0.00%                 | 3.322                 | 0.25                       | 0.00%               |
| Toluene           | 92.14   | 15.6431                   | 0.04%                 | 4.119                 | 64.43                      | 0.02%               |
| n-Octane          | 114.232 | 0.6222                    | 0.00%                 | 3.322                 | 2.07                       | 0.00%               |
| m-Xylene          | 106.16  | 2.9756                    | 0.01%                 | 3.574                 | 10.63                      | 0.00%               |
| p-Xylene          | 106.16  | 0.6702                    | 0.00%                 | 3.574                 | 2.40                       | 0.00%               |
| n-Nonane          | 128.2   | 0.0410                    | 0.00%                 | 2.959                 | 0.12                       | 0.00%               |
| <b>Total</b>      |         | <b>36539.23</b>           |                       |                       | <b>332068.82</b>           | <b>100.00%</b>      |
| <b>VOC Total</b>  |         | <b>172.73</b>             |                       |                       |                            |                     |

## Thermal Oxidizer Emissions

### Criteria Pollutant Emissions

| Component         | Flow (lb/hr)  | Controlled Emissions (lb/hr) <sup>6</sup> | Controlled Emissions (tons/yr) <sup>7</sup> |
|-------------------|---------------|-------------------------------------------|---------------------------------------------|
| Water             | 1271.2        | 1271.2                                    | 5567.684                                    |
| CO2               | 34944.5       | 34944.5                                   | 153057.101                                  |
| Hydrogen Sulfide  | 2.8           | 0.0140                                    | 0.061                                       |
| Nitrogen          | 0.2           | 0.2498                                    | 1.094                                       |
| Methane           | 88.6          | 0.4431                                    | 1.941                                       |
| Ethane            | 59.1          | 0.2957                                    | 1.295                                       |
| Propane           | 49.6          | 0.2482                                    | 1.087                                       |
| n-Butane          | 29.0          | 0.1451                                    | 0.636                                       |
| i-Butane          | 24.2          | 0.1208                                    | 0.529                                       |
| n-Pentane         | 8.4           | 0.0421                                    | 0.184                                       |
| i-Pentane         | 9.3           | 0.0467                                    | 0.205                                       |
| CycloPentane      | 1.8           | 0.0090                                    | 0.040                                       |
| n-Hexane          | 3.2           | 0.0160                                    | 0.070                                       |
| Cyclohexane       | 1.9           | 0.0093                                    | 0.041                                       |
| Other Hexanes     | 4.5           | 0.0227                                    | 0.099                                       |
| Benzene           | 15.1          | 0.0757                                    | 0.332                                       |
| n-Heptane         | 4.4           | 0.0222                                    | 0.097                                       |
| Methylcyclohexane | 1.1           | 0.0056                                    | 0.024                                       |
| 2,2,4-TMP         | 0.1           | 0.0004                                    | 0.002                                       |
| Toluene           | 15.6          | 0.0782                                    | 0.343                                       |
| n-Octane          | 0.6           | 0.0031                                    | 0.014                                       |
| m-Xylene          | 3.0           | 0.0149                                    | 0.065                                       |
| p-Xylene          | 0.7           | 0.0034                                    | 0.015                                       |
| n-Nonane          | 0.0           | 0.0002                                    | 0.001                                       |
| <b>VOC Total</b>  | <b>172.73</b> | <b>0.86</b>                               | <b>3.78</b>                                 |

### Firebox Emission Calculations

| NO <sub>x</sub> | CO    | VOC    | H <sub>2</sub> S | SO <sub>2</sub> | TSP   | PM <sub>10</sub> | PM <sub>2.5</sub> |                       |
|-----------------|-------|--------|------------------|-----------------|-------|------------------|-------------------|-----------------------|
|                 |       | 5.5    |                  |                 |       |                  |                   | lb/MMscf              |
|                 |       | 0.0054 |                  |                 |       |                  |                   | lb/MMBtu              |
| 0.080           | 0.060 |        |                  |                 | 0.020 | 0.020            | 0.020             | lb/MMBtu <sup>8</sup> |
|                 |       |        |                  | 5               |       |                  |                   | gr/100scf             |
| 3.36            | 2.52  | 0.23   |                  | 0.57            | 0.84  | 0.84             | 0.84              | lb/hr <sup>9</sup>    |
| 14.72           | 11.04 | 0.99   |                  | 2.50            | 3.68  | 3.68             | 3.68              | tons/yr <sup>10</sup> |

AP-42 Tables 1.4-1 and 1.4-2  
Per footnote a in AP-42 Table 1

Pipeline specification

## Thermal Oxidizer Emissions

## Total Emissions

| NO <sub>x</sub> | CO    | VOC  | H <sub>2</sub> S <sup>14</sup> | SO <sub>2</sub> | TSP  | PM <sub>10</sub> | PM <sub>2.5</sub> |         |                                |
|-----------------|-------|------|--------------------------------|-----------------|------|------------------|-------------------|---------|--------------------------------|
| 3.36            | 2.52  | 1.09 | 0.014                          | 5.81            | 0.84 | 0.84             | 0.84              | lb/hr   | Firebox + Controlled amine & T |
| 14.72           | 11.04 | 4.77 | 0.061                          | 25.44           | 3.68 | 3.68             | 3.68              | tons/yr | Firebox + Controlled amine & T |

## HAP Emission Calculations

|                               | HCHO     | Benzene  | Toluene  | n-Hexane | Total HAPs |          |                          |
|-------------------------------|----------|----------|----------|----------|------------|----------|--------------------------|
|                               | 1.23E-02 | 5.80E-03 | 2.65E-02 | 4.60E-03 | 0.61       | lb/MMscf | CARB Guidance            |
|                               | 1.17E-05 | 5.52E-06 | 2.52E-05 | 4.38E-06 | 5.83E-04   | lb/MMBtu | lb/MMscf / 10505 Btu/Scf |
| Firebox                       | 4.92E-04 | 2.32E-04 | 1.06E-03 | 1.84E-04 | 0.024      | lb/hr    |                          |
|                               | 2.15E-03 | 1.02E-03 | 4.64E-03 | 8.06E-04 | 0.11       | tons/yr  |                          |
| Controlled amine and TEG dehy |          | 0.332    | 3.43E-01 | 0.070    | 0.83       | tons/yr  |                          |
| Total                         | 4.92E-04 | 7.59E-02 | 7.93E-02 | 1.62E-02 | 0.21       | lb/hr    |                          |
|                               | 2.15E-03 | 3.33E-01 | 3.47E-01 | 0.071    | 0.93       | tons/yr  |                          |

## Notes

- <sup>1</sup> lb/hr flow = Amine still lb/hr
- <sup>2</sup> Weight% = Component lb/hr / Total lb/hr flow
- <sup>3</sup> From "Physical Properties of Hydrocarbons"
- <sup>4</sup> Flow (cf/hr) = Flow (lb/hr) \* Specific Volume (cf/lb)
- <sup>5</sup> Mol% = Component cf/hr / Total cf/hr flow
- <sup>6</sup> For HC, Controlled lb/hr = Flow (lb/hr) \* (1 - DRE%)
- For non-HC, Controlled lb/hr = Uncontrolled lb/hr
- <sup>7</sup> tons/yr = lb/hr \* Hours of operation (hr/yr) \* 1ton/2000lb
- <sup>8</sup> Manufacturer guarantee
- <sup>9</sup> lb/hr emissions calculated as follows:
- For SO<sub>2</sub>, lb/hr = Sgr S/100scf \* 1lb/7000gr \* Fuel consumption (MMBtu/hr) \* 10<sup>6</sup>Btu/MMBtu / LHV (Btu/scf) \* (64g/mol SO<sub>2</sub> / 32g/mol S)
- For other criteria pollutants, lb/hr = EF (lb/MMBtu) \* Fuel consumption (MMBtu/hr)
- <sup>10</sup> tons/yr = lb/hr \* Hours of operation (hr/yr) \* 1ton/2000lb
- <sup>11</sup> Firebox GHG ton/yr = EF (kg/MMBtu) \* Fuel consumption (MMBtu/hr) \* 1tonne/1000kg \* Hours of operation (hr/yr) \* 1.1023ton/tonne
- <sup>12</sup> Controlled amine emissions, as calculated above
- <sup>13</sup> tons/yr CO<sub>2</sub>e = (Firebox GHG + Controlled amine GHG) \* GWP
- <sup>14</sup> 99.5% combustion H<sub>2</sub>S; 100% conversion to SO<sub>2</sub>
- <sup>15</sup> 100% still vent safety factor does not apply to H<sub>2</sub>S as 4ppm has been considered in the inlet to amine plant.
- <sup>16</sup> non-condensables from dehy regen stream

## Greenhouse Gas Calculations

|                  | CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e |                                         |                              |       |          |         |
|------------------|-----------------|------------------|-----------------|-------------------|-----------------------------------------|------------------------------|-------|----------|---------|
|                  | 53.06           | 1.0E-04          | 1.0E-03         |                   | kg/MMBtu                                | 40 CFR 98 Tables C-1 and C-2 |       |          |         |
|                  | 1               | 298              | 25              |                   | GWP                                     | 40 CFR 98 Table A-1          |       |          |         |
| Firebox          | 21519.1         | 0.041            | 0.41            | 21541.4           | tons/yr <sup>11</sup>                   |                              |       |          |         |
| Controlled amine | 161688.0        | -                | 1.9             |                   | tons/yr <sup>12</sup>                   |                              |       |          |         |
|                  | 183207.2        | 12.1             | 58.7            | 183277.9          | tons/yr CO <sub>2</sub> e <sup>13</sup> |                              |       | 183207.2 | #VALUE! |
|                  |                 |                  |                 |                   |                                         | CO2                          | CH4   |          | 2.3     |
|                  |                 |                  |                 |                   |                                         | 153057.101                   | 1.941 |          |         |

## Stack Parameters

|               |         |           |
|---------------|---------|-----------|
| Exit Velocity | 19 ft/s | Mfg. data |
| Temperature   | 1650 F  | Mfg. data |
| Height        | 53.5 ft | Design    |
| Diameter      | 102 in  | Design    |

## Flare Normal Operation (Pilot Only) Emissions

Unit(s): FL-1 (pilot)  
Description: Flare pilot gas

Pilot fuel usage: 50 scf/hr Design  
Pilot count: 3 Design  
Total pilot usage: 150 scf/hr Fuel usage \* count  
Annual gas flow: 1314.0 Mscf/yr [Pilot gas (scf/hr) \* Hours (hr/yr) \* Mscf/1000scf]  
Pilot gas heat value: 997.5 Btu/scf Nominal higher heating value  
Pilot gas usage: 0.15 MMBtu/hr Total gas flow (scf/hr) \* HHV  
Pilot gas usage: 1310.8 MMBtu/yr Total gas flow (Mscf/yr) \* HHV  
Operating hours: 8760 hr/yr

| Composition      | Mole % <sup>1</sup> | MW <sup>2</sup> | MW*Mol%         | Spec.<br>Volume<br>(scf/lb) <sup>2</sup> | Heating Value<br>(Btu/scf) <sup>2</sup> | Mass Flow<br>(lb/hr) | Mass Flow<br>(lb/yr) | Mol% *<br>Heating<br>Value<br>(Btu/scf) |
|------------------|---------------------|-----------------|-----------------|------------------------------------------|-----------------------------------------|----------------------|----------------------|-----------------------------------------|
| Nitrogen         | 1.781               | 28.013          | 5.0E-01         | 13.547                                   | 0                                       | 2.0E-01              | 1.7E+03              | 0.00                                    |
| Carbon Dioxide   | 5.0E-03             | 44.01           | 2.2E-03         | 8.623                                    | 0                                       | 8.7E-04              | 7.6E+00              | 0.00                                    |
| Methane          | 97.462              | 16.043          | 1.6E+01         | 23.65                                    | 1009.7                                  | 6.2E+00              | 5.4E+04              | 984.07                                  |
| Ethane           | 7.3E-01             | 30.07           | 2.2E-01         | 12.62                                    | 1768.7                                  | 8.7E-02              | 7.6E+02              | 12.97                                   |
| Propane          | 1.9E-02             | 44.097          | 8.5E-03         | 8.606                                    | 2517.2                                  | 3.4E-03              | 2.9E+01              | 0.49                                    |
| i-Butane         | 2.7E-04             | 58.123          | 1.6E-04         | 6.529                                    | 3252.6                                  | 6.1E-05              | 5.4E-01              | 0.01                                    |
| n-Butane         | 2.0E-04             | 58.123          | 1.2E-04         | 6.529                                    | 3262                                    | 4.6E-05              | 4.0E-01              | 0.01                                    |
| i-Pentane        | 5.0E-06             | 72.15           | 3.6E-06         | 5.26                                     | 3999.7                                  | 1.4E-06              | 1.2E-02              | 0.00                                    |
| n-Pentane        | 2.0E-06             | 72.15           | 1.4E-06         | 5.26                                     | 4008.7                                  | 5.7E-07              | 5.0E-03              | 0.00                                    |
| Hexanes+         | 0.0E+00             | 100             | 0.0E+00         | 3.787                                    | 5502.8                                  | 0.0E+00              | 0.0E+00              | 0.00                                    |
| <b>VOC Total</b> | <b>1.98E-02</b>     |                 | <b>8.79E-03</b> |                                          |                                         | <b>3.47E-03</b>      | <b>30.42</b>         |                                         |
| <b>Total</b>     | <b>100.00</b>       |                 | <b>16.37</b>    |                                          |                                         | <b>6.47</b>          | <b>56678.32</b>      | <b>997.54</b>                           |

### Emission Calculations

| NO <sub>x</sub> | CO    | VOC    | SO <sub>2</sub> |                      |                                |
|-----------------|-------|--------|-----------------|----------------------|--------------------------------|
| 0.068           | 0.31  |        |                 | lb/MMBtu             | AP-42 Tables 13.5-1 and 13.5-2 |
|                 |       |        | 5               | gr S/100scf          |                                |
| 0.010           | 0.046 | 0.0035 | 0.0021          | lb/hr <sup>1</sup>   |                                |
| 0.045           | 0.20  | 0.015  | 0.0094          | tons/yr <sup>2</sup> |                                |

### Notes

<sup>1</sup> lb/hr emissions calculated as follows:

For SO<sub>2</sub>, lb/hr = 5gr S/100scf \* 1lb/7000gr \* Gas flow (Mscf/hr) \* 1000scf/Mscf \* (64g/mol SO<sub>2</sub> / 32g/mol S)

For other criteria pollutants, lb/hr = EF (lb/MMBtu) \* Fuel consumption (MMBtu/hr)

<sup>2</sup> tons/yr = lb/hr \* Hours of operation (hr/yr) \* 1ton/2000lb

<sup>3</sup> GHG ton/yr = EF (kg/MMBtu) \* Fuel consumption (MMBtu/hr) \* 1tonne/1000kg \* Hours of operation (hr/yr) \* 1.1023ton/tonne

### Greenhouse Gas Calculations

| CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e |                           |                              |
|-----------------|------------------|-----------------|-------------------|---------------------------|------------------------------|
| 53.06           | 1.00E-04         | 1.00E-03        |                   | kg/MMBtu                  | 40 CFR 98 Tables C-1 and C-2 |
| 1               | 298              | 25              |                   | GWP                       | 40 CFR 98 Table A-1          |
| 76.66           | 1.44E-04         | 1.44E-03        |                   | tons/yr <sup>3</sup>      |                              |
| 76.66           | 0.043            | 0.036           | 76.74             | tons/yr CO <sub>2</sub> e | tons/yr * GWP                |

### Stack Parameters

|               |      |      |                                                        |
|---------------|------|------|--------------------------------------------------------|
| Exit Velocity | 66   | ft/s | NMED Air Dispersion Modeling Guidelines, February 2014 |
| Temperature   | 1832 | F    | NMED Air Dispersion Modeling Guidelines, February 2014 |
| Height        | 120  | ft   | Design                                                 |
| Diameter      | 2.5  | ft   | Design                                                 |

## Flare Purging Emissions

Unit(s): FL-1 (purge)  
Description: Flare purge gas

Purge gas: 276 scf/hr HYSYS 7.3  
Hourly gas flow: 0.276 Mscf/hr  
Annual gas flow: 2417.8 Mscf/yr [Purge gas (scf/hr)] \* Hours (hr/yr) \* Mscf/1000scf  
Purge gas heat value: 997.5 Btu/scf Nominal higher heating value  
Purge gas usage: 0.3 MMBtu/hr Total gas flow (scf/hr) \* HHV  
Purge gas usage: 2411.8 MMBtu/yr Total gas flow (Mscf/yr) \* HHV  
Operating hours: 8760.0 hr/yr

| Composition      | Mole % <sup>1</sup> | MW <sup>2</sup> | MW* Mol%       | Spec.<br>Volume<br>(scf/lb) <sup>2</sup> | Heating Value<br>(Btu/scf) <sup>2</sup> | Mass Flow<br>(lb/hr) | Mass Flow<br>(lb/yr) | Mol% *<br>Heating<br>Value<br>(Btu/scf) |
|------------------|---------------------|-----------------|----------------|------------------------------------------|-----------------------------------------|----------------------|----------------------|-----------------------------------------|
| Nitrogen         | 1.781               | 28.013          | 5.0E-01        | 13.547                                   | 0                                       | 3.6E-01              | 3.2E+03              | 0.00                                    |
| Carbon Dioxide   | 5.0E-03             | 44.01           | 2.2E-03        | 8.623                                    | 0                                       | 1.6E-03              | 1.4E+01              | 0.00                                    |
| Methane          | 97.462              | 16.043          | 1.6E+01        | 23.65                                    | 1009.7                                  | 1.1E+01              | 1.0E+05              | 984.07                                  |
| Ethane           | 7.3E-01             | 30.07           | 2.2E-01        | 12.62                                    | 1768.7                                  | 1.6E-01              | 1.4E+03              | 12.97                                   |
| Propane          | 1.9E-02             | 44.097          | 8.5E-03        | 8.606                                    | 2517.2                                  | 6.2E-03              | 5.4E+01              | 0.49                                    |
| i-Butane         | 2.7E-04             | 58.123          | 1.6E-04        | 6.529                                    | 3252.6                                  | 1.1E-04              | 9.9E-01              | 0.01                                    |
| n-Butane         | 2.0E-04             | 58.123          | 1.2E-04        | 6.529                                    | 3262                                    | 8.5E-05              | 7.4E-01              | 0.01                                    |
| i-Pentane        | 5.0E-06             | 72.15           | 3.6E-06        | 5.26                                     | 3999.7                                  | 2.6E-06              | 2.3E-02              | 0.00                                    |
| n-Pentane        | 2.0E-06             | 72.15           | 1.4E-06        | 5.26                                     | 4008.7                                  | 1.0E-06              | 9.2E-03              | 0.00                                    |
| Hexanes+         | 0.0E+00             | 100             | 0.0E+00        | 3.787                                    | 5502.8                                  | 0.0E+00              | 0.0E+00              | 0.00                                    |
| <b>VOC Total</b> | <b>2.0E-02</b>      |                 | <b>8.8E-03</b> |                                          |                                         | <b>6.4E-03</b>       | <b>5.6E+01</b>       |                                         |
| <b>Total</b>     | <b>100.00</b>       |                 | <b>16.37</b>   |                                          |                                         | <b>1.2E+01</b>       | <b>1.0E+05</b>       | <b>997.5</b>                            |

### Emission Calculations

| NO <sub>x</sub> | CO   | VOC     | SO <sub>2</sub> | HAPs  |                                         |
|-----------------|------|---------|-----------------|-------|-----------------------------------------|
| 0.068           | 0.31 |         |                 |       | lb/MMBtu AP-42 Tables 13.5-1 and 13.5-2 |
|                 |      |         | 5               |       | gr S/100scf                             |
| 0.019           | 0.09 | 6.4E-03 | 0.004           | 0.000 | lb/hr <sup>3</sup>                      |
| 0.08            | 0.4  | 7.7E-03 | 0.017           | 0.000 | tons/yr <sup>4</sup>                    |

### Notes

<sup>1</sup> Flare composition using Aspen HYSYS Version 7.3 analysis.

<sup>2</sup> From "Physical Properties of Hydrocarbons"

<sup>3</sup> lb/hr emissions calculated as follows:

For SO<sub>2</sub>, lb/hr = 5gr S/100scf \* 1lb/7000gr \* Gas flow (Mscf/hr) \* 1000scf/Mscf \* (64g/mol SO<sub>2</sub> / 32g/mol S)

For other criteria pollutants, lb/hr = EF (lb/MMBtu) \* Fuel consumption (MMBtu/hr)

<sup>4</sup> tons/yr = lb/hr \* Hours of operation (hr/yr) \* 1ton/2000lb

<sup>5</sup> GHG ton/yr = EF (kg/MMBtu) \* Fuel consumption (MMBtu/hr) \* 1tonne/1000kg \* Hours of operation (hr/yr) \* 1.1023ton/tonne

### Greenhouse Gas Calculations

| CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e |                                         |
|-----------------|------------------|-----------------|-------------------|-----------------------------------------|
| 53.06           | 1.0E-04          | 1.0E-03         |                   | kg/MMBtu 40 CFR 98 Tables C-1 and C-2   |
| 1               | 298              | 25              |                   | GWP 40 CFR 98 Table A-1                 |
| 141.1           | 0.0003           | 0.0027          |                   | tons/yr <sup>5</sup>                    |
| 141.1           | 0.079            | 0.066           | 141.2             | tons/yr CO <sub>2</sub> e tons/yr * GWP |

Unit(s): FL-1 (process)  
Description: Process flaring emissions

Destruction Efficiency: 98% Manufacturer guaranteed DRE for C4+ & H<sub>2</sub>S  
Destruction Efficiency: 99% Manufacturer guaranteed DRE for C3

**Process Flaring Calculations**

Operating hours: 8760 hr/yr  
Max hourly volume: 917.2 Mscf/hr  
Max daily volume: 22.0 MMscf/day Estimated maximum volume  
Average daily volume: 0.95 MMscf/day Estimated average hourly volume  
Average annual volume: 346,750 Mscf/yr Estimated average annual volume  
Max hourly heat rate: 1,673 MMBtu/hr Heating value of flare analysis (Btu/scf) \* Volume (Mscf/hr) \* 1MMBtu/1000Btu  
Max annual heat rate: 632,472 MMBtu/yr Heating value of flare analysis (Btu/scf) \* Volume (Mscf/yr) \* 1MMBtu/1000Btu  
Heat content: 1,824.0 BTU/SCF 12/15/16 Flare Gas Analysis

| Process and Knockout Vapors |              |                 |              |                                       |                                         |                                   |                                |
|-----------------------------|--------------|-----------------|--------------|---------------------------------------|-----------------------------------------|-----------------------------------|--------------------------------|
| Composition <sup>1</sup>    | Mol%         | MW <sup>1</sup> | MW*Mol%      | Spec. Volume<br>(scf/lb) <sup>1</sup> | Heating Value<br>(Btu/scf) <sup>1</sup> | Mass Flow<br>(lb/hr) <sup>2</sup> | Mass Flow (lb/yr) <sup>3</sup> |
| Hydrogen Sulfide            | 0.001%       | 34.076          | 0.000        | 11.136                                | 637.0                                   | 0.8236                            | 311.4                          |
| Nitrogen                    | 6.185%       | 28.013          | 1.733        | 13.547                                | 0.0                                     | 4187.5553                         | 1,583,117.1                    |
| Carbon Dioxide              | 2.983%       | 44.01           | 1.313        | 8.623                                 | 0.0                                     | 3172.9180                         | 1,199,530.6                    |
| Methane                     | 45.423%      | 16.043          | 7.287        | 23.65                                 | 1009.7                                  | 17616.0548                        | 6,659,799.3                    |
| Ethane                      | 7.917%       | 30.07           | 2.381        | 12.62                                 | 1768.7                                  | 5753.9393                         | 2,175,293.0                    |
| Propane                     | 11.723%      | 44.097          | 5.169        | 8.606                                 | 2517.2                                  | 12493.9973                        | 4,723,390.9                    |
| i-Butane                    | 3.527%       | 58.123          | 2.050        | 6.529                                 | 3252.6                                  | 4954.7617                         | 1,873,161.7                    |
| n-Butane                    | 12.527%      | 58.123          | 7.281        | 6.529                                 | 3262                                    | 17598.0438                        | 6,652,990.1                    |
| 2-2 Dimethylpropane         | 0.048%       | 72.151          | 0.035        | 4.404                                 | 3984.2                                  | 99.9673                           | 37,792.9                       |
| i-Pentane                   | 4.298%       | 72.15           | 3.101        | 5.26                                  | 3999.7                                  | 7494.5343                         | 2,833,329.8                    |
| n-Pentane                   | 4.338%       | 72.15           | 3.130        | 5.26                                  | 4008.7                                  | 7564.2833                         | 2,859,698.7                    |
| Hexanes                     | 0.558%       | 86.178          | 0.481        | 4.4                                   | 4756.1                                  | 1163.1762                         | 439,742.0                      |
| n-Hexanes                   | 0.203%       | 86.178          | 0.175        | 4.4                                   | 4756.1                                  | 423.1627                          | 159,977.8                      |
| Benzene                     | 0.008%       | 78.114          | 0.006        | 4.858                                 | 3741.9                                  | 14.7266                           | 5,567.4                        |
| Toluene                     | 0.004%       | 92.141          | 0.004        | 4.119                                 | 4474.8                                  | 8.9070                            | 3,367.3                        |
| Heptanes plus               | 0.258%       | 100.205         | 0.259        | 3.787                                 | 5502.8                                  | 625.3525                          | 236,416.3                      |
| <b>VOC Total</b>            | <b>37.5%</b> |                 | <b>21.69</b> |                                       |                                         | <b>52,440.91</b>                  | <b>19,825,435.08</b>           |
| <b>Total</b>                | <b>100%</b>  |                 | <b>34.40</b> |                                       |                                         | <b>83,172.20</b>                  | <b>31,443,486.43</b>           |

<sup>1</sup> South Eddy Plant Flare Analysis: Date Sampled 12/15/2016

| Amine Flash      |                     |         |               |                           |                       |                       |                            |
|------------------|---------------------|---------|---------------|---------------------------|-----------------------|-----------------------|----------------------------|
| Component        | Mole % <sup>5</sup> | MW      | (lb/hr)       | w/SF (lb/hr) <sup>6</sup> | Weight % <sup>2</sup> | (scf/lb) <sup>3</sup> | Flow (scf/hr) <sup>4</sup> |
| Water            | 4.58%               | 18.015  | 21.6          | 43.1                      | 3.52%                 | 21.06                 | 907.93                     |
| CO2              | 11.69%              | 44.01   | 134.2         | 268.4                     | 21.92%                | 8.623                 | 2314.62                    |
| Hydrogen Sulfide | 0.0010%             | 34.08   | 0.009         | 0.017                     | 0.00%                 | 11.136                | 0.19                       |
| Nitrogen         | 0.51%               | 28.013  | 3.7           | 7.5                       | 0.61%                 | 13.547                | 101.25                     |
| Methane          | 65.59%              | 16.043  | 274.6         | 549.2                     | 44.85%                | 23.65                 | 12988.80                   |
| Ethane           | 10.42%              | 30.07   | 81.7          | 163.5                     | 13.35%                | 12.62                 | 2063.16                    |
| Propane          | 4.14%               | 44.097  | 47.6          | 95.2                      | 7.77%                 | 8.606                 | 819.38                     |
| n-Butane         | 1.32%               | 58.124  | 20.1          | 40.2                      | 3.28%                 | 6.529                 | 262.29                     |
| i-Butane         | 1.24%               | 58.124  | 18.8          | 37.6                      | 3.07%                 | 6.529                 | 245.22                     |
| n-Pentane        | 0.19%               | 72.151  | 3.5           | 7.0                       | 0.57%                 | 5.26                  | 36.80                      |
| i-Pentane        | 0.18%               | 72.151  | 3.4           | 6.8                       | 0.56%                 | 5.26                  | 35.84                      |
| Cyclopentane     | 0.01%               | 72.1    | 0.2           | 0.3                       | 0.03%                 | 5.411                 | 1.69                       |
| n-Hexane         | 0.03%               | 86.178  | 0.7           | 1.4                       | 0.12%                 | 4.404                 | 6.30                       |
| Benzene          | 0.05%               | 78.11   | 0.9           | 1.9                       | 0.15%                 | 4.858                 | 9.16                       |
| n-Heptane        | 0.02%               | 100.205 | 0.4           | 0.9                       | 0.07%                 | 3.787                 | 3.37                       |
| Toluene          | 0.02%               | 92.14   | 0.5           | 0.9                       | 0.08%                 | 4.119                 | 3.83                       |
| n-Octane         | 0.01%               | 114.232 | 0.2           | 0.4                       | 0.03%                 | 3.322                 | 1.41                       |
| Ethylbenzene     | 0.00%               | 106.16  | 0.0           | 0.0                       | 0.00%                 | 3.574                 | 0.00                       |
| Xylenes          | 0.00%               | 106.16  | 0.1           | 0.2                       | 0.01%                 | 3.574                 | 0.55                       |
| n-Nonane         | 0.00%               | 128.2   | 0.1           | 0.1                       | 0.01%                 | 2.959                 | 0.38                       |
| <b>Total</b>     | <b>100.00%</b>      |         | <b>612.31</b> | <b>1224.63</b>            |                       |                       | <b>19802.17</b>            |
| <b>VOC Total</b> |                     |         |               | <b>192.91</b>             |                       |                       |                            |

## Process Flaring Emissions

### Uncontrolled GC-1 through GC-6 Emissions Summary

| Unit No.     | VOC<br>(lb/hr) <sup>2</sup> | VOC<br>(tpy) <sup>2</sup> | Total HAPs<br>(lb/hr) <sup>1,2</sup> | Total HAPs<br>(tpy) <sup>1,2</sup> | Total H <sub>2</sub> S<br>(lb/hr) <sup>2</sup> | Total H <sub>2</sub> S<br>(tpy) <sup>2</sup> |
|--------------|-----------------------------|---------------------------|--------------------------------------|------------------------------------|------------------------------------------------|----------------------------------------------|
| GC-1         | 0.038                       | 0.17                      | 0.0013                               | 0.0055                             | 9.71E-07                                       | 4.25E-06                                     |
| GC-2         | 0.21                        | 0.90                      | 0.011                                | 0.047                              | 9.71E-07                                       | 4.25E-06                                     |
| GC-3         | 1.7E-01                     | 7.6E-01                   | 0.0055                               | 0.024                              | 9.71E-07                                       | 4.25E-06                                     |
| GC-4         | 1.8E-01                     | 7.7E-01                   | 0.0056                               | 0.025                              | 9.71E-07                                       | 4.25E-06                                     |
| GC-5         | 3.6E-02                     | 1.6E-01                   | 0.0011                               | 0.0047                             | 9.71E-07                                       | 4.25E-06                                     |
| GC-6         | 6.3E-05                     | 2.8E-04                   | 0.00                                 | 0.00                               | 9.71E-07                                       | 4.25E-06                                     |
| <b>TOTAL</b> | <b>0.63</b>                 | <b>2.76</b>               | <b>0.024</b>                         | <b>0.11</b>                        | <b>5.83E-06</b>                                | <b>2.55E-05</b>                              |

### Process Flaring Emissions

| NO <sub>x</sub> | CO            | VOC           | H <sub>2</sub> S <sup>2</sup> | SO <sub>2</sub> <sup>3</sup> |                            |                                                    |
|-----------------|---------------|---------------|-------------------------------|------------------------------|----------------------------|----------------------------------------------------|
| 0.068           | 0.31          |               |                               |                              | lb/MMBtu                   | AP-42 Tables 13.5-1 and 13.5-2                     |
|                 |               |               |                               | 98%                          | %                          | Estimated conversion of combusted H <sub>2</sub> S |
| <b>113.76</b>   | <b>518.62</b> | <b>926.79</b> | <b>0.017</b>                  | <b>1.55</b>                  | <b>lb/hr<sup>4</sup></b>   |                                                    |
| <b>21.50</b>    | <b>98.03</b>  | <b>174.69</b> | <b>0.0046</b>                 | <b>0.43</b>                  | <b>tons/yr<sup>5</sup></b> |                                                    |
| n-Hexane        | Benzene       | Toluene       | Total HAPs                    |                              |                            |                                                    |
| <b>8.49</b>     | <b>0.33</b>   | <b>0.20</b>   | <b>9.02</b>                   | <b>lb/hr<sup>4</sup></b>     |                            |                                                    |
| <b>1.73</b>     | <b>0.22</b>   | <b>0.12</b>   | <b>2.08</b>                   | <b>tons/yr<sup>5</sup></b>   |                            |                                                    |

### Notes

<sup>1</sup> From "Physical Properties of Hydrocarbons"

<sup>2</sup> Flow (lb/hr) = Volume (Mscf/event) / Duration (hr/event) \* 1000cf/Mscf / Sp. Vol. (scf/lb) \* Mol%

<sup>3</sup> Flow (tons/yr) = Volume (Mscf/yr) \* 1000scf/Mscf / Sp. Vol. (scf/lb) \* Mol%

<sup>4</sup> lb/hr emissions for process flaring calculated as follows:

For NO<sub>x</sub> and CO, lb/hr = EF (lb/MMBtu) \* Heat input (MMBtu/hr)

For VOC and HAPs, lb/hr = Flow (lb/hr) \* (1 - Control%)

The Control % for Propane was assumed to be 99% and the Control% for Butanes+ was assumed to be 98%

<sup>5</sup> tons/yr emissions for process flaring calculated as follows:

For NO<sub>x</sub> and CO, tons/yr = EF (lb/MMBtu) \* Heat input (MMBtu/yr) \* 1ton/2000lb

For VOC and HAPs, tons/yr = Flow (tons/yr) \* (1 - Control%)

The Control % for Propane was assumed to be 99% and the Control% for Butanes+ was assumed to be 98%

<sup>6</sup> Safety factor applied to amine flash: 100%

| CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e |                           |                                        |
|-----------------|------------------|-----------------|-------------------|---------------------------|----------------------------------------|
| 11191545.5      |                  | 38494.7         |                   | cf/yr                     | 40 CFR 98 Eqns. W-19, W-20, W-21, W-40 |
|                 | 1.00E-04         |                 |                   | kg/MMBtu                  | 40 CFR 98 Eqn. W-40                    |
| 0.0526          |                  | 0.0192          |                   | kg/cf                     | 40 CFR 98.233(v)                       |
| 1               | 298              | 25              |                   | GWP                       | 40 CFR 98 Table A-1                    |
| 648.9           | 0.070            | 0.8             |                   | tons/yr                   | 40 CFR 98 Eqns. W-36 and W-40          |
| 648.9           | 20.8             | 20.4            | 690.0             | tons/yr CO <sub>2</sub> e | tons/yr * GWP                          |

### Stack Parameters

|               |      |      |                                                        |
|---------------|------|------|--------------------------------------------------------|
| Exit Velocity | 65.6 | ft/s | NMED Air Dispersion Modeling Guidelines, February 2014 |
| Temperature   | 1832 | F    | NMED Air Dispersion Modeling Guidelines, February 2014 |
| Height        | 120  | ft   | Design                                                 |
| Diameter      | 2.5  | ft   | Design                                                 |

### Effective Stack Diameter - Process flaring

|                              |                   |                                                 |                                                        |
|------------------------------|-------------------|-------------------------------------------------|--------------------------------------------------------|
| Molecular Weight             | 34.4              | Molecular weight of gas                         |                                                        |
| Heat Release (q)             | 117108079 cal/sec | Gross heat released                             | MMBtu/hr * 10 <sup>6</sup> * 252 cal/Btu ÷ 3600 sec/hr |
| qn                           | 84137207.1        | q <sub>n</sub> = q(1-0.048(MW) <sup>1/2</sup> ) |                                                        |
| Effective Stack Diameter (m) | 9.2               | m                                               | D = (10 <sup>-6</sup> q <sub>n</sub> ) <sup>1/2</sup>  |
| Heat Input:                  | 1673.0            | MMBtu/hr                                        | Max hourly heat rate                                   |

Unit(s):       HAUL  
Description:   Truck haul road emissions

Input Data

|                                     |      |                                         |
|-------------------------------------|------|-----------------------------------------|
| Empty vehicle weight <sup>1</sup>   | 16   | tons                                    |
| Load weight <sup>2</sup>            | 21.2 | tons                                    |
| Loaded vehicle <sup>3</sup>         | 37.2 | tons                                    |
| Mean vehicle weight <sup>4</sup>    | 26.6 | tons                                    |
| Vehicle frequency                   | 1.0  | trips/hour                              |
| Vehicle frequency                   | 24.0 | vehicles/day                            |
| Round-trip distance                 | 0.30 | mile/trip                               |
| Operating hours                     | 8760 | hours/yr                                |
| Surface silt content <sup>5</sup>   | 4.8  | %                                       |
| Annual wet days <sup>6</sup>        | 60   | days/yr                                 |
| Vehicle miles traveled <sup>7</sup> | 0.3  | mile/hr                                 |
| Control percentage                  | 80%  | nominal, base course chemical treatment |

Emission Factors and Constants

| Parameter                       | PM <sub>30</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> |
|---------------------------------|------------------|------------------|-------------------|
| k, lb/VMT <sup>8</sup>          | 4.9              | 1.5              | 0.15              |
| a, lb/VMT <sup>8</sup>          | 0.70             | 0.90             | 0.90              |
| b, lb/VMT <sup>8</sup>          | 0.45             | 0.45             | 0.45              |
| Hourly EF, lb/VMT <sup>9</sup>  | 6.89             | 1.76             | 0.18              |
| Annual EF, lb/VMT <sup>10</sup> | 5.75             | 1.47             | 0.15              |

Uncontrolled Emissions

| PM <sub>30</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> |                      |
|------------------|------------------|-------------------|----------------------|
| 2.1              | 0.5              | 0.05              | lb/hr <sup>11</sup>  |
| 7.6              | 1.9              | 0.19              | ton/yr <sup>12</sup> |

Controlled Emissions

| PM <sub>30</sub> | PM <sub>10</sub> | PM <sub>2.5</sub> |                      |
|------------------|------------------|-------------------|----------------------|
| 0.41             | 0.11             | 0.011             | lb/hr <sup>13</sup>  |
| 1.51             | 0.39             | 0.039             | ton/yr <sup>13</sup> |

Notes

- <sup>1</sup> Empty vehicle weight includes driver and occupants and full fuel load.
- <sup>2</sup> Cargo, transported materials, etc. (5.6 lb/gal RVP 10 \*7560 gal truck/ 2000lb/ton)
- <sup>3</sup> Loaded vehicle weight = Empty + Load Size
- <sup>4</sup> Mean Vehicle weight = (Loaded Weight + Empty Weight) / 2
- <sup>5</sup> AP-42 Table 13.2.2-1, Taconite mining and processing mean silt content
- <sup>6</sup> AP-42 Figure 13.2.2-1
- <sup>7</sup> VMT/hr = Vehicle Miles Traveled per hour = Trips per hour \* Segment Length
- <sup>8</sup> Table 13.2.2-2, Industrial Roads
- <sup>9</sup> AP-42 13.2.2, Equation 1a
- <sup>10</sup> AP-42 13.2.2, Equation 2
- <sup>11</sup> lb/hr = Hourly EF (lb/VMT) \* VMT (mile/hr)
- <sup>12</sup> ton/yr = Annual EF (lb/VMT) \* Truck/day \* Mile/truck \* 365day/yr \* 1ton/2000lb
- <sup>13</sup> Uncontrolled emissions \* (1 - Control%)

Loadout of condensate tanks emissions

Unit(s): LOAD  
Description: Loadout of condensate tanks

Hose Information

Hose diameter: 2 inches Nominal  
Hose length: 10 feet Nominal  
Pressurized volume: 0.22 truck / event  
Pressure: 35 psig Nominal  
Depressurized volume: 0.7 scf/event Pressurized volume \* (Pressure + 14.7psi)/14.7psi  
Vapor molecular weight: 60 lb/lb-mol  
Condensate VP: 10 psia  
  
Vehicle frequency: 1 trucks/hr  
Vehicle frequency: 24 trucks/day

Emission Calculations

VOC  
0.12 lb/hr scf/truck \* lb-mol/379.4scf \* MW (lb/lb-mol) \* trucks/hr  
0.51 tons/yr scf/truck \* lb-mol/379.4scf \* MW (lb/lb-mol) \* trucks/day \* 365day/yr \* 1ton/2000lb

HAP Emissions

| Benzene | Toluene | e-Benzene | Xylenes | n-Hexane | Total HAPs |                      |         |
|---------|---------|-----------|---------|----------|------------|----------------------|---------|
| 5%      | 5%      | 2%        | 5%      | 5%       | 22%        | weight%              | Nominal |
| 0.006   | 0.006   | 0.002     | 0.006   | 0.006    | 0.026      | lb/hr <sup>1</sup>   |         |
| 0.026   | 0.026   | 0.0102    | 0.026   | 0.026    | 0.11       | tons/yr <sup>1</sup> |         |

Notes  
<sup>1</sup> VOC emissions \* HAP weight%

Unit: LOAD-PW  
Description: Loadout of produced water tanks

Uncontrolled Emisions

| VOCs <sup>1</sup> | units |            |
|-------------------|-------|------------|
| 0.17              | tpy   | ProMax run |

<sup>1</sup> Assumed 1% VOC content for produced water per TCEQ guidance.

HAP Emissions

| HAPs              | Uncontrolled<br>Loadout<br>Emission <sup>1</sup><br>tpy |
|-------------------|---------------------------------------------------------|
| <i>n</i> -Hexane  | 0.013                                                   |
| Heptanes+         | 0.020                                                   |
| <b>TOTAL HAPs</b> | <b>0.033</b>                                            |

<sup>1</sup> Loadout HAPs (tpy) = TK-S1 and TK-S2 Working and Breathing HAP \* (total Loadout VOC/ TK-S1 and TK-S2 working breathing losses)

Assumed 1% VOC content for produced water per TCEQ guidance.

Unit:TK-S1, TK-S2

Number of tanks:2

Description:Produced Water tank emissions

General Tank Information<sup>1</sup>

| Description                | Value   | Unit         | Note                                 |
|----------------------------|---------|--------------|--------------------------------------|
| Volume                     | 400     | bbl          |                                      |
| Facility Throughput Daily  | 480     | bbl/day      |                                      |
| Facility Throughput Annual | 175,200 | bbl/yr       | Maximum daily throughput*365 days/yr |
| Tank Throughput Daily      | 240     | bbl/day/tank | Max bbl/day per tank                 |
| Tank Throughput Annual     | 87600   | bbl/yr/tank  | Tank throughput *365 days/yr         |
| Tank Throughput Annual     | 3679200 | gal/yr/tank  | bbl/yr * 42 gal/bbl                  |

Uncontrolled Emissions

| VOCs  | Unit | Note                                                               |
|-------|------|--------------------------------------------------------------------|
| 0.048 | tpy  | BR&E ProMax Estimate (Working and Breathing) per Tank <sup>1</sup> |
| 0.018 | tpy  | BR&E ProMax Estimate (Flash) per Tank <sup>1</sup>                 |
| 0.065 | tpy  | Total uncontrolled VOC emissions per tank                          |

<sup>1</sup> BR&E ProMax was run using a throughput of 240 bpd and an assumed 1% VOC content of produced water for the working, breathing and flash emissions per TCEQ guidance.

| HAPs <sup>1</sup>                | Working & Breathing Losses |         | Flash Losses |         |
|----------------------------------|----------------------------|---------|--------------|---------|
|                                  | tpy                        |         | tpy          |         |
| n-Hexane                         | 0.0036                     |         | 0.0014       |         |
| Heptanes+ <sup>2</sup>           | 0.0058                     |         | 0.0023       |         |
|                                  | Working and Breathing HAPs | 9.4E-03 | Flash HAPs   | 3.7E-03 |
| Total HAPs per Tank <sup>3</sup> | 0.013                      | tpy     |              |         |

<sup>1</sup> HAP Emissions calculated using BR&E ProMax for flash emissions and working and breathing emissions, and an assumed 1% VOC content of produced water per TCEQ guidance.

<sup>2</sup> Heptanes+ is conservatively assumed to incorporate other HAP components.

<sup>3</sup>Total HAPs per Tank = Working and Breathing HAPs + Flash HAPs

| Unit                                     | VOC (tpy) | Total HAPs (tpy) |
|------------------------------------------|-----------|------------------|
| TK-S1                                    | 0.065     | 0.013            |
| TK-S2                                    | 0.065     | 0.013            |
| Total Emissions for Produced Water tanks | 0.13      | 0.026            |

Unit(s): FUG  
Description: Facility-wide fugitives

Gas Analysis

| Components         | MW     | Inlet Gas Before Dehydration |          |
|--------------------|--------|------------------------------|----------|
|                    |        | Mol %                        | Weight % |
| Nitrogen           | 28.01  | 1.2634                       | 1.7901   |
| Methane            | 16.04  | 83.4474                      | 67.7195  |
| Carbon Dioxide     | 44.01  | 1.821                        | 4.0540   |
| Hydrogen Sulfide   | 34.08  | 0.0004                       | 0.0007   |
| Ethane             | 30.07  | 8.2899                       | 12.6095  |
| Propane            | 44.10  | 3.1883                       | 7.1119   |
| i-Butane           | 58.12  | 0.3922                       | 1.1531   |
| n-Butane           | 58.12  | 0.8197                       | 2.4101   |
| i-Pentane          | 72.15  | 0.2064                       | 0.7533   |
| n-Pentane          | 72.15  | 0.2032                       | 0.7416   |
| i-Hexane           | 86.18  | 0.0920                       | 0.4011   |
| n-Hexane           | 86.18  | 0.0546                       | 0.2380   |
| Benzene            | 78.11  | 0.0158                       | 0.0624   |
| CC6                | 84.16  | 0.0291                       | 0.1239   |
| i-Heptane          | 100.21 | 0.0674                       | 0.3416   |
| n-Heptane          | 100.21 | 0.0164                       | 0.0831   |
| Toluene            | 92.14  | 0.014                        | 0.0653   |
| i-Octane           | 114.23 | 0.0443                       | 0.2560   |
| n-Octane           | 114.23 | 0.0042                       | 0.0243   |
| Ethylbenzene       | 106.17 | 0.0041                       | 0.0220   |
| p-m-Xylene         | 106.16 | 0.0006                       | 0.0032   |
| o-Xylene           | 106.16 | 0.0036                       | 0.0193   |
| i-Nonane           | 128.20 | 0.0005                       | 0.0032   |
| n-Nonane           | 128.20 | 0.0006                       | 0.0039   |
| i-Decane           | 142.29 | 0.001                        | 0.0072   |
| n-Dexane+          | 142.29 | 0.0001                       | 0.0007   |
| i-Undecanes+       | 156.31 | 0.0002                       | 0.0016   |
| Total <sup>1</sup> | 19.77  | 99.98                        | 100.00   |
| Total VOC          |        | 5.16                         | 13.83    |
| Total H2S          |        | 0.00040                      | 0.00069  |
| Total HAP          |        | 0.093                        | 0.41     |

Facility Fugitive Emissions

Emission Calculations

| Component Type | Service      | EF <sup>2</sup><br>(kg/hr/source) | Count <sup>3</sup> | Weight % VOC <sup>4</sup> | Weight % HAP <sup>4</sup> | Weight % H <sub>2</sub> S <sup>4</sup> | VOC Emissions <sup>5</sup><br>(lb/hr) | HAP Emissions <sup>5</sup><br>(lb/hr) | H2S Emissions <sup>5</sup><br>(lb/hr) |
|----------------|--------------|-----------------------------------|--------------------|---------------------------|---------------------------|----------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Valves         | Gas/Vapor    | 4.50E-03                          | 2285.8             | 13.8                      | 0.41                      | 0.00                                   | 3.1                                   | 0.093                                 | 0.000                                 |
|                | Light Liquid | 2.50E-03                          | 1465.2             | 100.0                     | 5.0                       | 0.05                                   | 8.1                                   | 0.40                                  | 0.004                                 |
|                | Heavy Liquid | 8.40E-06                          | -                  | -                         | -                         | -                                      | -                                     | -                                     | -                                     |
| Flanges        | Gas/Vapor    | 3.90E-04                          | 4591.4             | 13.8                      | 0.41                      | 0.00                                   | 0.55                                  | 0.016                                 | 0.0000                                |
|                | Light Liquid | 1.10E-04                          | 3317.6             | 100.0                     | 5.0                       | 0.05                                   | 0.80                                  | 0.040                                 | 0.0004                                |
|                | Heavy Liquid | 3.90E-07                          | -                  | -                         | -                         | -                                      | -                                     | -                                     | -                                     |
| OELs           | N/A          | -                                 | -                  | -                         | -                         | -                                      | -                                     | -                                     | -                                     |
| PRVs           | Gas/Vapor    | 8.80E-03                          | 47.3               | 13.8                      | 0.41                      | 0.00                                   | 0.127                                 | 0.0038                                | 0.0000                                |
|                | Light Liquid | 7.50E-03                          | 12.1               | 100.0                     | 5.0                       | -                                      | -                                     | -                                     | -                                     |
|                | Heavy Liquid | 3.20E-05                          | -                  | -                         | -                         | -                                      | -                                     | -                                     | -                                     |
| Other          | Gas/Vapor    | 8.80E-03                          | 1.1                | 13.8                      | 0.41                      | 0.00                                   | 0.003                                 | 0.0001                                | 0.0000001                             |
|                | Light Liquid | 7.50E-03                          | -                  | 100.0                     | 5.0                       | -                                      | -                                     | -                                     | -                                     |
|                | Heavy Liquid | 3.20E-05                          | -                  | -                         | -                         | -                                      | -                                     | -                                     | -                                     |
| Pumps          | Gas/Vapor    | 2.40E-03                          | -                  | 13.8                      | 0.41                      | -                                      | -                                     | -                                     | -                                     |
|                | Light Liquid | 1.30E-02                          | 11                 | 100.0                     | 5.0                       | 0.05                                   | 0.32                                  | 0.016                                 | 0.00016                               |
|                | Heavy Liquid | -                                 | -                  | -                         | -                         | -                                      | -                                     | -                                     | -                                     |
| Compressors    | Gas/Vapor    | 8.80E-03                          | 11                 | 13.8                      | 0.41                      | 0.00                                   | 0.030                                 | 0.00088                               | 0.000001                              |
|                | Light Liquid | 7.50E-03                          | -                  | 100.0                     | 5.0                       | -                                      | -                                     | -                                     | -                                     |
|                | Heavy Liquid | 3.20E-05                          | -                  | -                         | -                         | -                                      | -                                     | -                                     | -                                     |

Total Criteria Pollutant Emissions

| VOC  | H <sub>2</sub> S |                    |
|------|------------------|--------------------|
| 13.0 | 0.005            | lb/hr <sup>6</sup> |
| 0%   | 0%               | Safety factor      |
| 13.0 | 0.005            | lb/hr              |
| 57.1 | 0.021            | tpy <sup>7</sup>   |

HAP Emissions

| n-Hexane | Benzene | Toluene | Xylenes | Ethylbenzene | Total HAPs |                    |
|----------|---------|---------|---------|--------------|------------|--------------------|
| 0.156    | 0.106   | 0.107   | 0.095   | 0.095        | 0.56       | lb/hr <sup>6</sup> |
| 0%       | 0%      | 0%      | 0%      | 0%           | 0%         | Safety factor      |
| 0.16     | 0.11    | 0.11    | 0.095   | 0.095        | 0.56       | lb/hr              |
| 0.68     | 0.47    | 0.47    | 0.42    | 0.42         | 2.4        | tpy <sup>7</sup>   |

Notes

- <sup>1</sup> Total MW =  $\sum MW_i \times \text{Mol } \%$
- <sup>2</sup> Emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates, 1995
- <sup>3</sup> Facility component count based on similar facility component count  
Safety factor = 10% added to facility component count.
- <sup>4</sup> Weight% VOC and HAP of light liquid conservatively assumed to be 100% and 5%, respectively  
Weight% of n-hexane, benzene, toluene, xylenes, and ethylbenzene in light liquid conservatively assumed to be 1% for each
- <sup>5</sup> Emissions per component type (lb/hr) = EF (kg/hr/source) x Component Count x Weight% (VOC, HAP) x 2.20462 lb/kg
- <sup>6</sup> Total Emissions (lb/hr) = Weight %<sub>gas</sub> (VOC, HAP) x [ $\sum Ef_{i, \text{gas}}$  (kg/hr/source) x Component Count<sub>i, gas</sub>] x 2.20462 lb/kg  
+ Weight %liquid (VOC, HAP) x [ $\sum Ef_{i, \text{liquid}}$  (kg/hr/source) x Component Count<sub>i, liquid</sub>] x 2.20462 lb/kg
- <sup>7</sup> tons/yr = lb/hr \* Hours of operation (hr/yr) \* 1ton/2000lb
- <sup>8</sup> GHG ton/yr = Weight % (CO<sub>2</sub>, CH<sub>4</sub>) x [ $\sum Ef_{i, \text{gas}}$  (kg/hr/source) \* Component Count<sub>i, gas</sub>] \* 1tonne/1000kg \* Hours of operation (hr/yr) \* 1.1023ton/tonne
- <sup>9</sup> tons/yr CO<sub>2</sub>e = ton/yr \* GWP

Greenhouse Gas Calculations

| CO <sub>2</sub> | CH <sub>4</sub> | CO <sub>2</sub> e |                                        |
|-----------------|-----------------|-------------------|----------------------------------------|
| 4.1             | 67.7            |                   | Weight % in gas                        |
| 1               | 25              |                   | GWP                                    |
| 5.0             | 83.3            |                   | tons/yr <sup>8</sup>                   |
| 5.0             | 2083.1          | 2088.1            | tons/yr CO <sub>2</sub> e <sup>9</sup> |

## Gas Chromatographs (GC-1 - GC-6)

GC-1 (Meter: SE\_TRT\_IN 52902-01)

|           | Weighted MW |         |             |              |               |              |            |
|-----------|-------------|---------|-------------|--------------|---------------|--------------|------------|
|           | MW          | Mol%    | (lb/lbmole) | mass (lb/yr) | Safety Factor | mass (lb/hr) | mass (tpy) |
| Nitrogen  | 28.0134     | 2.14%   | 0.600       | 31.23        | 20%           | 4.28E-03     | 1.87E-02   |
| CO2       | 44.01       | 0.01%   | 0.002       | 0.11         | 20%           | 1.57E-05     | 6.87E-05   |
| H2S       | 34.08       | 0.0004% | 0.00014     | 0.0071       | 20%           | 9.71E-07     | 4.25E-06   |
| Methane   | 16.04246    | 75.64%  | 12.134      | 631.18       | 20%           | 8.65E-02     | 3.79E-01   |
| Ethane    | 30.06904    | 12.054% | 3.625       | 188.54       | 20%           | 2.58E-02     | 1.13E-01   |
| Propane   | 44.09562    | 6.60%   | 2.912       | 151.45       | 20%           | 2.07E-02     | 9.09E-02   |
| I-Butane  | 58.1222     | 0.812%  | 0.472       | 24.55        | 20%           | 3.36E-03     | 1.47E-02   |
| N-Butane  | 58.1222     | 2.055%  | 1.194       | 62.13        | 20%           | 8.51E-03     | 3.73E-02   |
| I-Pentane | 72.14878    | 0.417%  | 0.301       | 15.65        | 20%           | 2.14E-03     | 9.39E-03   |
| N-Pentane | 72.14878    | 0.450%  | 0.325       | 16.89        | 20%           | 2.31E-03     | 1.01E-02   |
| Hexane +  | 86.17536    | 0.206%  | 0.178       | 9.23         | 20%           | 1.26E-03     | 5.54E-03   |
|           |             | 100%    | 21.7        |              |               |              |            |

GC-2 (Meter: SE\_OVHD\_ST 52502-01)

|           | Weighted MW |         |             |              |               |              |            |
|-----------|-------------|---------|-------------|--------------|---------------|--------------|------------|
|           | MW          | Mol%    | (lb/lbmole) | mass (lb/yr) | Safety Factor | mass (lb/hr) | mass (tpy) |
| Nitrogen  | 28.0134     | 0.26%   | 0.072       | 3.74         | 20%           | 5.13E-04     | 2.25E-03   |
| CO2       | 44.01       | 2.64%   | 1.161       | 60.39        | 20%           | 8.27E-03     | 3.62E-02   |
| H2S       | 34.08       | 0.0004% | 0.00014     | 0.0071       | 20%           | 9.71E-07     | 4.25E-06   |
| Methane   | 16.04246    | 27.62%  | 4.431       | 230.48       | 20%           | 3.16E-02     | 1.38E-01   |
| Ethane    | 30.06904    | 17.450% | 5.247       | 272.94       | 20%           | 3.74E-02     | 1.64E-01   |
| Propane   | 44.09562    | 22.55%  | 9.945       | 517.33       | 20%           | 7.09E-02     | 3.10E-01   |
| I-Butane  | 58.1222     | 4.654%  | 2.705       | 140.71       | 20%           | 1.93E-02     | 8.44E-02   |
| N-Butane  | 58.1222     | 15.358% | 8.926       | 464.33       | 20%           | 6.36E-02     | 2.79E-01   |
| I-Pentane | 72.14878    | 3.778%  | 2.726       | 141.79       | 20%           | 1.94E-02     | 8.51E-02   |
| N-Pentane | 72.14878    | 4.271%  | 3.081       | 160.29       | 20%           | 2.20E-02     | 9.62E-02   |
| Hexane +  | 86.17536    | 1.733%  | 1.493       | 77.68        | 20%           | 1.06E-02     | 4.66E-02   |
|           |             | 100%    | 39.8        |              |               |              |            |

GC-3 (Meter: SE\_PRODUCT DEC1)

|           | Weighted MW |         |             |              |               |              |            |
|-----------|-------------|---------|-------------|--------------|---------------|--------------|------------|
|           | MW          | Mol%    | (lb/lbmole) | mass (lb/yr) | Safety Factor | mass (lb/hr) | mass (tpy) |
| Nitrogen  | 28.0134     | 0.00%   | 0.000       | 0.00         | 20%           | 0.00E+00     | 0.00E+00   |
| CO2       | 44.01       | 0.02%   | 0.007       | 0.37         | 20%           | 5.02E-05     | 2.20E-04   |
| H2S       | 34.08       | 0.0004% | 0.00014     | 0.0071       | 20%           | 9.71E-07     | 4.25E-06   |
| Methane   | 16.04246    | 0.76%   | 0.122       | 6.33         | 20%           | 8.66E-04     | 3.80E-03   |
| Ethane    | 30.06904    | 52.174% | 15.688      | 816.06       | 20%           | 1.12E-01     | 4.90E-01   |
| Propane   | 44.09562    | 29.91%  | 13.188      | 686.01       | 20%           | 9.40E-02     | 4.12E-01   |
| I-Butane  | 58.1222     | 3.677%  | 2.137       | 111.17       | 20%           | 1.52E-02     | 6.67E-02   |
| N-Butane  | 58.1222     | 9.178%  | 5.334       | 277.48       | 20%           | 3.80E-02     | 1.66E-01   |
| I-Pentane | 72.14878    | 1.905%  | 1.374       | 71.49        | 20%           | 9.79E-03     | 4.29E-02   |
| N-Pentane | 72.14878    | 2.071%  | 1.494       | 77.72        | 20%           | 1.06E-02     | 4.66E-02   |
| Hexane +  | 86.17536    | 0.900%  | 0.776       | 40.34        | 20%           | 5.53E-03     | 2.42E-02   |
|           |             | 100.59% | 40.1        |              |               |              |            |

# Gas Chromatograph Emissions

GC-4 (Meter: SE\_PRODUCT 52212\_PROD)

|           | Weighted MW |         |             |              |               |              |            |
|-----------|-------------|---------|-------------|--------------|---------------|--------------|------------|
|           | MW          | Mol%    | (lb/lbmole) | mass (lb/yr) | Safety Factor | mass (lb/hr) | mass (tpy) |
| Nitrogen  | 28.0134     | 0.00%   | 0.000       | 0.00         | 20%           | 0.00E+00     | 0.00E+00   |
| CO2       | 44.01       | 0.02%   | 0.009       | 0.48         | 20%           | 6.59E-05     | 2.88E-04   |
| H2S       | 34.08       | 0.0004% | 0.00014     | 0.0071       | 20%           | 9.71E-07     | 4.25E-06   |
| Methane   | 16.04246    | 0.62%   | 0.100       | 5.21         | 20%           | 7.13E-04     | 3.12E-03   |
| Ethane    | 30.06904    | 51.395% | 15.454      | 803.87       | 20%           | 1.10E-01     | 4.82E-01   |
| Propane   | 44.09562    | 30.43%  | 13.416      | 697.87       | 20%           | 9.56E-02     | 4.19E-01   |
| I-Butane  | 58.1222     | 3.753%  | 2.181       | 113.47       | 20%           | 1.55E-02     | 6.81E-02   |
| N-Butane  | 58.1222     | 9.411%  | 5.470       | 284.53       | 20%           | 3.90E-02     | 1.71E-01   |
| I-Pentane | 72.14878    | 1.929%  | 1.392       | 72.39        | 20%           | 9.92E-03     | 4.34E-02   |
| N-Pentane | 72.14878    | 2.090%  | 1.508       | 78.44        | 20%           | 1.07E-02     | 4.71E-02   |
| Hexane +  | 86.17536    | 0.919%  | 0.792       | 41.20        | 20%           | 5.64E-03     | 2.47E-02   |
|           |             | 100.57% | 40.3        |              |               |              |            |

GC-5 (Meter: SE\_IN\_RES 52901)

|           | Weighted MW |         |             |              |               |              |            |
|-----------|-------------|---------|-------------|--------------|---------------|--------------|------------|
|           | MW          | Mol%    | (lb/lbmole) | mass (lb/yr) | Safety Factor | mass (lb/hr) | mass (tpy) |
| Nitrogen  | 28.0134     | 2.04%   | 0.573       | 29.78        | 20%           | 4.08E-03     | 1.79E-02   |
| CO2       | 44.01       | 3.22%   | 1.418       | 73.78        | 20%           | 1.01E-02     | 4.43E-02   |
| H2S       | 34.08       | 0.0004% | 0.00014     | 0.0071       | 20%           | 9.71E-07     | 4.25E-06   |
| Methane   | 16.04246    | 73.18%  | 11.740      | 610.70       | 20%           | 8.37E-02     | 3.66E-01   |
| Ethane    | 30.06904    | 11.661% | 3.506       | 182.39       | 20%           | 2.50E-02     | 1.09E-01   |
| Propane   | 44.09562    | 6.32%   | 2.786       | 144.94       | 20%           | 1.99E-02     | 8.70E-02   |
| I-Butane  | 58.1222     | 0.762%  | 0.443       | 23.04        | 20%           | 3.16E-03     | 1.38E-02   |
| N-Butane  | 58.1222     | 1.917%  | 1.114       | 57.96        | 20%           | 7.94E-03     | 3.48E-02   |
| I-Pentane | 72.14878    | 0.378%  | 0.273       | 14.19        | 20%           | 1.94E-03     | 8.51E-03   |
| N-Pentane | 72.14878    | 0.407%  | 0.294       | 15.27        | 20%           | 2.09E-03     | 9.16E-03   |
| Hexane +  | 86.17536    | 0.176%  | 0.152       | 7.89         | 20%           | 1.08E-03     | 4.73E-03   |
|           |             | 100.07% | 22.3        |              |               |              |            |

GC-6 (Meter: SE\_IN\_RES 52903)

|           | Weighted MW |         |             |              |               |              |            |
|-----------|-------------|---------|-------------|--------------|---------------|--------------|------------|
|           | MW          | Mol%    | (lb/lbmole) | mass (lb/yr) | Safety Factor | mass (lb/hr) | mass (tpy) |
| Nitrogen  | 28.0134     | 2.81%   | 0.787       | 40.93        | 20%           | 5.61E-03     | 2.46E-02   |
| CO2       | 44.01       | 0.01%   | 0.002       | 0.11         | 20%           | 1.57E-05     | 6.87E-05   |
| H2S       | 34.08       | 0.0004% | 0.00014     | 0.0071       | 20%           | 9.71E-07     | 4.25E-06   |
| Methane   | 16.04246    | 96.08%  | 15.413      | 801.76       | 20%           | 1.10E-01     | 4.81E-01   |
| Ethane    | 30.06904    | 1.166%  | 0.351       | 18.24        | 20%           | 2.50E-03     | 1.09E-02   |
| Propane   | 44.09562    | 0.02%   | 0.009       | 0.46         | 20%           | 6.28E-05     | 2.75E-04   |
| I-Butane  | 58.1222     | 0.000%  | 0.000       | 0.00         | 20%           | 0.00E+00     | 0.00E+00   |
| N-Butane  | 58.1222     | 0.000%  | 0.000       | 0.00         | 20%           | 0.00E+00     | 0.00E+00   |
| I-Pentane | 72.14878    | 0.000%  | 0.000       | 0.00         | 20%           | 0.00E+00     | 0.00E+00   |
| N-Pentane | 72.14878    | 0.000%  | 0.000       | 0.00         | 20%           | 0.00E+00     | 0.00E+00   |
| Hexane +  | 86.17536    | 0.000%  | 0.000       | 0.00         | 20%           | 0.00E+00     | 0.00E+00   |
|           |             | 100.08% | 16.6        |              |               |              |            |

# Gas Chromatograph Emissions

| Stream per Gas Chromatograph     | Hours of Operation | Gas Flow             | Gas Flow           | Gas Flow            |
|----------------------------------|--------------------|----------------------|--------------------|---------------------|
|                                  | hrs/yr             | cm <sup>3</sup> /min | m <sup>3</sup> /yr | ft <sup>3</sup> /yr |
| Gas Chromatographs (GC-1 - GC-6) | 8760               | 400                  | 210.24             | 7424.56             |

$PV=nRT$   
 $n=PV/RT$   
 $m(lb)=PV(MW)/RT$   
 $P=39.7$  psia (15 psig+14.7) 39.7 <-- gas is 15 psig  
 $T= 528R$  (460+68) 528 <-- assumed standard ambient 68 deg F  
 $V=$  defined above ft<sup>3</sup>  
 $R=10.732$  ft<sup>3</sup>-psi/R lb-mol 10.732

## Uncontrolled GC-1 through GC-6 Emissions Summary

| Unit No.     | VOC (lb/hr) <sup>2</sup> | VOC (tpy) <sup>2</sup> | Total HAPs (lb/hr) <sup>1,2</sup> | Total HAPs (tpy) <sup>1,2</sup> | Total H2S (lb/hr) <sup>2</sup> | Total H2S (tpy) <sup>2</sup> |
|--------------|--------------------------|------------------------|-----------------------------------|---------------------------------|--------------------------------|------------------------------|
| GC-1         | 0.038                    | 0.17                   | 0.0013                            | 0.0055                          | 9.71E-07                       | 4.25E-06                     |
| GC-2         | 0.21                     | 0.90                   | 0.011                             | 0.047                           | 9.71E-07                       | 4.25E-06                     |
| GC-3         | 1.7E-01                  | 7.6E-01                | 0.0055                            | 0.024                           | 9.71E-07                       | 4.25E-06                     |
| GC-4         | 1.8E-01                  | 7.7E-01                | 0.0056                            | 0.025                           | 9.71E-07                       | 4.25E-06                     |
| GC-5         | 3.6E-02                  | 1.6E-01                | 0.0011                            | 0.0047                          | 9.71E-07                       | 4.25E-06                     |
| GC-6         | 6.3E-05                  | 2.8E-04                | 0.00                              | 0.00                            | 9.71E-07                       | 4.25E-06                     |
| <b>TOTAL</b> | <b>0.63</b>              | <b>2.76</b>            | <b>0.024</b>                      | <b>0.11</b>                     | <b>5.8E-06</b>                 | <b>2.55E-05</b>              |

<sup>1</sup> Total HAPs emissions were conservatively assumed to be equal to Total Hexanes+

<sup>2</sup> 20% safety factor applied

## Controlled GC-1 through GC-6 Emissions Summary

| Unit No.                                     | VOC (lb/hr)                                                                                  | VOC (tpy) | Total HAPs <sup>1</sup> (lb/hr) | Total HAPs (tpy) | Total H2S (lb/hr) | Total H2S w/SF (tpy) |
|----------------------------------------------|----------------------------------------------------------------------------------------------|-----------|---------------------------------|------------------|-------------------|----------------------|
| GC-1<br>GC-2<br>GC-3<br>GC-4<br>GC-5<br>GC-6 | All controlled GC-1 through GC-6 emissions are associated with the process flare, unit FL-1. |           |                                 |                  |                   |                      |

Flare SSM Emissions

Unit(s): FL-1 (SSM)  
Description: Routine and planned startup, shutdown and maintenance flaring emissions

Destruction Efficiency: 98% Manufacturer guaranteed DRE for C4+ & H<sub>2</sub>S  
Destruction Efficiency: 99% Manufacturer guaranteed DRE for C3

Blowdown Flaring Calculations

|                                               |       |                   |                                                                                                                            |
|-----------------------------------------------|-------|-------------------|----------------------------------------------------------------------------------------------------------------------------|
| Inlet gas compressor<br>blowdown volume:      | 20000 | scf/event         | Estimate                                                                                                                   |
| Residue gas compressor<br>blowdown volume:    | 30000 | scf/event         | Estimate                                                                                                                   |
| Off-gas compressor blowdown<br>volume:        | 650   | scf/event         | Estimate                                                                                                                   |
| Annual number of blowdowns<br>per compressor: | 15    | # of<br>events/yr | Estimate                                                                                                                   |
| Inlet compressors:                            | 3     |                   |                                                                                                                            |
| Residue gas compressors:                      | 3     |                   |                                                                                                                            |
| Other compressors:                            | 6     |                   | Other compressors include compressors associated with the TEG Overheads, Stabilizer, Propane, and Expander.                |
| Max hourly volume:                            | 307.8 | Mscf/hr           | Σ Specific Compressor Blowdown Volume (Mscf/event) * Number of Specific Compressors * 60 (min/hr) * 30 (min/event)         |
| Max annual volume:                            | 2,309 | Mscf/yr           | Σ Specific Compressor Blowdown Volume (Mscf/event) * Number of Specific Compressors * 12 Blowdowns/compressor/yr           |
| Max hourly heat rate:                         | 347   | MMBtu/hr          | Σ Compressor Blowdown Volume (MMscf/event) * # of Compressors * 60 (min/hr) * 30 (min/event) * Stream Heat Value (Btu/scf) |
| Max annual heat rate:                         | 2,604 | MMBtu/yr          | Σ Compressor Blowdown Volume (MMscf/event) * # of Compressors * 12 Blowdowns/compressor/yr * Stream Heat Value (Btu/scf)   |

| Inlet Gas        |        |                 |         |                                       |                                         |                                   |                                   |                                   |
|------------------|--------|-----------------|---------|---------------------------------------|-----------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Composition      | Mol%   | MW <sup>1</sup> | MW*Mol% | Spec. Volume<br>(scf/lb) <sup>1</sup> | Heating Value<br>(Btu/scf) <sup>1</sup> | Mass Flow<br>(lb/hr) <sup>2</sup> | Mass Flow<br>(lb/yr) <sup>3</sup> | Mol% * Heating Value<br>(Btu/scf) |
| Nitrogen         | 0.090  | 28.013          | 0.025   | 13.547                                | 0                                       | 8.0                               | 59.8                              | 0.00                              |
| Carbon Dioxide   | 3.000  | 44.01           | 1.320   | 8.623                                 | 0                                       | 417.4                             | 3130.8                            | 0.00                              |
| Hydrogen Sulfide | 0.0004 | 34.0809         | 0.00014 | 11.136                                | 637.02                                  | 0.043                             | 0.32                              | 0.0025                            |
| Methane          | 77.642 | 16.043          | 12.456  | 23.65                                 | 1009.7                                  | 3939.6                            | 29546.7                           | 784.0                             |
| Ethane           | 12.059 | 30.07           | 3.626   | 12.62                                 | 1768.7                                  | 1146.6                            | 8599.8                            | 213.3                             |
| Propane          | 4.240  | 44.097          | 1.870   | 8.606                                 | 2517.2                                  | 591.2                             | 4433.7                            | 106.7                             |
| i-Butane         | 0.750  | 58.123          | 0.436   | 6.529                                 | 3252.6                                  | 137.8                             | 1033.7                            | 24.4                              |
| n-Butane         | 1.160  | 58.123          | 0.674   | 6.529                                 | 3262                                    | 213.2                             | 1598.9                            | 37.8                              |
| i-Pentane        | 0.350  | 72.15           | 0.252   | 5.26                                  | 3999.7                                  | 79.8                              | 598.8                             | 14.0                              |
| n-Pentane        | 0.290  | 72.15           | 0.209   | 5.26                                  | 4008.7                                  | 66.2                              | 496.1                             | 11.6                              |
| Hexanes+         | 0.420  | 100             | 0.420   | 3.787                                 | 5502.8                                  | 133.1                             | 998.3                             | 23.1                              |
| VOC Total        | 7.2    |                 | 3.9     | 0.54                                  |                                         | 1221.3                            | 9159.5                            |                                   |
| Total            | 100.00 |                 | 21.3    |                                       |                                         | 6732.9                            | 50496.9                           | 1214.9                            |

| Residue Gas      |        |                 |         |                                       |                                         |                                   |                                   |                                   |
|------------------|--------|-----------------|---------|---------------------------------------|-----------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Composition      | Mol%   | MW <sup>1</sup> | MW*Mol% | Spec. Volume<br>(scf/lb) <sup>1</sup> | Heating Value<br>(Btu/scf) <sup>1</sup> | Mass Flow<br>(lb/hr) <sup>2</sup> | Mass Flow<br>(lb/yr) <sup>3</sup> | Mol% * Heating Value<br>(Btu/scf) |
| Nitrogen         | 0.115  | 28.013          | 0.032   | 13.547                                | 0                                       | 15.3                              | 114.9                             | 0.0                               |
| Carbon Dioxide   | 0.004  | 44.01           | 0.002   | 8.623                                 | 0                                       | 0.74                              | 5.6                               | 0.0                               |
| Hydrogen Sulfide | 0.0004 | 34.0809         | 0.00014 | 11.136                                | 637.02                                  | 0.065                             | 0.48                              | 0.0025                            |
| Methane          | 99.139 | 16.043          | 15.905  | 23.65                                 | 1009.7                                  | 7545.5                            | 56590.9                           | 1001.0                            |
| Ethane           | 0.727  | 30.07           | 0.219   | 12.62                                 | 1768.7                                  | 103.7                             | 778.0                             | 12.9                              |
| Propane          | 0.015  | 44.097          | 0.006   | 8.606                                 | 2517.2                                  | 3.0                               | 22.8                              | 0.4                               |
| i-Butane         | 0.000  | 58.123          | 0.000   | 6.529                                 | 3252.6                                  | 0.07                              | 0.5                               | 0.0                               |
| n-Butane         | 0.000  | 58.123          | 0.000   | 6.529                                 | 3262                                    | 0.0                               | 0.3                               | 0.0                               |
| i-Pentane        | 0.000  | 72.15           | 0.000   | 5.26                                  | 3999.7                                  | 0.0                               | 0.0                               | 0.0                               |
| n-Pentane        | 0.000  | 72.15           | 0.000   | 5.26                                  | 4008.7                                  | 0.0                               | 0.0                               | 0.0                               |
| Hexanes+         | 0      | 100             | 0.000   | 3.787                                 | 5502.8                                  | 0.0                               | 0.0                               | 0.0                               |
| VOC Total        | 0.015  |                 | 0.0066  |                                       |                                         | 3.2                               | 23.6                              |                                   |
| Total            | 100.00 |                 | 16.2    |                                       |                                         | 7668.5                            | 57513.5                           | 1014.3                            |

| Off-Gas          |        |                 |         |                                       |                                         |                                   |                                   |                                   |
|------------------|--------|-----------------|---------|---------------------------------------|-----------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Composition      | Mol%   | MW <sup>1</sup> | MW*Mol% | Spec. Volume<br>(scf/lb) <sup>1</sup> | Heating Value<br>(Btu/scf) <sup>1</sup> | Mass Flow<br>(lb/hr) <sup>2</sup> | Mass Flow<br>(lb/yr) <sup>3</sup> | Mol% * Heating Value<br>(Btu/scf) |
| Nitrogen         | 0.163  | 28.013          | 0.046   | 13.547                                | 0                                       | 0.9                               | 7.0                               | 0.0                               |
| Carbon Dioxide   | 2.126  | 44.01           | 0.936   | 8.623                                 | 0                                       | 19.2                              | 144.2                             | 0.00                              |
| Hydrogen Sulfide | 0.0004 | 34.0809         | 0.00014 | 11.136                                | 637.02                                  | 0.0028                            | 0.021                             | 0.0025                            |
| Methane          | 25.079 | 16.043          | 4.023   | 23.65                                 | 1009.7                                  | 82.7                              | 620.3                             | 253.2                             |
| Ethane           | 15.420 | 30.07           | 4.637   | 12.62                                 | 1768.7                                  | 95.3                              | 714.8                             | 272.7                             |
| Propane          | 20.387 | 44.097          | 8.990   | 8.606                                 | 2517.2                                  | 184.8                             | 1385.8                            | 513.2                             |
| i-Butane         | 5.848  | 58.123          | 3.399   | 6.529                                 | 3252.6                                  | 69.9                              | 524.0                             | 190.2                             |
| n-Butane         | 15.106 | 58.123          | 8.780   | 6.529                                 | 3262                                    | 180.5                             | 1353.5                            | 492.8                             |
| i-Pentane        | 5.868  | 72.15           | 4.234   | 5.26                                  | 3999.7                                  | 87.0                              | 652.6                             | 234.7                             |
| n-Pentane        | 5.924  | 72.15           | 4.274   | 5.26                                  | 4008.7                                  | 87.8                              | 658.8                             | 237.5                             |
| Hexanes+         | 4.079  | 100             | 4.079   | 3.787                                 | 5502.8                                  | 84.0                              | 630.1                             | 224.5                             |
| VOC Total        | 57.212 |                 | 33.7561 |                                       |                                         | 694.0                             | 5204.9                            |                                   |
| Total            | 100.00 |                 | 43.4    |                                       |                                         | 892.2                             | 6691.3                            | 2418.7                            |

## Flare SSM Emissions

### Blowdown Flaring Emissions

| NO <sub>x</sub> | CO               | VOC             | Total HAPs         | H <sub>2</sub> S          | SO <sub>2</sub> |                                                                                                                                                                                                                       |
|-----------------|------------------|-----------------|--------------------|---------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.068           | 0.31             |                 | 0.82<br>6.2<br>3.8 |                           |                 | lb/MMBtu AP-42 Tables 13.5-1 and 13.5-2<br>Hourly Flow (Mscf/hr), Assumed Hexanes + mol%<br>Annual Flow (Mscf/yr)<br>Specific Volume (cf/lb)<br>Estimated conversion of combusted H <sub>2</sub> S to SO <sub>2</sub> |
| 23.6            | 107.6            | 30.6            | 4.3                | 0.0022                    | 0.20            | 98%<br>lb/hr <sup>4</sup>                                                                                                                                                                                             |
| 0.53            | 2.42             | 0.69            | 0.098              | 4.98E-05                  | 2.44E-03        | tons/yr <sup>5</sup>                                                                                                                                                                                                  |
| CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e  |                           |                 |                                                                                                                                                                                                                       |
| 2.70E+06        |                  | 2.05E+06        |                    | cf/yr                     |                 | 40 CFR 98 Eqns. W-19, W-20, W-21, W-40                                                                                                                                                                                |
|                 | 1.00E-04         |                 |                    | kg/MMBtu                  |                 | 40 CFR 98 Eqn. W-40                                                                                                                                                                                                   |
| 0.053           |                  | 0.019           |                    | kg/cf                     |                 | 40 CFR 98.233(v)                                                                                                                                                                                                      |
| 1.0             | 298.0            | 25.0            |                    | GWP                       |                 | 40 CFR 98 Table A-1                                                                                                                                                                                                   |
| 156.77          | 0.00029          | 43.43           |                    | tons/yr                   |                 | 40 CFR 98 Eqns. W-36 and W-40                                                                                                                                                                                         |
| 156.77          | 0.086            | 1085.64         | 1242.49            | tons/yr CO <sub>2</sub> e |                 | tons/yr * GWP                                                                                                                                                                                                         |

### Plant Turnaround Flaring Emissions

Total plant gas capacity: 876785 scf/event  
Total plant degassing time: 4 hr/event  
Total heat content: 1065.2 MMBtu/event  
Hourly heat rate: 266.3 MMBtu/hr  
Annual heat rate: 1065.2 MMBtu/yr

| NO <sub>x</sub> | CO               | VOC             | Total HAPs         | H <sub>2</sub> S          | SO <sub>2</sub> |                                                                                                                                                                                                                       |
|-----------------|------------------|-----------------|--------------------|---------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.0680          | 0.3100           |                 | 0.92<br>3.7<br>3.8 |                           |                 | lb/MMBtu AP-42 Tables 13.5-1 and 13.5-2<br>Hourly Flow (Mscf/hr), Assumed Hexanes + mol%<br>Annual Flow (Mscf/yr)<br>Specific Volume (cf/lb)<br>Estimated conversion of combusted H <sub>2</sub> S to SO <sub>2</sub> |
| 18.1            | 82.6             | 33.8            | 4.9                | 1.57E-03                  | 0.15            | 98%<br>lb/hr <sup>4</sup>                                                                                                                                                                                             |
| 0.036           | 0.17             | 0.068           | 0.010              | 3.15E-06                  | 2.90E-04        | tons/yr <sup>5</sup>                                                                                                                                                                                                  |
| CO <sub>2</sub> | N <sub>2</sub> O | CH <sub>4</sub> | CO <sub>2</sub> e  |                           |                 |                                                                                                                                                                                                                       |
| 1124745.61      |                  | 6807.55         |                    | cf/yr                     |                 | 40 CFR 98 Eqns. W-19, W-20, W-21, W-40                                                                                                                                                                                |
|                 | 1.00E-04         |                 |                    | kg/MMBtu                  |                 | 40 CFR 98 Eqn. W-40                                                                                                                                                                                                   |
| 0.0526          |                  | 0.0192          |                    | kg/cf                     |                 | 40 CFR 98.233(v)                                                                                                                                                                                                      |
| 1               | 298              | 25              |                    | GWP                       |                 | 40 CFR 98 Table A-1                                                                                                                                                                                                   |
| 65.2            | 0.00012          | 0.14            |                    | tons/yr                   |                 | 40 CFR 98 Eqns. W-36 and W-40                                                                                                                                                                                         |
| 65.2            | 0.035            | 3.6             | 68.9               | tons/yr CO <sub>2</sub> e |                 | tons/yr * GWP                                                                                                                                                                                                         |

Flare SSM Emissions

Thermal Oxidizer Downtime

Flared gas heating value: 300 Btu/scf Includes amine still, flash and enrichment gas; min. allowed under 40 CFR 60.18  
Enrichment gas flow: 189,897 scf/hr  
Event duration: 10 hours/event  
Event frequency: 10 events/year

| Component        | Flow (scf/hr) <sup>6</sup> | Flow (lb/hr) | Mole % <sup>6</sup> | Heating Value          | Mol% *          | MW                   | MW*mol%                        |
|------------------|----------------------------|--------------|---------------------|------------------------|-----------------|----------------------|--------------------------------|
|                  |                            |              |                     | (Btu/scf) <sup>1</sup> | (Btu/scf)       |                      |                                |
| Water            | 38192.0                    | 1813.5       | 8.07%               | 0                      | 0               | 18.015               | 1.454654444                    |
| CO2              | 430374.5                   | 49910.1      | 90.99%              | 0                      | 0               | 44.01                | 40.04522354                    |
| Hydrogen Sulfide | 31.1                       | 2.8          | 0.00658%            | 11.136                 | 7.3E-04         | 34.0809              | 0.002243353                    |
| Nitrogen         | 3.9                        | 0.3          | 0.001%              | 0                      | 0.0             | 28.013               | 0.000233437                    |
| Methane          | 2385.9                     | 100.9        | 0.50%               | 909.1                  | 4.6             | 16.043               | 0.080925582                    |
| Ethane           | 811.7                      | 64.3         | 0.17%               | 1617.8                 | 2.8             | 30.07                | 0.051606668                    |
| Propane          | 451.2                      | 52.4         | 0.10%               | 2315.9                 | 2.2             | 44.097               | 0.04206907                     |
| n-Butane         | 199.1                      | 30.5         | 0.042%              | 3010.5                 | 1.27            | 58.123               | 0.024465162                    |
| i-Butane         | 185.3                      | 28.4         | 0.039%              | 3001                   | 1.18            | 58.123               | 0.022771818                    |
| n-Pentane        | 45.3                       | 8.6          | 0.0096%             | 3706.8                 | 0.35            | 72.15                | 0.006905454                    |
| i-Pentane        | 50.1                       | 9.5          | 0.0106%             | 3697.9                 | 0.39            | 72.15                | 0.007637752                    |
| n-Hexane         | 14.3                       | 3.3          | 0.003%              | 4403.9                 | 0.13            | 100                  | 0.003026648                    |
| n-Heptane        | 16.9                       | 4.5          | 0.0036%             | 5100.3                 | 0.18            | 100                  | 0.003583492                    |
| n-Octane         | 2.2                        | 0.7          | 0.0005%             | 5796.1                 | 0.03            | 114.23               | 0.000523617                    |
| Total            | 472763.6                   | 52029.7      | 100.0%              |                        | 13.1            |                      | 41.75                          |
|                  |                            |              |                     |                        |                 |                      |                                |
|                  | NO <sub>x</sub>            | CO           | VOC                 | H <sub>2</sub> S       | SO <sub>2</sub> | lb/MMBtu             | AP-42 Tables 13.5-1 and 13.5-2 |
|                  | 0.0680                     | 0.3100       |                     |                        |                 |                      |                                |
|                  | 13.5                       | 61.6         | 2.2                 | 0.0559                 | 5.26            | lb/hr <sup>6</sup>   |                                |
|                  | 0.68                       | 3.08         | 0.11                | 2.80E-03               | 2.63E-01        | tons/yr <sup>7</sup> |                                |
|                  |                            |              |                     |                        |                 |                      |                                |
|                  | n-Hexane                   | Total HAPs   |                     |                        |                 |                      |                                |
|                  | 0.07                       | 0.07         | lb/hr               |                        |                 |                      |                                |
|                  | 0.0033                     | 0.0033       | tons/yr             |                        |                 |                      |                                |

Notes

<sup>1</sup> From "Physical Properties of Hydrocarbons"  
<sup>2</sup> Flow (lb/hr) = Volume (Mscf/event) / Duration (hr/event) \* 1000cf/Mscf / Sp. Vol. (scf/lb) \* Mol%  
<sup>3</sup> Flow (tons/yr) = Volume (Mscf/yr) \* 1000scf/Mscf / Sp. Vol. (scf/lb) \* Mol%  
<sup>4</sup> lb/hr emissions for blowdown events calculated as follows:  
For NOx and CO, lb/hr = EF (lb/MMBtu) \* Heat input (MMBtu/hr)  
For VOC and HAPs, lb/hr = Flow (lb/hr) \* (1 - Control%)  
The Control % for Propane was assumed to be 99% and the Control% for Butanes+ was assumed to be 98%  
<sup>5</sup> tons/yr emissions for blowdown events calculated as follows:  
For NOx and CO, tons/yr = EF (lb/MMBtu) \* Heat input (MMBtu/yr) \* 1ton/2000lb  
For VOC and HAPs, tons/yr = Flow (tons/yr) \* (1 - Control%)  
A 500% safety factor was added to the blowdown flaring annual emissions for conservative purposes.  
The Control % for Propane was assumed to be 99% and the Control% for Butanes+ was assumed to be 98%  
<sup>6</sup> lb/hr emissions for TO downtime calculated as follows:  
For NOx and CO, lb/hr = EF (lb/MMBtu) \* Total flow (cf/hr) \* Heat value (Btu/scf) \* 1MMBtu/106Btu  
For VOC, lb/hr = VOC flow (lb/hr) \* (1 - Control%); assumes enrichment gas is 100% VOC  
The Control % for Propane was assumed to be 99% and the Control% for Butanes+ was assumed to be 98%  
<sup>7</sup> tons/yr emissions for TO downtime = lb/hr \* Duration (hr/event) \* Frequency (event/yr) \* 1ton/2000lb  
<sup>8</sup> For CO<sub>2</sub> calculations, assumes enrichment gas is 100% ethane (2 carbon atoms).  
<sup>9</sup> For CH<sub>4</sub> calculations, assumes enrichment gas is 100% methane.

| CO <sub>2</sub> <sup>8</sup> | N <sub>2</sub> O | CH <sub>4</sub> <sup>9</sup> | CO <sub>2</sub> e |                           |                                        |
|------------------------------|------------------|------------------------------|-------------------|---------------------------|----------------------------------------|
| 80981454                     |                  | 384562.9                     |                   | cf/yr                     | 40 CFR 98 Eqns. W-19, W-20, W-21, W-40 |
|                              | 1.00E-04         |                              |                   | kg/MMBtu                  | 40 CFR 98 Eqn. W-40                    |
| 0.0526                       |                  | 0.0192                       |                   | kg/cf                     | 40 CFR 98.233(v)                       |
| 1                            | 298              | 25                           |                   | GWP                       | 40 CFR 98 Table A-1                    |
| 4695.4                       | 2.2E-05          | 8.139                        |                   | tons/yr                   | 40 CFR 98 Eqns. W-36 and W-40          |
| 4695.4                       | 0.0065           | 203.5                        | 4898.9            | tons/yr CO <sub>2</sub> e | tons/yr * GWP                          |

SSM Blowdown Venting Emissions

Unit(s): SSM Blowdown Venting  
Description: Venting due to blowdowns during SSM events

| Vessel Name                                             | Inlet Filter Separator | Inlet Filter Coalescer | Treated Gas Filter Coalescer | Treated Gas Filter Coalescer | DEHY Dust Filter | DEHY Dust Filter | Condensate Filters | Condensate Filters | Heat Medium Filter | Residue Gas Filter Coalescer | Various compressors |
|---------------------------------------------------------|------------------------|------------------------|------------------------------|------------------------------|------------------|------------------|--------------------|--------------------|--------------------|------------------------------|---------------------|
| Vessel #                                                | FL-1001                | FL-1002                | FL-1004                      | FL-1005                      | FL-1006          | FL-1007          | FL-1019            | FL-1020            | FL-1018            | FL-1008                      | N/A                 |
| SCF/event                                               | 4,252                  | 4,649                  | 4,509                        | 4,509                        | 2,544            | 2,544            | 100                | 100                | 28                 | 3,384                        | 2,000               |
| Events per year                                         | 6                      | 6                      | 6                            | 6                            | 6                | 6                | 2920               | 2920               | 4                  | 6                            | 160                 |
| Annual Blowdown volume per vessel <sup>1</sup> (scf/yr) | 25,512                 | 27,894                 | 27,054                       | 27,054                       | 15,264           | 15,264           | 292,000            | 292,000            | 112                | 20,304                       | 320,000             |
| Hourly Blowdown volume per vessel <sup>2</sup> (scf/hr) | 4,252                  | 4,649                  | 4,509                        | 4,509                        | 2,544            | 2,544            | 100                | 100                | 28                 | 3,384                        | 24,000              |

|                                                                           |         |        |
|---------------------------------------------------------------------------|---------|--------|
| Maximum annual blowdown volume vented for vessels FL-1001 through FL-1008 | 742,458 | scf/yr |
| Maximum hourly volume vented for vessels FL-1001 through FL-1008          | 26,619  | scf/hr |
| Maximum annual blowdown volume vented for various compressors             | 320,000 | scf/yr |
| Maximum hourly blowdown volume vented for various compressors             | 24,000  | scf/hr |

| Off-Gas <sup>3</sup> |        |                 |           |                                    |                                |                   |
|----------------------|--------|-----------------|-----------|------------------------------------|--------------------------------|-------------------|
| Composition          | Mol%   | MW <sup>4</sup> | MW*Mol%   | Spec. Volume (scf/lb) <sup>4</sup> | Mass Flow (lb/yr) <sup>5</sup> | Mass Flow (lb/hr) |
| Nitrogen             | 0.163  | 28.013          | 0.0456612 | 13.547                             | 89.33391452                    | 3.2028471         |
| Carbon Dioxide       | 2.126  | 44.01           | 0.9356526 | 8.623                              | 1830.529639                    | 65.629124         |
| Methane              | 25.079 | 16.043          | 4.023424  | 23.65                              | 7873.194157                    | 282.27395         |
| Ethane               | 15.420 | 30.07           | 4.636794  | 12.62                              | 9071.871918                    | 325.24959         |
| Propane              | 20.387 | 44.097          | 8.9900554 | 8.606                              | 17588.30031                    | 630.58512         |
| i-Butane             | 5.848  | 58.123          | 3.399033  | 6.529                              | 6650.167536                    | 238.42535         |
| n-Butane             | 15.106 | 58.123          | 8.7800604 | 6.529                              | 17178.08324                    | 615.87778         |
| i-Pentane            | 5.868  | 72.15           | 4.233762  | 5.26                               | 8282.782403                    | 296.95873         |
| n-Pentane            | 5.924  | 72.15           | 4.274166  | 5.26                               | 8361.827361                    | 299.79269         |
| Hexanes+             | 4.079  | 100             | 4.079     | 3.787                              | 7997.058838                    | 286.71482         |

| Amine Contactor <sup>6</sup> |        |                 |             |                                    |                                |                   |
|------------------------------|--------|-----------------|-------------|------------------------------------|--------------------------------|-------------------|
| Composition                  | Mol%   | MW <sup>4</sup> | MW*Mol%     | Spec. Volume (scf/lb) <sup>4</sup> | Mass Flow (lb/yr) <sup>5</sup> | Mass Flow (lb/hr) |
| Hydrogen sulfide             | 0.001  | 34.076          | 0.00034076  | 11.136                             | 0.2873563                      | 0.0215517         |
| Nitrogen                     | 1.938  | 28.013          | 0.54289194  | 13.547                             | 457.78401                      | 34.333801         |
| Carbon Dioxide               | 2.070  | 44.01           | 0.911007    | 8.623                              | 768.17813                      | 57.61336          |
| Methane                      | 75.911 | 16.043          | 12.17840173 | 23.65                              | 10271.256                      | 770.34419         |
| Ethane                       | 10.921 | 30.07           | 3.2839447   | 12.62                              | 2769.1918                      | 207.68938         |
| Propane                      | 5.662  | 44.097          | 2.49677214  | 8.606                              | 2105.3219                      | 157.89914         |
| i-Butane                     | 0.700  | 58.123          | 0.406861    | 6.529                              | 343.0847                       | 25.731352         |
| n-Butane                     | 1.704  | 58.123          | 0.99041592  | 6.529                              | 835.16618                      | 62.637464         |
| i-Pentane                    | 0.374  | 72.15           | 0.269841    | 5.26                               | 227.52852                      | 17.064639         |
| n-Pentane                    | 0.384  | 72.15           | 0.277056    | 5.26                               | 233.61217                      | 17.520913         |
| Hexanes+                     | 0.336  | 100             | 0.336       | 3.787                              | 283.91867                      | 21.2939           |

Blowdown Venting Emissions

| VOC    | Total HAPs <sup>7</sup> | H <sub>2</sub> S |       |
|--------|-------------------------|------------------|-------|
| 2,671  | 308                     | 0.022            | lb/hr |
| 70,087 | 8,281                   | 0.29             | lb/yr |
| 35.0   | 4.14                    | 1.4E-04          | tpy   |

<sup>1</sup> Annual blowdown volume per vessel (scf/yr) = Blowdown volume per event (scf/event) \* Events per year  
<sup>2</sup> Hourly blowdown volume per vessel (scf/hr) = Blowdown volume per event (scf/event) \* (1 event/1 hr)  
<sup>3</sup> Actual blowdown venting is due to a variety of gas process streams; however, the off-gas analysis was used as the most conservative analysis.  
<sup>4</sup> From "Physical Properties of Hydrocarbons"  
<sup>5</sup> Mass flow (lb/yr) = Annual blowdown volume vented (scf/yr) \* Composition Mol% / Specific Volume of Component (scf/lb)  
<sup>6</sup> The amine contactor analysis was used for the calculation of the emissions due to compressor blowdown venting  
<sup>7</sup> Total HAPs assumed to be Total Hexanes +

# Section 7

## Information Used To Determine Emissions

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**Information Used to Determine Emissions** shall include the following:

- ☒ If manufacturer data are used, include specifications for emissions units and control equipment, including control efficiencies specifications and sufficient engineering data for verification of control equipment operation, including design drawings, test reports, and design parameters that affect normal operation.
  - ☐ If test data are used, include a copy of the complete test report. If the test data are for an emissions unit other than the one being permitted, the emission units must be identical. Test data may not be used if any difference in operating conditions of the unit being permitted and the unit represented in the test report significantly effect emission rates.
  - ☒ If the most current copy of AP-42 is used, reference the section and date located at the bottom of the page. Include a copy of the page containing the emissions factors, and clearly mark the factors used in the calculations.
  - ☐ If an older version of AP-42 is used, include a complete copy of the section.
  - ☒ If an EPA document or other material is referenced, include a complete copy.
  - ☐ Fuel specifications sheet.
  - ☒ If computer models are used to estimate emissions, include an input summary (if available) and a detailed report, and a disk containing the input file(s) used to run the model. For tank-flashing emissions, include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., permit or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis.
- 

### Steady-State Emission Calculations

#### Heaters (units H-1, H-2)

- AP-42 Tables 1.4-1 and 1.4-2
- CARB Data

#### Amine Unit (unit Amine-1)

- Dow Oil & Gas Simulation output

#### TEG Dehydrator Unit (unit Dehy-1)

- GRI-GlyCalc Version 4.0

#### Flare (unit FL-1)

- South Eddy Purge Gas – AspenTech data
- AP-42 Tables 13.5-1 and 13.5-2
- TNRCC RG-109
- Flare Gas Analysis
- Flare Stack Specification Sheet
- John Zink DRE Efficiency certification

#### Thermal Oxidizer (unit TO-1)

- Thermal Oxidizer specification sheet
- Dow Oil & Gas Simulation output
- AP-42 Tables 1.4-2, 1.4-2 and 1.4-3
- CARB Data

#### Haul Roads (unit HAUL)

- AP-42 Section 13.2.2

#### Facility-Wide Fugitives (unit FUG)

- Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates, 1995
- Expected gas analysis
- Facility component count

**Blowdown Flaring (unit FL-1 [BD-SSM])**

- AP-42 Tables 13.5-1 and 13.5-2
- Expected gas analyses
- Physical Properties of Hydrocarbons excerpt

**Plant Turnaround Flaring (unit FL-1 [PT-SSM])**

- AP-42 Tables 13.5-1 and 13.5-2
- Expected gas analyses
- Physical Properties of Hydrocarbons excerpt

**Thermal Oxidizer Downtime Flaring (unit FL-1 [TO-SSM])**

- AP-42 Tables 13.5-1 and 13.5-2
- Dow Oil & Gas Simulation output
- GRI-GlyCalc Version 4.0
- Physical Properties of Hydrocarbons excerpt

**Greenhouse Gas Emission Calculations**

- 40 CFR 98, Subpart C – Table C-1
- 40 CFR 98, Subpart C – Table C-2
- 40 CFR 98, Subpart A – Table A-1
- 40 CFR 98, Subpart W – Equations

**Gas Chromatographs (units GC-1 through GC-6)**

- Analyses of Gas Chromatograph streams

**SSM Blowdown Venting (unit SSM Blowdown Venting)**

- Analyses of streams used in emission calculation

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

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

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

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

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

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION<sup>a</sup>

| Pollutant                                                | Emission Factor<br>(lb/10 <sup>6</sup> scf) | Emission Factor Rating |
|----------------------------------------------------------|---------------------------------------------|------------------------|
| CO <sub>2</sub> <sup>b</sup>                             | 120,000                                     | A                      |
| Lead                                                     | 0.0005                                      | D                      |
| N <sub>2</sub> O (Uncontrolled)                          | 2.2                                         | E                      |
| N <sub>2</sub> O (Controlled-low-NO <sub>x</sub> burner) | 0.64                                        | E                      |
| PM (Total) <sup>c</sup>                                  | 7.6                                         | D                      |
| PM (Condensable) <sup>c</sup>                            | 5.7                                         | D                      |
| PM (Filterable) <sup>c</sup>                             | 1.9                                         | B                      |
| SO <sub>2</sub> <sup>d</sup>                             | 0.6                                         | A                      |
| TOC                                                      | 11                                          | B                      |
| Methane                                                  | 2.3                                         | B                      |
| VOC                                                      | 5.5                                         | C                      |

<sup>a</sup> Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from lb/10<sup>6</sup> scf to kg/10<sup>6</sup> m<sup>3</sup>, multiply by 16. To convert from lb/10<sup>6</sup> scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds.

VOC = Volatile Organic Compounds.

<sup>b</sup> Based on approximately 100% conversion of fuel carbon to CO<sub>2</sub>. CO<sub>2</sub>[lb/10<sup>6</sup> scf] = (3.67) (CON) (C)(D), where CON = fractional conversion of fuel carbon to CO<sub>2</sub>, C = carbon content of fuel by weight (0.76), and D = density of fuel, 4.2x10<sup>4</sup> lb/10<sup>6</sup> scf.

<sup>c</sup> All PM (total, condensable, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM<sub>10</sub>, PM<sub>2.5</sub> or PM<sub>1</sub> emissions. Total PM is the sum of the filterable PM and condensable PM. Condensable PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

<sup>d</sup> Based on 100% conversion of fuel sulfur to SO<sub>2</sub>.

Assumes sulfur content is natural gas of 2,000 grains/10<sup>6</sup> scf. The SO<sub>2</sub> emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO<sub>2</sub> emission factor by the ratio of the site-specific sulfur content (grains/10<sup>6</sup> scf) to 2,000 grains/10<sup>6</sup> scf.



## **AB 2588 COMBUSTION EMISSION FACTORS**

Emission factors for combustion of natural gas and diesel fuel were developed for use in AB 2588 emission inventory reports in 1990 and updated in 1991, 1992 and 1995. These factors have been updated again based on new data available from the USEPA (1) (10).

These emission factors are to be used where source testing or fuel analysis are not required by the AB 2588 Criteria and Guidelines Regulations, Appendix D. The factors are divided into external combustion sources (boilers, heaters, flares) and internal combustion sources (engines, turbines). Natural gas combustion factors are further divided into a number of sub-categories, based on equipment size and type.

If better source specific data such as manufacturer's data, source tests, or fuel analysis is available, it should be used rather than these emission factors.

### **Natural Gas Combustion Factors**

Natural gas combustion factors were developed for listed substances identified by the California Air Resources Board (CARB) as significant components of natural gas combustion emissions (2) and for some federal HAPs.

In the past, the VCAPCD has included emission factors for natural gas fired internal combustion equipment in this document. In 2000, the USEPA published air toxics emission factors for natural gas fired turbines and engines. For natural gas fired internal combustion equipment, the emission factors from the USEPA publication AP-42 (1) should be used.

For natural gas fired turbines, emission factors from Table 3.1-3 of AP-42, dated April 2000 should be used. For natural gas fired internal combustion engines, emission factors from Tables 3.2-1, 3.2-2, and 3.2-3 of AP-42, dated August 2000, as applicable, should be used.

### **Natural Gas Fired External Combustion Equipment**

|                               | <10 MMBTUh          | 10-100 MMBTUh | >100 MMBTUh | flare |
|-------------------------------|---------------------|---------------|-------------|-------|
| Pollutant                     | Emissions (lb/MMcf) |               |             |       |
| benzene                       | 0.0080              | 0.0058        | 0.0017      | 0.159 |
| formaldehyde                  | 0.0170              | 0.0123        | 0.0036      | 1.169 |
| PAH's (including naphthalene) | 0.0004              | 0.0004        | 0.0004      | 0.014 |
| naphthalene                   | 0.0003              | 0.0003        | 0.0003      | 0.011 |
| acetaldehyde                  | 0.0043              | 0.0031        | 0.0009      | 0.043 |
| acrolein                      | 0.0027              | 0.0027        | 0.0008      | 0.010 |
| propylene                     | 0.7310              | 0.5300        | 0.01553     | 2.440 |
| toluene                       | 0.0366              | 0.0265        | 0.0078      | 0.058 |
| xylene                        | 0.0272              | 0.0197        | 0.0058      | 0.029 |
| ethyl benzene                 | 0.0095              | 0.0069        | 0.0020      | 1.444 |
| hexane                        | 0.0063              | 0.0046        | 0.0013      | 0.029 |

External combustion equipment includes boilers, heaters, and steam generators.

### **Derivation of Factors**

The emission factors for boilers, heaters, and steam generators were based on the results of source tests performed mostly on units rated at between 10 and 100 million BTU per hour. The following test data was used: benzene (3) (6) (16) (19); formaldehyde (3) (6) (19); PAH, naphthalene, toluene, xylenes, ethyl benzene (16) (19); acetaldehyde, acrolein, and propylene (19); and hexane (20).

The test results listed above were used directly to determine the emission factors for boilers, heaters, and steam generators with heat input ratings of 10-100 MMBTU/hr. For units <10 MMBTU/hr and >100 MMBTU/hr, were calculated by scaling the factors for 10-100 MMBTU/hr equipment by the ratios of their TOC emission factors (7).

For flares, the factors were developed by applying the CARB species profiles (8) to the USEPA TOC emission factor for flares (1). The internal combustion species profile was used as CARB stated that they had very little confidence in the external combustion profile, and they use only the internal combustion profile (9). Information on acrolein was not contained in the species profile used. It was therefore assumed that the ratio of acrolein to formaldehyde is the same for flares as for turbines. The PAH emission factor is from EPA (10)

## Derivation of Factors

For external combustion equipment, formaldehyde, PAH, and naphthalene emission factors for were developed using source test data (17). Based on information from CARB it was assumed that acetaldehyde and acrolein emissions would be the same as formaldehyde (14). Emission factors for toluene, xylenes, propylene, ethyl benzene, and hexane were based on USEPA emission factors for total organic compounds and CARB species profile (8) for substances identified by CARB as significant.

For internal combustion engines, emission factors for formaldehyde, PAH's, naphthalene, and metals were based on source testing (4), (5), (6), (18). Benzene, acetaldehyde, acrolein, toluene and xylenes emission factors were based on sources (4), (5), and (18). Propylene factors were based on source tests (4) and (5). 1,3-butadiene was based on (4). Ethyl benzene and hexane emission factors were based on (18).

For all oil combustion equipment, emission factors for chlorobenzene, hydrogen chloride, and metals were based on stack testing and fuel analyses (4), (5), (6), (12), (13), (18). It was assumed that 99.9% of the chlorine contained in the fuel was converted to hydrogen chloride (15), with the remainder converted to chlorobenzene. 5% of the chromium in the fuel samples was assumed to be emitted as hexavalent chromium (15).

Dioxins (PCDD's), furans (PCDF's), and beryllium were identified as potentially significant components of diesel combustion exhaust (2). However, the only test results for diesel combustion found (11) reported "not detected" for dioxins and furans. Beryllium has not been detected in any of the diesel fuel analyses reviewed (4), (5), (6), (12), (13), (18). For emission inventory reporting purposes, facilities should report these compounds on for PRO using an emission estimation code of "99" and writing "ND" for the emissions.

## References

- (1) USEPA, Compilation of Air Pollutant Emission Factors, Volume I, Fifth Edition, AP-42, January 1995, and Supplement F, 2000
- (2) Gary Agid, California Air Resources Board, Letter to Air Pollution Control District, September 12, 1989
- (3) CARNOT, Emission Inventory Testing at Southern California Edison Company Long Beach Auxiliary Boiler, May 1990
- (4) CARNOT, Emissions of Air Toxic Species: Test Conducted Under AB 2588 for the Western States Petroleum Association, May 1990
- (5) South Coast Environmental, Compliance Report: Hydraulic Dredge "Ollie Riedel", Report Number T1238C, March 8, 1991
- (6) ENSR Consulting and Engineering, Western States Petroleum Association, Pooled Source Report: Oil and Gas Production Combustion Sources, Fresno and Ventura Counties, California, Document Number 7230-007-700, January 1991
- (7) Ventura County Air Pollution Control District, Emission Factors and Calculation Procedures, July 1985
- (8) State of California Air Resources Board, Identification of Volatile Organic Compound Species Profiles, August 1991, as updated November 29, 2000, profiles 504 and 719

- (9) Paul Allen, California Air Resources Board, Telephone conversation, February 1, 1990
- (10) United States Environmental Protection Agency, Locating and Estimating Air Emissions From Sources of Polycyclic Organic Matter, EPA-454/R-98-014, July 1998
- (11) United States Environmental Protection Agency, Toxic Air Pollutant Emission Factors-A Compilation for Selected Air Toxic Compounds and Sources, EPA-450/2-88-006a, October 1988
- (12) BTC Environmental, Inc., Ventura Port District Dredge: Air Toxics Emissions Retesting, January 29, 1991
- (13) Shell Western E & P, Emission Inventory Report for Ventura Avenue Field, June 11, 1990
- (14) Muriel Strand, California Air Resources Board, Telephone conversation, February 6, 1990
- (15) State of California Air Resources Board, Technical Guidance Document to the Criteria and Guidelines Regulation for AB 2588, August 1989
- (16) Shell Western E&P, Emission Measurements for Speciated PAH's and BTXE Compounds on a Gas fired Turbine and Steam Generator, June 24-27, 1991
- (17) Marine Corps Base Camp Pendleton, California: Draft Final Air Toxics Emissions Inventory Report, May 1, 1991
- (18) Entropy Environmentalists, Inc., Pooled Source Testing of a Rig Diesel-Fired Internal Combustion Engine, conducted for Western States Petroleum Association, July 29-31, 1992
- (19) Radian Corporation, Source Test Report for the Texaco Heater Treater, the Mobil Steam Generator, and the SWEPI Gas Turbine in the San Joaquin Valley Unified Air Pollution Control District, September 1992
- (20) AIRx Testing, Emissions Testing OLS Energu Natural Gas Fired Turbine, and Two Auxiliary Boilers, Job Number 22030, April 21, 1994



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**ProComp Report**  
**Enterprise Cryo**

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|                                        |                                  |
|----------------------------------------|----------------------------------|
| <b><u>Tracking Number:</u></b>         | DOGM-0030114, rev13a             |
| <b><u>Customer:</u></b>                | OPD, LLC                         |
| <b><u>Plant/Project:</u></b>           | Wolfcamp Cryo                    |
| <b><u>Location:</u></b>                | Chaparral, NM                    |
| <b><u>Technical Contact:</u></b>       | Linda Pirtle/Jason Binz          |
| <b><u>Sales Contact:</u></b>           | John Gordon                      |
| <b><u>Customer Contact:</u></b>        | Srinivasa Pachipulusu            |
| <b><u>Customer Phone No.:</u></b>      | 281-371-5964 / 281-371-7500      |
| <b><u>Customer E-mail Address:</u></b> | srinivasa.pachipulusu@opdepc.com |
| <b><u>Project Number:</u></b>          | OPD 13070, (OPD rev C)           |

**Notes:**

OPD (Dow Rev 12): 250 MMSCFD, 2.88% CO<sub>2</sub>  
UCARSOL AP-814 for deep CO<sub>2</sub> removal  
Circ rate 1000 gpm  
Revision 13a: Inlet flow rate increased to 250 MMScfd and increased CO<sub>2</sub>.

The Dow Chemical Company assumes no obligation or liability resulting from the use of this information.  
No warranty, expressed or implied, is given nor is freedom from any patent owned by Dow or others to be inferred.

Equipment sizes are estimated and should be confirmed by normal rigorous engineering methods.

Purchase of UCARSOL™ or SELEXOL™ solvent from The Dow Chemical Company will require executing a Non-Analysis/Non-Disclosure Agreement.

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## Simulation Summary

### Enterprise Cryo

#### Inlet Streams

|                          |             |            |
|--------------------------|-------------|------------|
| STREAM-ID                |             | 15         |
| Stream Name              |             | Raw feed   |
| Inlet Block              |             | Feed Gas   |
| Temperature              | deg F       | 119.9000   |
| Pressure                 | Psi (g)     | 898.0000   |
| Vapor Fraction (mol/mol) | -           | 0.9997     |
| Flowrate                 | lb/hr       | 5.9731E+05 |
| Volume Flow (Liquid)     | USgal/min   |            |
| Volume Flow (Vapor)      | MMSCFD @60F |            |
| Water                    | mol frac    | 2.6019E-03 |
| Carbon Dioxide           | mol frac    | 2.8848E-02 |
| Hydrogen Sulfide         | mol frac    | 6.0000E-08 |
| Nitrogen                 | mol frac    | 1.9380E-02 |
| Methane                  | mol frac    | 0.7501     |
| Ethane                   | mol frac    | 0.1092     |
| Propane                  | mol frac    | 5.6620E-02 |
| n-Butane                 | mol frac    | 1.7040E-02 |
| iso-Butane*              | mol frac    | 7.0000E-03 |
| n-Pentane                | mol frac    | 3.8400E-03 |
| iso-Pentane*             | mol frac    | 3.7400E-03 |
| CycloPentane**           | mol frac    | 3.2000E-04 |
| n-Hexane                 | mol frac    | 6.6000E-04 |
| Benzene                  | mol frac    | 1.3000E-04 |
| n-Heptane                | mol frac    | 3.1000E-04 |
| Toluene                  | mol frac    | 6.0000E-05 |
| n-Octane                 | mol frac    | 1.0000E-04 |
| m-Xylene                 | mol frac    | 5.0000E-06 |
| p-Xylene*                | mol frac    | 5.0000E-06 |
| n-Nonane                 | mol frac    | 2.0000E-05 |
| TOTAL                    | mol frac    | 1.0000     |

**Outlet Streams**

| STREAM-ID                |             | 2           | 5          | 9          |
|--------------------------|-------------|-------------|------------|------------|
| Stream Name              |             | Treated Gas | Flash Gas  |            |
| Outlet Block             |             | Treated Gas | Flash Gas  | Acid Gas   |
| Temperature              | deg F       | 146.0280    | 161.3594   | 120.0000   |
| Pressure                 | Psi (g)     | 895.2007    | 80.0000    | 8.0000     |
| Vapor Fraction (mol/mol) | -           | 1.0000      | 1.0000     | 1.0000     |
| Flowrate                 | lb/hr       | 5.6259E+05  | 570.1700   | 3.5596E+04 |
| Volume Flow (Liquid)     | USgal/min   |             |            |            |
| Volume Flow (Vapor)      | MMSCFD @60F | 242.7575    | 0.2213     | 7.7461     |
| Water                    | mol frac    | 3.0295E-03  | 4.5855E-02 | 8.1053E-02 |
| Carbon Dioxide           | mol frac    | 3.7977E-04  | 0.1169     | 0.9158     |
| Hydrogen Sulfide         | mol frac    | 1.1200E-08  | 2.1810E-07 | 1.5792E-06 |
| Nitrogen                 | mol frac    | 1.9953E-02  | 5.1138E-03 | 3.9584E-06 |
| Methane                  | mol frac    | 0.7718      | 0.6560     | 2.0592E-03 |
| Ethane                   | mol frac    | 0.1124      | 0.1042     | 4.6396E-04 |
| Propane                  | mol frac    | 5.8266E-02  | 4.1383E-02 | 1.7016E-04 |
| n-Butane                 | mol frac    | 1.7534E-02  | 1.3247E-02 | 6.8104E-05 |
| iso-Butane*              | mol frac    | 7.1913E-03  | 1.2385E-02 | 1.9521E-04 |
| n-Pentane                | mol frac    | 3.9527E-03  | 1.8584E-03 | 6.8525E-06 |
| iso-Pentane*             | mol frac    | 3.8497E-03  | 1.8100E-03 | 6.6741E-06 |
| CycloPentane**           | mol frac    | 3.2946E-04  | 8.5129E-05 | 1.6281E-07 |
| n-Hexane                 | mol frac    | 6.7936E-04  | 3.1833E-04 | 1.3819E-06 |
| Benzene                  | mol frac    | 1.2969E-04  | 4.6283E-04 | 1.1793E-04 |
| n-Heptane                | mol frac    | 3.1906E-04  | 1.7007E-04 | 1.0358E-06 |
| Toluene                  | mol frac    | 5.9665E-05  | 1.9339E-04 | 6.1081E-05 |
| n-Octane                 | mol frac    | 1.0290E-04  | 7.1255E-05 | 7.1822E-07 |
| m-Xylene                 | mol frac    | 4.9041E-06  | 1.3911E-05 | 7.2855E-06 |
| p-Xylene*                | mol frac    | 4.9041E-06  | 1.3911E-05 | 7.2855E-06 |
| n-Nonane                 | mol frac    | 2.0568E-05  | 1.8996E-05 | 3.6869E-07 |
| TOTAL                    | mol frac    | 1.0000      | 1.0000     | 1.0000     |

**Global Data**

Atmospheric Pressure: 13.1000 Psi  
Standard Temperature: 60.0000 deg F

**Pumps, Compressors, Turbines, Expanders**

P-1 (PUMP) Power: 37.0931 HP  
P-2 (PUMP) Power: 659.2994 HP

**Heat Exchangers**

Lean Cooler (HEATER) Duty: -28.9030 MMBtu/hr  
HXL (HTXR) Duty: 29.6995 MMBtu/hr  
Flash Drum (FLASH) Duty: 0.0000 MMBtu/hr  
Sep (FLASH) Duty: 0.0000 MMBtu/hr  
Regenerator (CONDENSER) Duty: -14.4730 MMBtu/hr  
Regenerator (REBOILER) Duty: 53.0000 MMBtu/hr

**Absorber (COLUMN)**

Lean Solvent Stream ID: 3 (Lean to abs)  
Temperature: 124.9783 deg F  
Flowrate: 4.9896E+05 lb/hr  
Solvent Strength: 45.0003 %-mass/mass



Acid Gas Loading: 1.9233E-02 mol/mol

Rich Solvent Stream ID: 4 (Abs Rich)

Acid Gas Loading: 0.4094 mol/mol

### **Regenerator (COLUMN)**

Rich Solvent Stream ID: 8

Temperature: 203.2724 deg F

Flowrate: 5.3311E+05 lb/hr

Solvent Strength: 45.0149 %-mass/mass

Acid Gas Loading: 0.4080 mol/mol

Lean Solvent Stream ID: 10 (Hot Lean 1)

Acid Gas Loading: 1.9227E-02 mol/mol

Reboiler Pressure: 14.3726 Psi (g)

Reflux Flowrate: 1.2914E+04 lb/hr



Oil &amp; Gas

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## Stream Table - Enterprise Cryo

| STREAM-ID                |             | 1          | 2           | 3           | 4          | 5          | 6            | 7          | 8          | 9          | 10         | 11         |
|--------------------------|-------------|------------|-------------|-------------|------------|------------|--------------|------------|------------|------------|------------|------------|
| Stream Name              |             |            | Treated Gas | Lean to abs | Abs Rich   | Flash Gas  | Flashed Rich |            |            |            | Hot Lean 1 | Hot Lean 2 |
| Inlet/Outlet Block       |             |            | Treated Gas |             |            | Flash Gas  |              |            |            | Acid Gas   |            |            |
| Temperature              | deg F       | 119.4277   | 146.0280    | 124.9783    | 160.6283   | 161.3594   | 161.3594     | 217.5062   | 203.2724   | 120.0000   | 251.7835   | 251.9345   |
| Pressure                 | Psi (g)     | 898.0000   | 895.2007    | 906.9000    | 898.0000   | 80.0000    | 80.0000      | 75.0000    | 15.0000    | 8.0000     | 14.3726    | 60.0000    |
| Vapor Fraction (mol/mol) | -           | 1.0000     | 1.0000      | 0.0000      | 0.0000     | 1.0000     | 0.0000       | 9.3432E-04 | 1.8851E-02 | 1.0000     | 0.0000     | 0.0000     |
| Flowrate                 | lb/hr       | 5.9731E+05 | 5.6259E+05  | 4.9896E+05  | 5.3368E+05 | 570.1700   | 5.3311E+05   | 5.3311E+05 | 5.3311E+05 | 3.5596E+04 | 4.9751E+05 | 4.9751E+05 |
| Volume Flow (Liquid)     | USgal/min   |            |             | 988.6428    | 986.0655   |            | 984.1360     |            |            |            | 1045.2278  | 1045.2150  |
| Volume Flow (Vapor)      | MMSCFD @60F | 250.0000   | 242.7575    |             |            | 0.2213     |              |            |            | 7.7461     |            |            |
| Enthalpy                 | Btu/lb      | -1736.1453 | -1591.2516  | -4390.5668  | -4370.6428 | -2216.8573 | -4372.9464   | -4317.2259 | -4317.2270 | -3897.8296 | -4269.7935 | -4269.6037 |
| Heat Capacity            | Btu/lb-R    | 0.6051     | 0.6177      | 0.9098      | 0.9675     | 0.4605     | 0.9836       |            |            | 0.2179     | 0.9151     | 0.9151     |
| Density                  | lb/ft3      | 3.6772     | 3.2405      | 62.9221     | 67.4755    | 0.3317     | 67.5356      | 55.7384    | 5.7091     | 0.1428     | 59.3427    | 59.3434    |
| Viscosity                | cP          | 1.1551E-02 | 1.1945E-02  | 3.6571      | 2.2541     | 1.2870E-02 | 2.2336       |            |            | 1.5939E-02 | 0.7606     | 0.7596     |
| UCARSOL™ AP-814 (dry)    | mass %      |            |             | 44.8473     | 41.9261    |            | 41.9709      |            |            |            | 44.9737    | 44.9737    |
| Carbon Dioxide           | loading     |            |             | 1.9233E-02  | 0.4094     |            | 0.4080       |            |            |            | 1.9227E-02 | 1.9227E-02 |
| Hydrogen Sulfide         | loading     |            |             | 2.3349E-08  | 6.9639E-07 |            | 6.9374E-07   |            |            |            | 2.3343E-08 | 2.3343E-08 |
| Water                    | mol frac    | 2.6019E-03 | 3.0295E-03  | 0.8814      | 0.8420     | 4.5855E-02 | 0.8431       | 0.8431     | 0.8431     | 8.1053E-02 | 0.8809     | 0.8809     |
| Carbon Dioxide           | mol frac    | 2.8848E-02 | 3.7977E-04  | 2.2376E-03  | 4.5523E-02 | 0.1169     | 4.5426E-02   | 4.5426E-02 | 4.5426E-02 | 0.9158     | 2.2470E-03 | 2.2470E-03 |
| Hydrogen Sulfide         | mol frac    | 6.0000E-08 | 1.1200E-08  | 2.7165E-09  | 7.7435E-08 | 2.1810E-07 | 7.7245E-08   | 7.7245E-08 | 7.7245E-08 | 1.5792E-06 | 2.7281E-09 | 2.7281E-09 |
| Nitrogen                 | mol frac    | 1.9380E-02 | 1.9953E-02  | 0.0000      | 7.0825E-06 | 5.1138E-03 | 1.8711E-07   | 1.8711E-07 | 1.8711E-07 | 3.9584E-06 | 0.0000     | 0.0000     |
| Methane                  | mol frac    | 0.7501     | 0.7718      | 0.0000      | 9.8174E-04 | 0.6560     | 9.7333E-05   | 9.7333E-05 | 9.7333E-05 | 2.0592E-03 | 0.0000     | 0.0000     |
| Ethane                   | mol frac    | 0.1092     | 0.1124      | 0.0000      | 1.6236E-04 | 0.1042     | 2.1931E-05   | 2.1931E-05 | 2.1931E-05 | 4.6396E-04 | 0.0000     | 0.0000     |
| Propane                  | mol frac    | 5.6620E-02 | 5.8266E-02  | 2.2376E-20  | 6.3835E-05 | 4.1383E-02 | 8.0430E-06   | 8.0430E-06 | 8.0430E-06 | 1.7016E-04 | 2.2435E-20 | 2.2435E-20 |
| n-Butane                 | mol frac    | 1.7040E-02 | 1.7534E-02  | 3.7147E-20  | 2.1078E-05 | 1.3247E-02 | 3.2191E-06   | 3.2191E-06 | 3.2191E-06 | 6.8104E-05 | 3.7245E-20 | 3.7245E-20 |
| iso-Butane*              | mol frac    | 7.0000E-03 | 7.1913E-03  | 9.3574E-19  | 2.5916E-05 | 1.2385E-02 | 9.2271E-06   | 9.2271E-06 | 9.2271E-06 | 1.9521E-04 | 9.3819E-19 | 9.3819E-19 |
| n-Pentane                | mol frac    | 3.8400E-03 | 3.9527E-03  | 4.3987E-21  | 2.8295E-06 | 1.8584E-03 | 3.2391E-07   | 3.2391E-07 | 3.2391E-07 | 6.8525E-06 | 4.4104E-21 | 4.4104E-21 |
| iso-Pentane*             | mol frac    | 3.7400E-03 | 3.8497E-03  | 4.2842E-21  | 2.7558E-06 | 1.8100E-03 | 3.1547E-07   | 3.1547E-07 | 3.1547E-07 | 6.6741E-06 | 4.2956E-21 | 4.2956E-21 |
| CycloPentane**           | mol frac    | 3.2000E-04 | 3.2946E-04  | 0.0000      | 1.2248E-07 | 8.5129E-05 | 7.6960E-09   | 7.6960E-09 | 7.6960E-09 | 1.6281E-07 | 0.0000     | 0.0000     |
| n-Hexane                 | mol frac    | 6.6000E-04 | 6.7936E-04  | 2.4100E-21  | 4.9448E-07 | 3.1833E-04 | 6.5322E-08   | 6.5322E-08 | 6.5322E-08 | 1.3819E-06 | 2.4164E-21 | 2.4164E-21 |
| Benzene                  | mol frac    | 1.3000E-04 | 1.2969E-04  | 7.4998E-17  | 6.1908E-06 | 4.6283E-04 | 5.5742E-06   | 5.5742E-06 | 5.5742E-06 | 1.1793E-04 | 7.5188E-17 | 7.5188E-17 |
| n-Heptane                | mol frac    | 3.1000E-04 | 3.1906E-04  | 5.9085E-21  | 2.7823E-07 | 1.7007E-04 | 4.8959E-08   | 4.8959E-08 | 4.8959E-08 | 1.0358E-06 | 5.9243E-21 | 5.9243E-21 |
| Toluene                  | mol frac    | 6.0000E-05 | 5.9665E-05  | 1.1369E-16  | 3.1440E-06 | 1.9339E-04 | 2.8872E-06   | 2.8872E-06 | 2.8872E-06 | 6.1081E-05 | 1.1398E-16 | 1.1398E-16 |
| n-Octane                 | mol frac    | 1.0000E-04 | 1.0290E-04  | 1.7403E-20  | 1.2999E-07 | 7.1255E-05 | 3.3949E-08   | 3.3949E-08 | 3.3949E-08 | 7.1822E-07 | 1.7449E-20 | 1.7449E-20 |
| m-Xylene                 | mol frac    | 5.0000E-06 | 4.9041E-06  | 8.0103E-17  | 3.6266E-07 | 1.3911E-05 | 3.4437E-07   | 3.4437E-07 | 3.4437E-07 | 7.2855E-06 | 8.0305E-17 | 8.0305E-17 |
| p-Xylene*                | mol frac    | 5.0000E-06 | 4.9041E-06  | 8.0103E-17  | 3.6266E-07 | 1.3911E-05 | 3.4437E-07   | 3.4437E-07 | 3.4437E-07 | 7.2855E-06 | 8.0305E-17 | 8.0305E-17 |
| n-Nonane                 | mol frac    | 2.0000E-05 | 2.0568E-05  | 4.7314E-20  | 4.3019E-08 | 1.8996E-05 | 1.7427E-08   | 1.7427E-08 | 1.7427E-08 | 3.6869E-07 | 4.7441E-20 | 4.7441E-20 |
| TOTAL                    | mol frac    | 1.0000     | 1.0000      | 1.0000      | 1.0000     | 1.0000     | 1.0000       | 1.0000     | 1.0000     | 1.0000     | 1.0000     | 1.0000     |



Oil & Gas

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## Stream Table - Enterprise Cryo

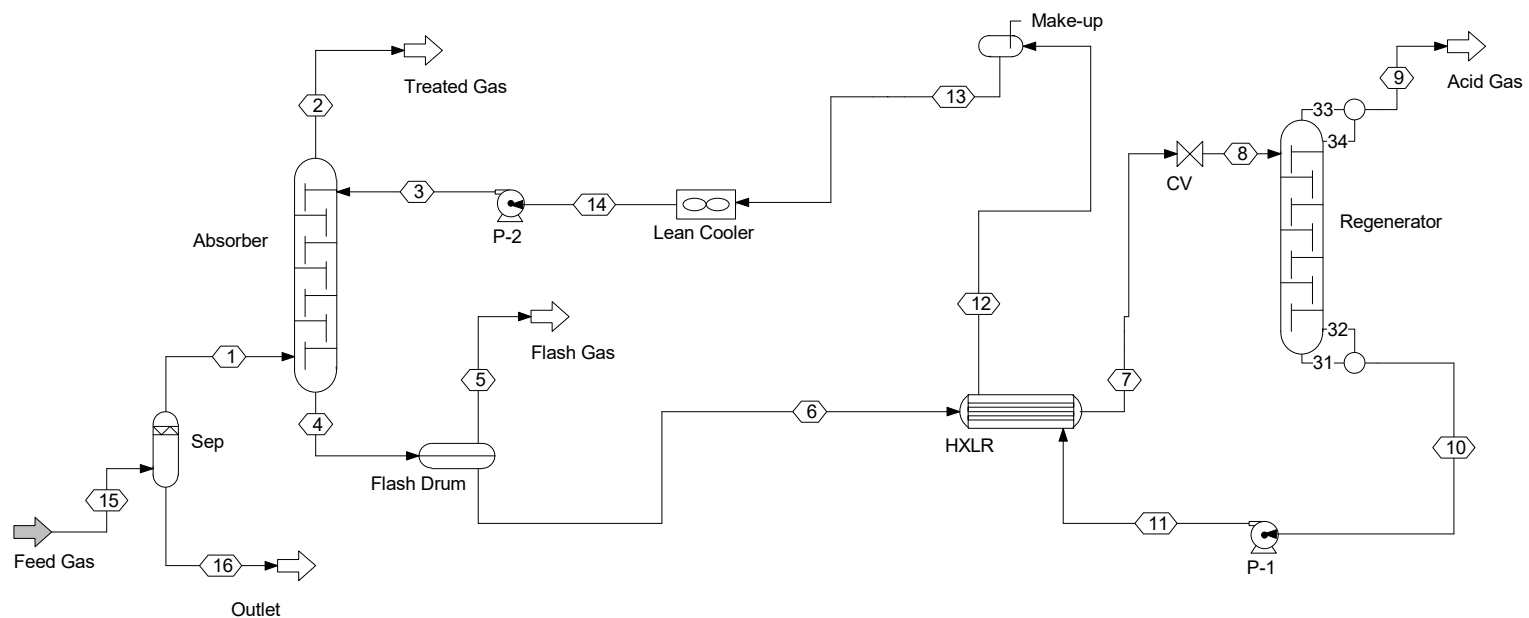
| STREAM-ID                |             | 12         | 13          | 14         | 15         | 16     | 31         | 32         | 33         | 34         |
|--------------------------|-------------|------------|-------------|------------|------------|--------|------------|------------|------------|------------|
| Stream Name              |             |            | Warm Lean 2 |            | Raw feed   |        | Lean       | Steam      | OHD        | Reflux     |
| Inlet/Outlet Block       |             |            |             |            | Feed Gas   | Outlet |            |            |            |            |
| Temperature              | deg F       | 186.3594   | 186.3594    | 122.6000   | 119.9000   |        | 248.2924   | 251.7835   | 209.2465   | 120.0000   |
| Pressure                 | Psi (g)     | 55.0000    | 55.0000     | 50.0000    | 898.0000   |        | 13.3726    | 14.3726    | 10.0000    | 8.0000     |
| Vapor Fraction (mol/mol) | -           | 0.0000     | 0.0000      | 0.0000     | 0.9997     |        | 0.0000     | 1.0000     | 1.0000     | 0.0000     |
| Flowrate                 | lb/hr       | 4.9751E+05 | 4.9896E+05  | 4.9896E+05 | 5.9731E+05 |        | 5.5194E+05 | 5.4431E+04 | 4.8511E+04 | 1.2914E+04 |
| Volume Flow (Liquid)     | USgal/min   | 1012.0109  | 1014.9944   | 989.2286   |            |        | 1155.6387  |            |            | 26.0885    |
| Volume Flow (Vapor)      | MMSCFD @60F |            |             |            |            |        |            | 26.7768    | 14.2551    |            |
| Enthalpy                 | Btu/lb      | -4329.3106 | -4335.9919  | -4393.9295 | -1736.1453 |        | -4493.6483 | -5565.8355 | -4362.7414 | -6765.0658 |
| Heat Capacity            | Btu/lb-R    | 0.9073     | 0.9076      | 0.9119     |            |        | 0.9277     | 0.4545     | 0.2890     | 0.9985     |
| Density                  | lb/ft3      | 61.2905    | 61.2884     | 62.8849    | 3.6733     |        | 59.5453    | 6.7524E-02 | 0.1004     | 61.7167    |
| Viscosity                | cP          | 1.5071     | 1.4993      | 3.8090     |            |        | 0.6872     | 1.3164E-02 | 1.6700E-02 | 0.5547     |
| UCARSOL™ AP-814 (dry)    | mass %      | 44.9737    | 44.8473     | 44.8473    |            |        | 40.6874    |            |            | 0.2798     |
| Carbon Dioxide           | loading     | 1.9227E-02 | 1.9225E-02  | 1.9233E-02 |            |        | 3.4477E-02 |            |            | 0.9864     |
| Hydrogen Sulfide         | loading     | 2.3343E-08 | 2.3340E-08  | 2.3349E-08 |            |        | 4.7179E-08 |            |            | 4.6612E-06 |
| Water                    | mol frac    | 0.8809     | 0.8814      | 0.8814     | 2.6019E-03 |        | 0.8963     | 0.9865     | 0.5002     | 0.9990     |
| Carbon Dioxide           | mol frac    | 2.2470E-03 | 2.2367E-03  | 2.2376E-03 | 2.8848E-02 |        | 3.4548E-03 | 1.0497E-02 | 0.4978     | 4.7194E-04 |
| Hydrogen Sulfide         | mol frac    | 2.7281E-09 | 2.7155E-09  | 2.7165E-09 | 6.0000E-08 |        | 4.7276E-09 | 1.6387E-08 | 8.5917E-07 | 2.2301E-09 |
| Nitrogen                 | mol frac    | 0.0000     | 0.0000      | 0.0000     | 1.9380E-02 |        | 0.0000     | 0.0000     | 2.1510E-06 | 5.3878E-11 |
| Methane                  | mol frac    | 0.0000     | 0.0000      | 0.0000     | 0.7501     |        | 0.0000     | 0.0000     | 1.1190E-03 | 5.3246E-08 |
| Ethane                   | mol frac    | 0.0000     | 0.0000      | 0.0000     | 0.1092     |        | 0.0000     | 0.0000     | 2.5212E-04 | 1.3793E-08 |
| Propane                  | mol frac    | 2.2435E-20 | 2.2331E-20  | 2.2376E-20 | 5.6620E-02 |        | 1.7924E-17 | 1.2231E-16 | 9.2464E-05 | 4.3967E-09 |
| n-Butane                 | mol frac    | 3.7245E-20 | 3.7073E-20  | 3.7147E-20 | 1.7040E-02 |        | 2.4496E-17 | 1.6711E-16 | 3.7008E-05 | 1.5272E-09 |
| iso-Butane*              | mol frac    | 9.3819E-19 | 9.3386E-19  | 9.3574E-19 | 7.0000E-03 |        | 2.3350E-16 | 1.5896E-15 | 1.0608E-04 | 4.3907E-09 |
| n-Pentane                | mol frac    | 4.4104E-21 | 4.3901E-21  | 4.3987E-21 | 3.8400E-03 |        | 3.8962E-18 | 2.6589E-17 | 3.7236E-06 | 7.8385E-11 |
| iso-Pentane*             | mol frac    | 4.2956E-21 | 4.2757E-21  | 4.2842E-21 | 3.7400E-03 |        | 3.7947E-18 | 2.5897E-17 | 3.6267E-06 | 7.6343E-11 |
| CycloPentane**           | mol frac    | 0.0000     | 0.0000      | 0.0000     | 3.2000E-04 |        | 0.0000     | 0.0000     | 8.8477E-08 | 1.0499E-11 |
| n-Hexane                 | mol frac    | 2.4164E-21 | 2.4052E-21  | 2.4100E-21 | 6.6000E-04 |        | 1.7437E-18 | 1.1897E-17 | 7.5094E-07 | 9.5779E-12 |
| Benzene                  | mol frac    | 7.5188E-17 | 7.4841E-17  | 7.4998E-17 | 1.3000E-04 |        | 2.6239E-15 | 1.7485E-14 | 6.4198E-05 | 2.5688E-07 |
| n-Heptane                | mol frac    | 5.9243E-21 | 5.8969E-21  | 5.9085E-21 | 3.1000E-04 |        | 3.1088E-18 | 2.1201E-17 | 5.6283E-07 | 4.6666E-12 |
| Toluene                  | mol frac    | 1.1398E-16 | 1.1346E-16  | 1.1369E-16 | 6.0000E-05 |        | 3.4850E-15 | 2.3141E-14 | 3.3238E-05 | 1.0269E-07 |
| n-Octane                 | mol frac    | 1.7449E-20 | 1.7369E-20  | 1.7403E-20 | 1.0000E-04 |        | 5.6764E-18 | 3.8674E-17 | 3.9028E-07 | 2.0735E-12 |
| m-Xylene                 | mol frac    | 8.0305E-17 | 7.9935E-17  | 8.0103E-17 | 5.0000E-06 |        | 1.6218E-15 | 1.0610E-14 | 3.9642E-06 | 1.1770E-08 |
| p-Xylene*                | mol frac    | 8.0305E-17 | 7.9935E-17  | 8.0103E-17 | 5.0000E-06 |        | 1.6218E-15 | 1.0610E-14 | 3.9642E-06 | 1.1770E-08 |
| n-Nonane                 | mol frac    | 4.7441E-20 | 4.7222E-20  | 4.7314E-20 | 2.0000E-05 |        | 8.5053E-18 | 5.7823E-17 | 2.0034E-07 | 7.4443E-13 |
| TOTAL                    | mol frac    | 1.0000     | 1.0000      | 1.0000     | 1.0000     |        | 1.0000     | 1.0000     | 1.0000     | 1.0000     |

**Make-up Stream(s)**

| Control Block         |        | Make-up   |
|-----------------------|--------|-----------|
| Flowrate              | lb/hr  | 1450.0524 |
| Water                 | lb/hr  | 1428.2653 |
| UCARSOL™ AP-814 (dry) | lb/hr  | 21.7871   |
| TOTAL                 | lb/hr  | 1450.0524 |
| Water                 | mass % | 98.4975   |
| UCARSOL™ AP-814 (dry) | mass % | 1.5025    |
| TOTAL                 | mass % | 100.0000  |

Positive component flowrates are component make-ups.

Negative component flowrates are component extractions.



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## Process Flow Diagram Enterprise Cryo

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## Major Equipment Summary

### Enterprise Cryo

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#### P-1 (PUMP)

|                  |                  |
|------------------|------------------|
| Inlet Pressure:  | 14.3726 Psi (g)  |
| Outlet Pressure: | 60.0000 Psi (g)  |
| Pressure Rise:   | 45.6274 Psi      |
| Flowrate:        | 4.9751E+05 lb/hr |
| Efficiency:      | 75 %             |
| Power:           | 37.0931 HP       |

#### P-2 (PUMP)

|                  |                  |
|------------------|------------------|
| Inlet Pressure:  | 50.0000 Psi (g)  |
| Outlet Pressure: | 906.9000 Psi (g) |
| Pressure Rise:   | 856.9000 Psi     |
| Flowrate:        | 4.9896E+05 lb/hr |
| Efficiency:      | 75 %             |
| Power:           | 659.2994 HP      |

#### Lean Cooler (HEATER)

|                     |                   |
|---------------------|-------------------|
| Inlet Temperature:  | 186.3588 deg F    |
| Outlet Temperature: | 122.6000 deg F    |
| Pressure Drop:      | 5.0000 Psi        |
| Heat Duty:          | -28.9030 MMBtu/hr |

#### HXLR (HTXR)

|                            |                       |
|----------------------------|-----------------------|
| Performance Stream Number: | 7                     |
| Inlet Temperature:         | 161.3594 deg F        |
| Outlet Temperature:        | 217.5062 deg F        |
| Pressure Drop:             | 5.0000 Psi            |
| Free Stream Number:        | 12                    |
| Inlet Temperature:         | 251.9345 deg F        |
| Outlet Temperature:        | 186.3594 deg F        |
| Pressure Drop:             | 5.0000 Psi            |
| Flowtype:                  | Counter-Current       |
| Heat Duty:                 | 29.6995 MMBtu/hr      |
| LMTD:                      | 29.4631 deg F         |
| Area:                      | 9163.5783 ft2         |
| Heat Transfer Coefficient: | 110.0000 Btu/hr-ft2-F |

**Flash Drum (FLASH)**

Flash Type: QP  
Inlet Temperature: 160.6283 deg F  
Outlet Temperature: 161.3594 deg F  
Outlet Pressure: 80.0000 Psi (g)  
Heat Duty: 0.0000 Btu/hr  
Vapor fraction (mol/mol): 1.3484E-03 -  
Residence Time: 10.0000 minutes  
Drum Diameter: 9.8553 ft  
Drum Length: 34.4934 ft

**Sep (FLASH)**

Flash Type: QP  
Inlet Temperature: 119.9000 deg F  
Outlet Temperature: 119.4277 deg F  
Outlet Pressure: 898.0000 Psi (g)  
Heat Duty: 0.0000 MMBtu/hr  
Vapor fraction (mol/mol): 1.0000 -  
Residence Time: 2.0000 minutes  
Drum Diameter: 0.0000 ft  
Drum Length: 0.0000 ft

**Absorber (COLUMN)****Column**

Total Pressure Drop: 2.7993 Psi  
Internals: Generic Valve Trays\*  
Number of Trays: 20  
Tray Spacing: 2.0000 ft  
Number Of Passes: 2  
Weir Height: 3.0000 inch  
Foam Derating Factor: 0.75

Diameter: 10.1536 ft  
Active Tray Area: 65.8835 ft<sup>2</sup>  
Percent Vapor Flood: 80.0000  
Percent DownComer Flood: 75.0000

Outlet Stream 4 Connects: At Bottom of Column  
Outlet Stream 2 Connects: At Top of Column  
Inlet Stream 1 Connects: At Bottom of Section  
Inlet Stream 3 Connects: At Top of Section

**Vapor Phase**

| Sec:Seg | Temperature<br>deg F | Pressure<br>Psi (g) | Density<br>lb/ft <sup>3</sup> | Viscosity<br>cP | Total Flow<br>lb/hr |
|---------|----------------------|---------------------|-------------------------------|-----------------|---------------------|
| 1:1     | 146.0280             | 895.2007            | 3.2405                        | 1.1945E-02      | 5.6259E+05          |
| 1:2     | 159.9733             | 895.3382            | 3.1312                        | 1.2188E-02      | 5.6439E+05          |
| 1:3     | 174.5572             | 895.4758            | 3.0294                        | 1.2436E-02      | 5.6583E+05          |
| 1:4     | 188.8624             | 895.6136            | 2.9424                        | 1.2672E-02      | 5.6790E+05          |
| 1:5     | 201.5452             | 895.7515            | 2.8767                        | 1.2876E-02      | 5.7085E+05          |
| 1:6     | 211.2357             | 895.8898            | 2.8356                        | 1.3029E-02      | 5.7462E+05          |
| 1:7     | 217.2953             | 896.0284            | 2.8168                        | 1.3125E-02      | 5.7865E+05          |
| 1:8     | 220.1963             | 896.1674            | 2.8134                        | 1.3173E-02      | 5.8205E+05          |



| Sec:Seg | Temperature<br>deg F | Pressure<br>Psi (g) | Density<br>lb/ft3 | Viscosity<br>cP | Total Flow<br>lb/hr |
|---------|----------------------|---------------------|-------------------|-----------------|---------------------|
| 1:9     | 220.9259             | 896.3068            | 2.8185            | 1.3184E-02      | 5.8435E+05          |
| 1:10    | 220.2923             | 896.4464            | 2.8286            | 1.3173E-02      | 5.8570E+05          |
| 1:11    | 218.7538             | 896.5862            | 2.8424            | 1.3145E-02      | 5.8646E+05          |
| 1:12    | 216.5005             | 896.7261            | 2.8601            | 1.3105E-02      | 5.8692E+05          |
| 1:13    | 213.5479             | 896.8662            | 2.8825            | 1.3051E-02      | 5.8725E+05          |
| 1:14    | 209.7894             | 897.0065            | 2.9111            | 1.2983E-02      | 5.8757E+05          |
| 1:15    | 205.0069             | 897.1469            | 2.9483            | 1.2895E-02      | 5.8795E+05          |
| 1:16    | 198.8520             | 897.2876            | 2.9979            | 1.2781E-02      | 5.8848E+05          |
| 1:17    | 190.7849             | 897.4287            | 3.0664            | 1.2629E-02      | 5.8925E+05          |
| 1:18    | 180.0031             | 897.5703            | 3.1643            | 1.2424E-02      | 5.9040E+05          |
| 1:19    | 165.3726             | 897.7125            | 3.3095            | 1.2144E-02      | 5.9210E+05          |
| 1:20    | 145.4410             | 897.8557            | 3.5290            | 1.1765E-02      | 5.9454E+05          |

**Liquid Phase**

| Sec:Seg | Temperature<br>deg F | Pressure<br>Psi (g) | Density<br>lb/ft3 | Viscosity<br>cP | Surface Tension<br>dyne/cm | Total Flow<br>lb/hr |
|---------|----------------------|---------------------|-------------------|-----------------|----------------------------|---------------------|
| 1:1     | 137.7882             | 895.3382            | 62.4173           | 2.9392          | 43.8892                    | 5.0077E+05          |
| 1:2     | 151.7214             | 895.4758            | 62.0930           | 2.3688          | 42.8345                    | 5.0220E+05          |
| 1:3     | 166.7826             | 895.6136            | 61.7662           | 1.9093          | 41.7308                    | 5.0427E+05          |
| 1:4     | 182.2158             | 895.7515            | 61.4523           | 1.5576          | 40.6581                    | 5.0722E+05          |
| 1:5     | 196.6198             | 895.8898            | 61.2037           | 1.3083          | 39.7386                    | 5.1099E+05          |
| 1:6     | 208.2248             | 896.0284            | 61.0824           | 1.1498          | 39.0848                    | 5.1502E+05          |
| 1:7     | 215.8748             | 896.1674            | 61.1059           | 1.0625          | 38.7197                    | 5.1842E+05          |
| 1:8     | 219.8433             | 896.3068            | 61.2187           | 1.0227          | 38.5774                    | 5.2072E+05          |
| 1:9     | 221.2361             | 896.4464            | 61.3573           | 1.0109          | 38.5775                    | 5.2207E+05          |
| 1:10    | 221.0425             | 896.5862            | 61.5015           | 1.0153          | 38.6661                    | 5.2283E+05          |
| 1:11    | 219.8546             | 896.7261            | 61.6574           | 1.0303          | 38.8161                    | 5.2329E+05          |
| 1:12    | 217.9482             | 896.8662            | 61.8380           | 1.0537          | 39.0180                    | 5.2362E+05          |
| 1:13    | 215.4008             | 897.0065            | 62.0589           | 1.0855          | 39.2737                    | 5.2394E+05          |
| 1:14    | 212.1644             | 897.1469            | 62.3395           | 1.1277          | 39.5925                    | 5.2432E+05          |
| 1:15    | 208.0952             | 897.2876            | 62.7062           | 1.1840          | 39.9917                    | 5.2484E+05          |
| 1:16    | 202.9526             | 897.4287            | 63.1968           | 1.2608          | 40.4972                    | 5.2561E+05          |
| 1:17    | 196.3646             | 897.5703            | 63.8631           | 1.3697          | 41.1486                    | 5.2677E+05          |
| 1:18    | 187.7690             | 897.7125            | 64.7676           | 1.5323          | 42.0030                    | 5.2847E+05          |
| 1:19    | 176.3535             | 897.8557            | 65.9593           | 1.7911          | 43.1375                    | 5.3091E+05          |
| 1:20    | 160.6283             | 898.0000            | 67.4755           | 2.2541          | 44.6557                    | 5.3368E+05          |

**Regenerator (COLUMN)****Condenser**

|                  |                   |
|------------------|-------------------|
| Temperature:     | 120.0000 deg F    |
| Pressure:        | 8.0000 Psi (g)    |
| Pressure Drop:   | 2.0000 Psi        |
| Heat Duty:       | -14.4730 MMBtu/hr |
| Reflux Flowrate: | 1.2914E+04 lb/hr  |

**Reboiler**

|                  |                  |
|------------------|------------------|
| Temperature:     | 251.7835 deg F   |
| Pressure:        | 14.3726 Psi (g)  |
| Pressure Drop:   | 1.0000 Psi       |
| Heat Duty:       | 53.0000 MMBtu/hr |
| Stripping Ratio: | 1.0048           |

**Column**

|                       |                      |
|-----------------------|----------------------|
| Total Pressure Drop:  | 3.3726 Psi           |
| Internals:            | Generic Valve Trays* |
| Number of Trays:      | 20                   |
| Tray Spacing:         | 2.0000 ft            |
| Number Of Passes:     | 1                    |
| Weir Height:          | 3.0000 inch          |
| Foam Derating Factor: | 0.8                  |



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Diameter: 9.5623 ft  
Active Tray Area: 57.3691 ft<sup>2</sup>  
Percent Vapor Flood: 80.0000  
Percent DownComer Flood: 80.0000

Inlet Stream 8 Connects: At Top of Section

### Vapor Phase

| Sec:Seg | Temperature<br>deg F | Pressure<br>Psi (g) | Density<br>lb/ft <sup>3</sup> | Viscosity<br>cP | Total Flow<br>lb/hr |
|---------|----------------------|---------------------|-------------------------------|-----------------|---------------------|
| 1:1     | 212.9194             | 10.0000             | 9.7527E-02                    | 1.6344E-02      | 3.4578E+04          |
| 1:2     | 222.1959             | 10.1681             | 8.6704E-02                    | 1.5702E-02      | 4.0004E+04          |
| 1:3     | 228.3776             | 10.3366             | 7.9314E-02                    | 1.5173E-02      | 4.4888E+04          |
| 1:4     | 232.2542             | 10.5054             | 7.4914E-02                    | 1.4789E-02      | 4.7938E+04          |
| 1:5     | 234.8718             | 10.6742             | 7.2128E-02                    | 1.4501E-02      | 4.9547E+04          |
| 1:6     | 236.8290             | 10.8430             | 7.0192E-02                    | 1.4270E-02      | 5.0431E+04          |
| 1:7     | 238.4031             | 11.0118             | 6.8766E-02                    | 1.4080E-02      | 5.0995E+04          |
| 1:8     | 239.7252             | 11.1806             | 6.7689E-02                    | 1.3921E-02      | 5.1412E+04          |
| 1:9     | 240.8664             | 11.3493             | 6.6869E-02                    | 1.3786E-02      | 5.1752E+04          |
| 1:10    | 241.8713             | 11.5180             | 6.6246E-02                    | 1.3671E-02      | 5.2045E+04          |
| 1:11    | 242.7701             | 11.6867             | 6.5780E-02                    | 1.3574E-02      | 5.2309E+04          |
| 1:12    | 243.5847             | 11.8554             | 6.5438E-02                    | 1.3490E-02      | 5.2551E+04          |
| 1:13    | 244.3315             | 12.0240             | 6.5198E-02                    | 1.3417E-02      | 5.2780E+04          |
| 1:14    | 245.0233             | 12.1926             | 6.5041E-02                    | 1.3355E-02      | 5.2998E+04          |
| 1:15    | 245.6704             | 12.3613             | 6.4952E-02                    | 1.3301E-02      | 5.3207E+04          |
| 1:16    | 246.2822             | 12.5298             | 6.4918E-02                    | 1.3254E-02      | 5.3410E+04          |
| 1:17    | 246.8710             | 12.6984             | 6.4930E-02                    | 1.3213E-02      | 5.3609E+04          |
| 1:18    | 247.4628             | 12.8670             | 6.4974E-02                    | 1.3178E-02      | 5.3802E+04          |
| 1:19    | 248.1375             | 13.0355             | 6.5027E-02                    | 1.3153E-02      | 5.3990E+04          |
| 1:20    | 249.1768             | 13.2041             | 6.5116E-02                    | 1.3124E-02      | 5.4152E+04          |

### Liquid Phase

| Sec:Seg | Temperature<br>deg F | Pressure<br>Psi (g) | Density<br>lb/ft <sup>3</sup> | Viscosity<br>cP | Surface Tension<br>dyne/cm | Total Flow<br>lb/hr |
|---------|----------------------|---------------------|-------------------------------|-----------------|----------------------------|---------------------|
| 1:1     | 208.8831             | 10.1681             | 63.2991                       | 1.1417          | 40.3257                    | 5.3752E+05          |
| 1:2     | 219.5167             | 10.3366             | 62.5521                       | 0.9967          | 39.4653                    | 5.4240E+05          |
| 1:3     | 226.7655             | 10.5054             | 61.9309                       | 0.9098          | 38.8146                    | 5.4545E+05          |
| 1:4     | 231.2029             | 10.6742             | 61.4650                       | 0.8596          | 38.3608                    | 5.4706E+05          |
| 1:5     | 234.1019             | 10.8430             | 61.1183                       | 0.8274          | 38.0253                    | 5.4794E+05          |
| 1:6     | 236.2176             | 11.0118             | 60.8557                       | 0.8043          | 37.7575                    | 5.4851E+05          |
| 1:7     | 237.8939             | 11.1806             | 60.6509                       | 0.7862          | 37.5331                    | 5.4893E+05          |
| 1:8     | 239.2888             | 11.3493             | 60.4863                       | 0.7714          | 37.3402                    | 5.4926E+05          |
| 1:9     | 240.4848             | 11.5180             | 60.3499                       | 0.7590          | 37.1717                    | 5.4956E+05          |
| 1:10    | 241.5323             | 11.6867             | 60.2339                       | 0.7483          | 37.0232                    | 5.4982E+05          |
| 1:11    | 242.4649             | 11.8554             | 60.1332                       | 0.7391          | 36.8909                    | 5.5006E+05          |
| 1:12    | 243.3067             | 12.0240             | 60.0442                       | 0.7309          | 36.7724                    | 5.5029E+05          |
| 1:13    | 244.0757             | 12.1926             | 59.9643                       | 0.7235          | 36.6653                    | 5.5051E+05          |
| 1:14    | 244.7854             | 12.3613             | 59.8917                       | 0.7169          | 36.5679                    | 5.5072E+05          |
| 1:15    | 245.4468             | 12.5298             | 59.8250                       | 0.7109          | 36.4785                    | 5.5092E+05          |
| 1:16    | 246.0682             | 12.6984             | 59.7631                       | 0.7053          | 36.3960                    | 5.5112E+05          |
| 1:17    | 246.6566             | 12.8670             | 59.7051                       | 0.7001          | 36.3193                    | 5.5131E+05          |
| 1:18    | 247.2181             | 13.0355             | 59.6502                       | 0.6953          | 36.2471                    | 5.5150E+05          |
| 1:19    | 247.7581             | 13.2041             | 59.5976                       | 0.6907          | 36.1795                    | 5.5166E+05          |
| 1:20    | 248.2924             | 13.3726             | 59.5453                       | 0.6872          | 36.1035                    | 5.5194E+05          |

Case Name: Enterprise South Eddy

File Name: P:\1. CLIENTS\Enterprise\Projects\South Eddy\143201.0031 Greenfield NSR  
Application\06 Calculations\South Eddy GLYCalc Output\_v0.3.ddf

Date: March 06, 2015

## DESCRIPTION:

Description: 240 MMscf/d

Annual Hours of Operation: 8760.0 hours/yr

## EMISSIONS REPORTS:

## CONTROLLED REGENERATOR EMISSIONS

| Component                   | lbs/hr  | lbs/day  | tons/yr  |
|-----------------------------|---------|----------|----------|
| Methane                     | 4.4380  | 106.512  | 19.4385  |
| Ethane                      | 9.5881  | 230.115  | 41.9959  |
| Propane                     | 15.9463 | 382.711  | 69.8448  |
| Isobutane                   | 6.4431  | 154.635  | 28.2209  |
| n-Butane                    | 12.9997 | 311.993  | 56.9387  |
| Isopentane                  | 4.3735  | 104.964  | 19.1558  |
| n-Pentane                   | 4.2485  | 101.965  | 18.6086  |
| Cyclopentane                | 1.4091  | 33.818   | 6.1717   |
| n-Hexane                    | 1.8163  | 43.590   | 7.9552   |
| Cyclohexane                 | 1.4997  | 35.992   | 6.5685   |
| Other Hexanes               | 2.5159  | 60.381   | 11.0195  |
| Heptanes                    | 2.5716  | 61.717   | 11.2634  |
| Methylcyclohexane           | 0.8563  | 20.551   | 3.7505   |
| 2,2,4-Trimethylpentane      | 0.0315  | 0.756    | 0.1381   |
| Benzene                     | 6.9169  | 166.004  | 30.2958  |
| Toluene                     | 10.2442 | 245.861  | 44.8696  |
| Xylenes                     | 2.1633  | 51.919   | 9.4752   |
| C8+ Heavies                 | 0.0265  | 0.637    | 0.1163   |
| Total Emissions             | 88.0884 | 2114.121 | 385.8271 |
| Total Hydrocarbon Emissions | 88.0884 | 2114.121 | 385.8271 |
| Total VOC Emissions         | 74.0622 | 1777.494 | 324.3927 |
| Total HAP Emissions         | 21.1721 | 508.131  | 92.7339  |
| Total BTEX Emissions        | 19.3243 | 463.784  | 84.6407  |

## UNCONTROLLED REGENERATOR EMISSIONS

| Component    | lbs/hr  | lbs/day | tons/yr |
|--------------|---------|---------|---------|
| Methane      | 4.4476  | 106.741 | 19.4803 |
| Ethane       | 9.6844  | 232.426 | 42.4178 |
| Propane      | 16.7206 | 401.296 | 73.2364 |
| Isobutane    | 7.0647  | 169.554 | 30.9436 |
| n-Butane     | 14.7328 | 353.587 | 64.5296 |
| Isopentane   | 5.9827  | 143.584 | 26.2041 |
| n-Pentane    | 6.0741  | 145.779 | 26.6047 |
| Cyclopentane | 2.2480  | 53.951  | 9.8461  |
| n-Hexane     | 3.6128  | 86.707  | 15.8240 |
| Cyclohexane  | 3.6208  | 86.900  | 15.8592 |

|                             |          |          |           |
|-----------------------------|----------|----------|-----------|
| Other Hexanes               | 4.3367   | 104.082  | 18.9949   |
| Heptanes                    | 9.6638   | 231.932  | 42.3275   |
| Methylcyclohexane           | 3.3259   | 79.821   | 14.5674   |
| 2,2,4-Trimethylpentane      | 0.1206   | 2.894    | 0.5282    |
| Benzene                     | 19.6314  | 471.154  | 85.9855   |
| Toluene                     | 63.0984  | 1514.361 | 276.3709  |
| Xylenes                     | 42.7167  | 1025.202 | 187.0993  |
| C8+ Heavies                 | 26.4665  | 635.197  | 115.9235  |
| -----                       |          |          |           |
| Total Emissions             | 243.5486 | 5845.168 | 1066.7431 |
| -----                       |          |          |           |
| Total Hydrocarbon Emissions | 243.5486 | 5845.168 | 1066.7431 |
| Total VOC Emissions         | 229.4167 | 5506.000 | 1004.8450 |
| Total HAP Emissions         | 129.1799 | 3100.318 | 565.8080  |
| Total BTEX Emissions        | 125.4465 | 3010.717 | 549.4558  |

## FLASH TANK OFF GAS

| Component                   | lbs/hr   | lbs/day  | tons/yr  |
|-----------------------------|----------|----------|----------|
| -----                       |          |          |          |
| Methane                     | 55.5471  | 1333.130 | 243.2962 |
| Ethane                      | 37.4655  | 899.173  | 164.0990 |
| Propane                     | 27.1982  | 652.757  | 119.1282 |
| Isobutane                   | 7.8952   | 189.485  | 34.5811  |
| n-Butane                    | 12.5928  | 302.226  | 55.1563  |
| Isopentane                  | 4.5488   | 109.170  | 19.9236  |
| n-Pentane                   | 3.7449   | 89.878   | 16.4028  |
| Cyclopentane                | 0.3850   | 9.240    | 1.6863   |
| n-Hexane                    | 1.2863   | 30.871   | 5.6340   |
| Cyclohexane                 | 0.3509   | 8.423    | 1.5371   |
| Other Hexanes               | 2.0252   | 48.605   | 8.8704   |
| Heptanes                    | 1.7742   | 42.581   | 7.7711   |
| Methylcyclohexane           | 0.2563   | 6.150    | 1.1224   |
| 2,2,4-Trimethylpentane      | 0.0440   | 1.055    | 0.1926   |
| Benzene                     | 0.2409   | 5.780    | 1.0549   |
| Toluene                     | 0.5176   | 12.423   | 2.2672   |
| Xylenes                     | 0.1408   | 3.380    | 0.6168   |
| C8+ Heavies                 | 0.5245   | 12.587   | 2.2972   |
| -----                       |          |          |          |
| Total Emissions             | 156.5382 | 3756.916 | 685.6372 |
| -----                       |          |          |          |
| Total Hydrocarbon Emissions | 156.5382 | 3756.916 | 685.6372 |
| Total VOC Emissions         | 63.5256  | 1524.613 | 278.2419 |
| Total HAP Emissions         | 2.2296   | 53.510   | 9.7655   |
| Total BTEX Emissions        | 0.8993   | 21.583   | 3.9389   |

## EQUIPMENT REPORTS:

## CONDENSER

|                               |                     |
|-------------------------------|---------------------|
| Condenser Outlet Temperature: | 120.00 deg. F       |
| Condenser Pressure:           | 13.50 psia          |
| Condenser Duty:               | 1.04e+000 MM BTU/hr |
| Hydrocarbon Recovery:         | 12.47 bbls/day      |
| Produced Water:               | 93.17 bbls/day      |
| VOC Control Efficiency:       | 67.72 %             |
| HAP Control Efficiency:       | 83.61 %             |

BTEX Control Efficiency: 84.60 %  
 Dissolved Hydrocarbons in Water: 603.57 mg/L

| Component              | Emitted | Condensed |
|------------------------|---------|-----------|
| Water                  | 0.39%   | 99.61%    |
| Carbon Dioxide         | 98.42%  | 1.58%     |
| Nitrogen               | 99.71%  | 0.29%     |
| Methane                | 99.79%  | 0.21%     |
| Ethane                 | 99.01%  | 0.99%     |
| Propane                | 95.37%  | 4.63%     |
| Isobutane              | 91.20%  | 8.80%     |
| n-Butane               | 88.24%  | 11.76%    |
| Isopentane             | 73.10%  | 26.90%    |
| n-Pentane              | 69.94%  | 30.06%    |
| Cyclopentane           | 62.68%  | 37.32%    |
| n-Hexane               | 50.27%  | 49.73%    |
| Cyclohexane            | 41.42%  | 58.58%    |
| Other Hexanes          | 58.01%  | 41.99%    |
| Heptanes               | 26.61%  | 73.39%    |
| Methylcyclohexane      | 25.75%  | 74.25%    |
| 2,2,4-Trimethylpentane | 26.14%  | 73.86%    |
| Benzene                | 35.23%  | 64.77%    |
| Toluene                | 16.24%  | 83.76%    |
| Xylenes                | 5.06%   | 94.94%    |
| C8+ Heavies            | 0.10%   | 99.90%    |

#### ABSORBER

Calculated Absorber Stages: 2.03  
 Specified Dry Gas Dew Point: 7.00 lbs. H2O/MMSCF  
 Temperature: 130.0 deg. F  
 Pressure: 900.0 psig  
 Dry Gas Flow Rate: 240.0000 MMSCF/day  
 Glycol Losses with Dry Gas: 15.4725 lb/hr  
 Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 142.97 lbs. H2O/MMSCF  
 Calculated Lean Glycol Recirc. Ratio: 1.98 gal/lb H2O

| Component              | Remaining<br>in Dry Gas | Absorbed<br>in Glycol |
|------------------------|-------------------------|-----------------------|
| Water                  | 4.88%                   | 95.12%                |
| Carbon Dioxide         | 99.80%                  | 0.20%                 |
| Nitrogen               | 99.98%                  | 0.02%                 |
| Methane                | 99.98%                  | 0.02%                 |
| Ethane                 | 99.95%                  | 0.05%                 |
| Propane                | 99.92%                  | 0.08%                 |
| Isobutane              | 99.91%                  | 0.09%                 |
| n-Butane               | 99.88%                  | 0.12%                 |
| Isopentane             | 99.89%                  | 0.11%                 |
| n-Pentane              | 99.87%                  | 0.13%                 |
| Cyclopentane           | 99.45%                  | 0.55%                 |
| n-Hexane               | 99.81%                  | 0.19%                 |
| Cyclohexane            | 99.19%                  | 0.81%                 |
| Other Hexanes          | 99.85%                  | 0.15%                 |
| Heptanes               | 99.70%                  | 0.30%                 |
| Methylcyclohexane      | 99.19%                  | 0.81%                 |
| 2,2,4-Trimethylpentane | 99.86%                  | 0.14%                 |
| Benzene                | 93.56%                  | 6.44%                 |

|             |        |        |
|-------------|--------|--------|
| Toluene     | 91.81% | 8.19%  |
| Xylenes     | 86.06% | 13.94% |
| C8+ Heavies | 99.04% | 0.96%  |

## FLASH TANK

Flash Control: Vented to atmosphere  
Flash Temperature: 130.0 deg. F  
Flash Pressure: 75.0 psig

| Component              | Left in Glycol | Removed in Flash Gas |
|------------------------|----------------|----------------------|
| Water                  | 99.97%         | 0.03%                |
| Carbon Dioxide         | 48.74%         | 51.26%               |
| Nitrogen               | 6.99%          | 93.01%               |
| Methane                | 7.41%          | 92.59%               |
| Ethane                 | 20.54%         | 79.46%               |
| Propane                | 38.07%         | 61.93%               |
| Isobutane              | 47.22%         | 52.78%               |
| n-Butane               | 53.91%         | 46.09%               |
| Isopentane             | 57.02%         | 42.98%               |
| n-Pentane              | 62.05%         | 37.95%               |
| Cyclopentane           | 85.45%         | 14.55%               |
| n-Hexane               | 73.87%         | 26.13%               |
| Cyclohexane            | 91.45%         | 8.55%                |
| Other Hexanes          | 68.48%         | 31.52%               |
| Heptanes               | 84.57%         | 15.43%               |
| Methylcyclohexane      | 93.13%         | 6.87%                |
| 2,2,4-Trimethylpentane | 73.68%         | 26.32%               |
| Benzene                | 98.85%         | 1.15%                |
| Toluene                | 99.25%         | 0.75%                |
| Xylenes                | 99.71%         | 0.29%                |
| C8+ Heavies            | 98.29%         | 1.71%                |

## REGENERATOR

No Stripping Gas used in regenerator.

| Component      | Remaining in Glycol | Distilled Overhead |
|----------------|---------------------|--------------------|
| Water          | 21.78%              | 78.22%             |
| 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     | 0.88%               | 99.12%             |
| n-Pentane      | 0.81%               | 99.19%             |
| Cyclopentane   | 0.59%               | 99.41%             |
| n-Hexane       | 0.68%               | 99.32%             |
| Cyclohexane    | 3.50%               | 96.50%             |
| Other Hexanes  | 1.46%               | 98.54%             |
| Heptanes       | 0.59%               | 99.41%             |

|                        |        |        |
|------------------------|--------|--------|
| Methylcyclohexane      | 4.30%  | 95.70% |
| 2,2,4-Trimethylpentane | 2.04%  | 97.96% |
| Benzene                | 5.06%  | 94.94% |
| Toluene                | 7.97%  | 92.03% |
| Xylenes                | 12.99% | 87.01% |
| C8+ Heavies            | 12.25% | 87.75% |

## STREAM REPORTS:

## WET GAS STREAM

Temperature: 130.00 deg. F  
 Pressure: 914.70 psia  
 Flow Rate: 1.00e+007 scfh

| Component              | Conc.<br>(vol%) | Loading<br>(lb/hr) |
|------------------------|-----------------|--------------------|
| Water                  | 3.01e-001       | 1.43e+003          |
| Carbon Dioxide         | 1.10e+000       | 1.29e+004          |
| Nitrogen               | 1.02e-001       | 7.53e+002          |
| Methane                | 7.73e+001       | 3.28e+005          |
| Ethane                 | 1.20e+001       | 9.58e+004          |
| Propane                | 5.01e+000       | 5.84e+004          |
| Isobutane              | 1.05e+000       | 1.62e+004          |
| n-Butane               | 1.52e+000       | 2.34e+004          |
| Isopentane             | 5.11e-001       | 9.75e+003          |
| n-Pentane              | 3.87e-001       | 7.38e+003          |
| Cyclopentane           | 2.59e-002       | 4.80e+002          |
| n-Hexane               | 1.14e-001       | 2.59e+003          |
| Cyclohexane            | 2.19e-002       | 4.88e+002          |
| Other Hexanes          | 1.85e-001       | 4.22e+003          |
| Heptanes               | 1.42e-001       | 3.78e+003          |
| Methylcyclohexane      | 1.69e-002       | 4.40e+002          |
| 2,2,4-Trimethylpentane | 3.99e-003       | 1.20e+002          |
| Benzene                | 1.49e-002       | 3.09e+002          |
| Toluene                | 3.19e-002       | 7.77e+002          |
| Xylenes                | 1.10e-002       | 3.08e+002          |
| C8+ Heavies            | 6.28e-002       | 2.83e+003          |
| Total Components       | 100.00          | 5.70e+005          |

## DRY GAS STREAM

Temperature: 130.00 deg. F  
 Pressure: 914.70 psia  
 Flow Rate: 1.00e+007 scfh

| Component      | Conc.<br>(vol%) | Loading<br>(lb/hr) |
|----------------|-----------------|--------------------|
| Water          | 1.47e-002       | 7.00e+001          |
| Carbon Dioxide | 1.11e+000       | 1.28e+004          |
| Nitrogen       | 1.02e-001       | 7.53e+002          |
| Methane        | 7.76e+001       | 3.28e+005          |
| Ethane         | 1.21e+001       | 9.57e+004          |

|                        |           |           |
|------------------------|-----------|-----------|
| Propane                | 5.02e+000 | 5.84e+004 |
| Isobutane              | 1.06e+000 | 1.62e+004 |
| n-Butane               | 1.52e+000 | 2.34e+004 |
| Isopentane             | 5.12e-001 | 9.74e+003 |
| n-Pentane              | 3.87e-001 | 7.37e+003 |
| Cyclopentane           | 2.58e-002 | 4.78e+002 |
| n-Hexane               | 1.14e-001 | 2.58e+003 |
| Cyclohexane            | 2.18e-002 | 4.84e+002 |
| Other Hexanes          | 1.86e-001 | 4.22e+003 |
| Heptanes               | 1.43e-001 | 3.76e+003 |
| Methylcyclohexane      | 1.69e-002 | 4.36e+002 |
| 2,2,4-Trimethylpentane | 3.99e-003 | 1.20e+002 |
| Benzene                | 1.40e-002 | 2.89e+002 |
| Toluene                | 2.94e-002 | 7.13e+002 |
| Xylenes                | 9.46e-003 | 2.65e+002 |
| C8+ Heavies            | 6.24e-002 | 2.80e+003 |
| -----                  |           |           |
| Total Components       | 100.00    | 5.69e+005 |

## LEAN GLYCOL STREAM

-----

Temperature: 130.00 deg. F  
Flow Rate: 4.50e+001 gpm

| Component              | Conc.<br>(wt%) | Loading<br>(lb/hr) |
|------------------------|----------------|--------------------|
| -----                  |                |                    |
| TEG                    | 9.84e+001      | 2.49e+004          |
| Water                  | 1.50e+000      | 3.80e+002          |
| Carbon Dioxide         | 9.94e-012      | 2.52e-009          |
| Nitrogen               | 6.11e-014      | 1.55e-011          |
| Methane                | 7.96e-018      | 2.02e-015          |
| Ethane                 | 8.79e-008      | 2.23e-005          |
| Propane                | 7.06e-009      | 1.79e-006          |
| Isobutane              | 1.77e-009      | 4.49e-007          |
| n-Butane               | 2.68e-009      | 6.78e-007          |
| Isopentane             | 2.09e-004      | 5.29e-002          |
| n-Pentane              | 1.95e-004      | 4.93e-002          |
| Cyclopentane           | 5.23e-005      | 1.32e-002          |
| n-Hexane               | 9.73e-005      | 2.46e-002          |
| Cyclohexane            | 5.19e-004      | 1.31e-001          |
| Other Hexanes          | 2.54e-004      | 6.43e-002          |
| Heptanes               | 2.27e-004      | 5.75e-002          |
| Methylcyclohexane      | 5.90e-004      | 1.49e-001          |
| 2,2,4-Trimethylpentane | 9.90e-006      | 2.51e-003          |
| Benzene                | 4.13e-003      | 1.05e+000          |
| Toluene                | 2.16e-002      | 5.46e+000          |
| Xylenes                | 2.52e-002      | 6.38e+000          |
| C8+ Heavies            | 1.46e-002      | 3.70e+000          |
| -----                  |                |                    |
| Total Components       | 100.00         | 2.53e+004          |

## RICH GLYCOL STREAM

-----

Temperature: 130.00 deg. F  
Pressure: 914.70 psia  
Flow Rate: 4.85e+001 gpm  
NOTE: Stream has more than one phase.

| Component              | Conc.<br>(wt%) | Loading<br>(lb/hr) |
|------------------------|----------------|--------------------|
| -----                  | -----          | -----              |
| TEG                    | 9.19e+001      | 2.49e+004          |
| Water                  | 6.45e+000      | 1.74e+003          |
| Carbon Dioxide         | 9.30e-002      | 2.51e+001          |
| Nitrogen               | 5.70e-004      | 1.54e-001          |
| Methane                | 2.22e-001      | 6.00e+001          |
| Ethane                 | 1.74e-001      | 4.72e+001          |
| Propane                | 1.62e-001      | 4.39e+001          |
| Isobutane              | 5.53e-002      | 1.50e+001          |
| n-Butane               | 1.01e-001      | 2.73e+001          |
| Isopentane             | 3.91e-002      | 1.06e+001          |
| n-Pentane              | 3.65e-002      | 9.87e+000          |
| Cyclopentane           | 9.78e-003      | 2.65e+000          |
| n-Hexane               | 1.82e-002      | 4.92e+000          |
| Cyclohexane            | 1.52e-002      | 4.10e+000          |
| Other Hexanes          | 2.38e-002      | 6.43e+000          |
| Heptanes               | 4.25e-002      | 1.15e+001          |
| Methylcyclohexane      | 1.38e-002      | 3.73e+000          |
| 2,2,4-Trimethylpentane | 6.18e-004      | 1.67e-001          |
| Benzene                | 7.73e-002      | 2.09e+001          |
| Toluene                | 2.55e-001      | 6.91e+001          |
| Xylenes                | 1.82e-001      | 4.92e+001          |
| C8+ Heavies            | 1.13e-001      | 3.07e+001          |
| -----                  | -----          | -----              |
| Total Components       | 100.00         | 2.71e+004          |

## FLASH TANK OFF GAS STREAM

Temperature: 130.00 deg. F  
 Pressure: 89.70 psia  
 Flow Rate: 2.35e+003 scfh

| Component              | Conc.<br>(vol%) | Loading<br>(lb/hr) |
|------------------------|-----------------|--------------------|
| -----                  | -----           | -----              |
| Water                  | 4.06e-001       | 4.54e-001          |
| Carbon Dioxide         | 4.73e+000       | 1.29e+001          |
| Nitrogen               | 8.26e-002       | 1.43e-001          |
| Methane                | 5.59e+001       | 5.55e+001          |
| Ethane                 | 2.01e+001       | 3.75e+001          |
| Propane                | 9.95e+000       | 2.72e+001          |
| Isobutane              | 2.19e+000       | 7.90e+000          |
| n-Butane               | 3.50e+000       | 1.26e+001          |
| Isopentane             | 1.02e+000       | 4.55e+000          |
| n-Pentane              | 8.37e-001       | 3.74e+000          |
| Cyclopentane           | 8.86e-002       | 3.85e-001          |
| n-Hexane               | 2.41e-001       | 1.29e+000          |
| Cyclohexane            | 6.73e-002       | 3.51e-001          |
| Other Hexanes          | 3.79e-001       | 2.03e+000          |
| Heptanes               | 2.86e-001       | 1.77e+000          |
| Methylcyclohexane      | 4.21e-002       | 2.56e-001          |
| 2,2,4-Trimethylpentane | 6.21e-003       | 4.40e-002          |
| Benzene                | 4.97e-002       | 2.41e-001          |
| Toluene                | 9.06e-002       | 5.18e-001          |
| Xylenes                | 2.14e-002       | 1.41e-001          |
| C8+ Heavies            | 4.97e-002       | 5.24e-001          |
| -----                  | -----           | -----              |

Total Components 100.00 1.70e+002

## FLASH TANK GLYCOL STREAM

Temperature: 130.00 deg. F  
 Flow Rate: 4.81e+001 gpm

| Component              | Conc.<br>(wt%) | Loading<br>(lb/hr) |
|------------------------|----------------|--------------------|
| TEG                    | 9.25e+001      | 2.49e+004          |
| Water                  | 6.49e+000      | 1.74e+003          |
| Carbon Dioxide         | 4.56e-002      | 1.23e+001          |
| Nitrogen               | 4.01e-005      | 1.08e-002          |
| Methane                | 1.65e-002      | 4.45e+000          |
| Ethane                 | 3.60e-002      | 9.68e+000          |
| Propane                | 6.22e-002      | 1.67e+001          |
| Isobutane              | 2.63e-002      | 7.06e+000          |
| n-Butane               | 5.48e-002      | 1.47e+001          |
| Isopentane             | 2.25e-002      | 6.04e+000          |
| n-Pentane              | 2.28e-002      | 6.12e+000          |
| Cyclopentane           | 8.41e-003      | 2.26e+000          |
| n-Hexane               | 1.35e-002      | 3.64e+000          |
| Cyclohexane            | 1.40e-002      | 3.75e+000          |
| Other Hexanes          | 1.64e-002      | 4.40e+000          |
| Heptanes               | 3.62e-002      | 9.72e+000          |
| Methylcyclohexane      | 1.29e-002      | 3.48e+000          |
| 2,2,4-Trimethylpentane | 4.58e-004      | 1.23e-001          |
| Benzene                | 7.69e-002      | 2.07e+001          |
| Toluene                | 2.55e-001      | 6.86e+001          |
| Xylenes                | 1.83e-001      | 4.91e+001          |
| C8+ Heavies            | 1.12e-001      | 3.02e+001          |
| Total Components       | 100.00         | 2.69e+004          |

## REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 3.01e+004 scfh

| Component      | Conc.<br>(vol%) | Loading<br>(lb/hr) |
|----------------|-----------------|--------------------|
| Water          | 9.55e+001       | 1.36e+003          |
| Carbon Dioxide | 3.51e-001       | 1.23e+001          |
| Nitrogen       | 4.85e-004       | 1.08e-002          |
| Methane        | 3.50e-001       | 4.45e+000          |
| Ethane         | 4.06e-001       | 9.68e+000          |
| Propane        | 4.78e-001       | 1.67e+001          |
| Isobutane      | 1.53e-001       | 7.06e+000          |
| n-Butane       | 3.20e-001       | 1.47e+001          |
| Isopentane     | 1.05e-001       | 5.98e+000          |
| n-Pentane      | 1.06e-001       | 6.07e+000          |
| Cyclopentane   | 4.04e-002       | 2.25e+000          |
| n-Hexane       | 5.28e-002       | 3.61e+000          |
| Cyclohexane    | 5.42e-002       | 3.62e+000          |
| Other Hexanes  | 6.34e-002       | 4.34e+000          |
| Heptanes       | 1.22e-001       | 9.66e+000          |

|                        |           |           |
|------------------------|-----------|-----------|
| Methylcyclohexane      | 4.27e-002 | 3.33e+000 |
| 2,2,4-Trimethylpentane | 1.33e-003 | 1.21e-001 |
| Benzene                | 3.17e-001 | 1.96e+001 |
| Toluene                | 8.63e-001 | 6.31e+001 |
| Xylenes                | 5.07e-001 | 4.27e+001 |
| C8+ Heavies            | 1.96e-001 | 2.65e+001 |
| -----                  |           |           |
| Total Components       | 100.00    | 1.62e+003 |

## CONDENSER VENT GAS STREAM

Temperature: 120.00 deg. F  
Pressure: 13.50 psia  
Flow Rate: 8.81e+002 scfh

| Component              | Conc.<br>(vol%) | Loading<br>(lb/hr) |  |
|------------------------|-----------------|--------------------|--|
| -----                  |                 |                    |  |
| Water                  | 1.26e+001       | 5.28e+000          |  |
| Carbon Dioxide         | 1.18e+001       | 1.21e+001          |  |
| Nitrogen               | 1.65e-002       | 1.07e-002          |  |
| Methane                | 1.19e+001       | 4.44e+000          |  |
| Ethane                 | 1.37e+001       | 9.59e+000          |  |
| Propane                | 1.56e+001       | 1.59e+001          |  |
| Isobutane              | 4.77e+000       | 6.44e+000          |  |
| n-Butane               | 9.63e+000       | 1.30e+001          |  |
| Isopentane             | 2.61e+000       | 4.37e+000          |  |
| n-Pentane              | 2.54e+000       | 4.25e+000          |  |
| Cyclopentane           | 8.65e-001       | 1.41e+000          |  |
| n-Hexane               | 9.08e-001       | 1.82e+000          |  |
| Cyclohexane            | 7.67e-001       | 1.50e+000          |  |
| Other Hexanes          | 1.26e+000       | 2.52e+000          |  |
| Heptanes               | 1.11e+000       | 2.57e+000          |  |
| Methylcyclohexane      | 3.76e-001       | 8.56e-001          |  |
| 2,2,4-Trimethylpentane | 1.19e-002       | 3.15e-002          |  |
| Benzene                | 3.81e+000       | 6.92e+000          |  |
| Toluene                | 4.79e+000       | 1.02e+001          |  |
| Xylenes                | 8.78e-001       | 2.16e+000          |  |
| C8+ Heavies            | 6.71e-003       | 2.65e-002          |  |
| -----                  |                 |                    |  |
| Total Components       | 100.00          | 1.05e+002          |  |

## CONDENSER PRODUCED WATER STREAM

Temperature: 120.00 deg. F  
Flow Rate: 2.72e+000 gpm

| Component      | Conc.<br>(wt%) | Loading<br>(lb/hr) | (ppm)   |
|----------------|----------------|--------------------|---------|
| -----          |                |                    |         |
| Water          | 9.99e+001      | 1.36e+003          | 999301. |
| Carbon Dioxide | 9.52e-003      | 1.29e-001          | 95.     |
| Nitrogen       | 2.21e-007      | 3.01e-006          | 0.      |
| Methane        | 1.76e-004      | 2.39e-003          | 2.      |
| Ethane         | 4.33e-004      | 5.88e-003          | 4.      |
| Propane        | 7.41e-004      | 1.01e-002          | 7.      |
| Isobutane      | 1.63e-004      | 2.22e-003          | 2.      |
| n-Butane       | 4.37e-004      | 5.94e-003          | 4.      |
| Isopentane     | 1.04e-004      | 1.41e-003          | 1.      |
| n-Pentane      | 1.08e-004      | 1.47e-003          | 1.      |

|                        |           |           |          |
|------------------------|-----------|-----------|----------|
| Cyclopentane           | 2.52e-004 | 3.42e-003 | 3.       |
| n-Hexane               | 3.82e-005 | 5.20e-004 | 0.       |
| Cyclohexane            | 1.78e-004 | 2.42e-003 | 2.       |
| Other Hexanes          | 4.27e-005 | 5.80e-004 | 0.       |
| Heptanes               | 3.00e-005 | 4.08e-004 | 0.       |
| Methylcyclohexane      | 4.85e-005 | 6.60e-004 | 0.       |
| 2,2,4-Trimethylpentane | 2.46e-007 | 3.34e-006 | 0.       |
| Benzene                | 2.32e-002 | 3.15e-001 | 232.     |
| Toluene                | 2.82e-002 | 3.84e-001 | 282.     |
| Xylenes                | 6.23e-003 | 8.47e-002 | 62.      |
| C8+ Heavies            | 1.95e-007 | 2.65e-006 | 0.       |
| -----                  |           |           |          |
| Total Components       | 100.00    | 1.36e+003 | 1000000. |

## CONDENSER RECOVERED OIL STREAM

-----

Temperature: 120.00 deg. F  
Flow Rate: 3.64e-001 gpm

| Component              | Conc.<br>(wt%) | Loading<br>(lb/hr) |
|------------------------|----------------|--------------------|
| -----                  |                |                    |
| Water                  | 4.74e-002      | 7.34e-002          |
| Carbon Dioxide         | 4.13e-002      | 6.39e-002          |
| Nitrogen               | 1.84e-005      | 2.84e-005          |
| Methane                | 4.62e-003      | 7.15e-003          |
| Ethane                 | 5.84e-002      | 9.04e-002          |
| Propane                | 4.94e-001      | 7.64e-001          |
| Isobutane              | 4.00e-001      | 6.19e-001          |
| n-Butane               | 1.12e+000      | 1.73e+000          |
| Isopentane             | 1.04e+000      | 1.61e+000          |
| n-Pentane              | 1.18e+000      | 1.82e+000          |
| Cyclopentane           | 5.40e-001      | 8.35e-001          |
| n-Hexane               | 1.16e+000      | 1.80e+000          |
| Cyclohexane            | 1.37e+000      | 2.12e+000          |
| Other Hexanes          | 1.18e+000      | 1.82e+000          |
| Heptanes               | 4.58e+000      | 7.09e+000          |
| Methylcyclohexane      | 1.60e+000      | 2.47e+000          |
| 2,2,4-Trimethylpentane | 5.76e-002      | 8.91e-002          |
| Benzene                | 8.01e+000      | 1.24e+001          |
| Toluene                | 3.39e+001      | 5.25e+001          |
| Xylenes                | 2.61e+001      | 4.05e+001          |
| C8+ Heavies            | 1.71e+001      | 2.64e+001          |
| -----                  |                |                    |
| Total Components       | 100.00         | 1.55e+002          |

|    |                                                                                                                                                            |              |                                                                                   |                                 |  |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------|---------------------------------|--|
| 1  | <div></div> <div>KOCH BUSINESS SOLUTIONS<br/>Burlington, MA<br/>USA</div> |              | Case Name: Case 2 - Orla Cryo Plant with NGL Stabilizer - Summer - Design Case.hs |                                 |  |
| 2  |                                                                                                                                                            |              | Unit Set: Sri1e«1                                                                 |                                 |  |
| 3  |                                                                                                                                                            |              | Date/Time: Tue Jun 21 17:16:11 2016                                               |                                 |  |
| 4  |                                                                                                                                                            |              |                                                                                   |                                 |  |
| 5  |                                                                                                                                                            |              |                                                                                   | Fluid Package: Basis-1          |  |
| 6  | Material Stream: South Eddy Purge Gas                                                                                                                      |              |                                                                                   | Property Package: Peng-Robinson |  |
| 7  |                                                                                                                                                            |              |                                                                                   |                                 |  |
| 8  |                                                                                                                                                            |              |                                                                                   |                                 |  |
| 9  | CONDITIONS                                                                                                                                                 |              |                                                                                   |                                 |  |
| 10 |                                                                                                                                                            |              |                                                                                   |                                 |  |
| 11 |                                                                                                                                                            | Overall      | Vapour Phase                                                                      |                                 |  |
| 12 | Vapour / Phase Fraction                                                                                                                                    | 1.0000       | 1.0000                                                                            |                                 |  |
| 13 | Temperature: (F)                                                                                                                                           | 110.0 *      | 110.0                                                                             |                                 |  |
| 14 | Pressure: (psia)                                                                                                                                           | 13.36 *      | 13.36                                                                             |                                 |  |
| 15 | Molar Flow (MMSCFD)                                                                                                                                        | 6.624e-003 * | 6.624e-003                                                                        |                                 |  |
| 16 | Mass Flow (lb/hr)                                                                                                                                          | 11.90        | 11.90                                                                             |                                 |  |
| 17 | Std Ideal Liq Vol Flow (barrel/day)                                                                                                                        | 2.664        | 2.664                                                                             |                                 |  |
| 18 | Molar Enthalpy (Btu/lbmole)                                                                                                                                | -3.139e+004  | -3.139e+004                                                                       |                                 |  |
| 19 | Molar Entropy (Btu/lbmole-F)                                                                                                                               | 44.67        | 44.67                                                                             |                                 |  |
| 20 | Heat Flow (Btu/hr)                                                                                                                                         | -2.283e+004  | -2.283e+004                                                                       |                                 |  |
| 21 | Liq Vol Flow @Std Cond (barrel/day)                                                                                                                        | 1177 *       | 1177                                                                              |                                 |  |
| 22 | PROPERTIES                                                                                                                                                 |              |                                                                                   |                                 |  |
| 23 |                                                                                                                                                            |              |                                                                                   |                                 |  |
| 24 |                                                                                                                                                            | Overall      | Vapour Phase                                                                      |                                 |  |
| 25 | Molecular Weight                                                                                                                                           | 16.37        | 16.37                                                                             |                                 |  |
| 26 | Molar Density (lbmole/ft3)                                                                                                                                 | 2.189e-003   | 2.189e-003                                                                        |                                 |  |
| 27 | Mass Density (lb/ft3)                                                                                                                                      | 3.582e-002   | 3.582e-002                                                                        |                                 |  |
| 28 | Act. Volume Flow (barrel/day)                                                                                                                              | 1420         | 1420                                                                              |                                 |  |
| 29 | Mass Enthalpy (Btu/lb)                                                                                                                                     | -1918        | -1918                                                                             |                                 |  |
| 30 | Mass Entropy (Btu/lb-F)                                                                                                                                    | 2.729        | 2.729                                                                             |                                 |  |
| 31 | Heat Capacity (Btu/lbmole-F)                                                                                                                               | 8.784        | 8.784                                                                             |                                 |  |
| 32 | Mass Heat Capacity (Btu/lb-F)                                                                                                                              | 0.5367       | 0.5367                                                                            |                                 |  |
| 33 | LHV Mass Basis (Std) (Btu/lb)                                                                                                                              | 2.084e+004   | 2.084e+004                                                                        |                                 |  |
| 34 | Phase Fraction [Vol. Basis]                                                                                                                                | 1.000        | 1.000                                                                             |                                 |  |
| 35 | Phase Fraction [Mass Basis]                                                                                                                                | 1.000        | 1.000                                                                             |                                 |  |
| 36 | Partial Pressure of CO2 (psia)                                                                                                                             | 6.658e-004   | ---                                                                               |                                 |  |
| 37 | Cost Based on Flow (Cost/s)                                                                                                                                | 0.0000       | 0.0000                                                                            |                                 |  |
| 38 | Act. Gas Flow (ACFM)                                                                                                                                       | 5.538        | 5.538                                                                             |                                 |  |
| 39 | Avg. Liq. Density (lbmole/ft3)                                                                                                                             | 1.167        | 1.167                                                                             |                                 |  |
| 40 | Specific Heat (Btu/lbmole-F)                                                                                                                               | 8.784        | 8.784                                                                             |                                 |  |
| 41 | Std. Gas Flow (MMSCFD)                                                                                                                                     | 6.624e-003   | 6.624e-003                                                                        |                                 |  |
| 42 | Std. Ideal Liq. Mass Density (lb/ft3)                                                                                                                      | 19.10        | 19.10                                                                             |                                 |  |
| 43 | Act. Liq. Flow (USGPM)                                                                                                                                     | ---          | ---                                                                               |                                 |  |
| 44 | Z Factor                                                                                                                                                   | 0.9983       | 0.9983                                                                            |                                 |  |
| 45 | Watson K                                                                                                                                                   | 19.11        | 19.11                                                                             |                                 |  |
| 46 | User Property                                                                                                                                              | ---          | ---                                                                               |                                 |  |
| 47 | Cp/(Cp - R)                                                                                                                                                | 1.292        | 1.292                                                                             |                                 |  |
| 48 | Cp/Cv                                                                                                                                                      | 1.295        | 1.295                                                                             |                                 |  |
| 49 | Heat of Vap. (Btu/lbmole)                                                                                                                                  | 4022         | ---                                                                               |                                 |  |
| 50 | Kinematic Viscosity (cSt)                                                                                                                                  | 20.83        | 20.83                                                                             |                                 |  |
| 51 | Liq. Mass Density (Std. Cond) (lb/ft3)                                                                                                                     | 4.323e-002   | 4.323e-002                                                                        |                                 |  |
| 52 | Liq. Vol. Flow (Std. Cond) (barrel/day)                                                                                                                    | 1177         | 1177                                                                              |                                 |  |
| 53 | Liquid Fraction                                                                                                                                            | 0.0000       | 0.0000                                                                            |                                 |  |
| 54 | Molar Volume (ft3/lbmole)                                                                                                                                  | 456.8        | 456.8                                                                             |                                 |  |
| 55 | Mass Heat of Vap. (Btu/lb)                                                                                                                                 | 245.7        | ---                                                                               |                                 |  |
| 56 | Phase Fraction [Molar Basis]                                                                                                                               | 1.0000       | 1.0000                                                                            |                                 |  |
| 57 | Surface Tension (dyne/cm)                                                                                                                                  | ---          | ---                                                                               |                                 |  |
| 58 | Thermal Conductivity (Btu/hr-ft-F)                                                                                                                         | 2.089e-002   | 2.089e-002                                                                        |                                 |  |
| 59 | Viscosity (cP)                                                                                                                                             | 1.195e-002   | 1.195e-002                                                                        |                                 |  |
| 60 | Cv (Semi-Ideal) (Btu/lbmole-F)                                                                                                                             | 6.798        | 6.798                                                                             |                                 |  |
| 61 | Mass Cv (Semi-Ideal) (Btu/lb-F)                                                                                                                            | 0.4154       | 0.4154                                                                            |                                 |  |
| 62 | Cv (Btu/lbmole-F)                                                                                                                                          | 6.782        | 6.782                                                                             |                                 |  |
| 63 | Aspen Technology Inc. Aspen HYSYS Version 7.3 (25.0.4.7337) Page 1 of 5                                                                                    |              |                                                                                   |                                 |  |

|    |                                                                                                                                                            |                        |                                       |                                                                                   |               |                                 |
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| 2  |                                                                                                                                                            |                        |                                       | Unit Set: Sri1e«1                                                                 |               |                                 |
| 3  |                                                                                                                                                            |                        |                                       | Date/Time: Tue Jun 21 17:16:11 2016                                               |               |                                 |
| 4  |                                                                                                                                                            |                        |                                       |                                                                                   |               |                                 |
| 5  |                                                                                                                                                            |                        |                                       | Fluid Package: Basis-1                                                            |               |                                 |
| 6  | Material Stream: South Eddy Purge Gas (cont                                                                                                                |                        |                                       | Property Package: Peng-Robinson                                                   |               |                                 |
| 7  |                                                                                                                                                            |                        |                                       |                                                                                   |               |                                 |
| 8  |                                                                                                                                                            |                        |                                       |                                                                                   |               |                                 |
| 9  | PROPERTIES                                                                                                                                                 |                        |                                       |                                                                                   |               |                                 |
| 10 |                                                                                                                                                            |                        |                                       |                                                                                   |               |                                 |
| 11 |                                                                                                                                                            | Overall                | Vapour Phase                          |                                                                                   |               |                                 |
| 12 | Mass Cv (Btu/lb-F)                                                                                                                                         | 0.4144                 | 0.4144                                |                                                                                   |               |                                 |
| 13 | Cv (Ent. Method) (Btu/lbmole-F)                                                                                                                            | ---                    | ---                                   |                                                                                   |               |                                 |
| 14 | Mass Cv (Ent. Method) (Btu/lb-F)                                                                                                                           | ---                    | ---                                   |                                                                                   |               |                                 |
| 15 | Cp/Cv (Ent. Method)                                                                                                                                        | ---                    | ---                                   |                                                                                   |               |                                 |
| 16 | Reid VP at 37.8 C (psia)                                                                                                                                   | ---                    | ---                                   |                                                                                   |               |                                 |
| 17 | True VP at 37.8 C (psia)                                                                                                                                   | ---                    | ---                                   |                                                                                   |               |                                 |
| 18 | Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)                                                                                                               | 1177                   | 1177                                  |                                                                                   |               |                                 |
| 19 | Partial Pressure of H2S (psia)                                                                                                                             | 0.0000                 | ---                                   |                                                                                   |               |                                 |
| 20 | Viscosity Index                                                                                                                                            | 0.5104                 | ---                                   |                                                                                   |               |                                 |
| 21 | HHV Mass Basis (Std) (Btu/lb)                                                                                                                              | 2.296e+004             | 2.296e+004                            |                                                                                   |               |                                 |
| 22 | CO2 Loading                                                                                                                                                | ---                    | ---                                   |                                                                                   |               |                                 |
| 23 | CO2 App ML Con (lbmole/ft3)                                                                                                                                | ---                    | ---                                   |                                                                                   |               |                                 |
| 24 | CO2 App WT Con (lbmol/lb)                                                                                                                                  | ---                    | ---                                   |                                                                                   |               |                                 |
| 25 | Phase Fraction [Act. Vol. Basis]                                                                                                                           | 1.000                  | 1.000                                 |                                                                                   |               |                                 |
| 26 | LHV Vol Basis (Std) (MMBtu/gal)                                                                                                                            | 2.846                  | 2.846                                 |                                                                                   |               |                                 |
| 27 | HHV Vol Basis (Std) (MMBtu/gal)                                                                                                                            | 3.136                  | 3.136                                 |                                                                                   |               |                                 |
| 28 |                                                                                                                                                            |                        |                                       |                                                                                   |               |                                 |
| 29 | COMPOSITION                                                                                                                                                |                        |                                       |                                                                                   |               |                                 |
| 30 |                                                                                                                                                            |                        |                                       |                                                                                   |               |                                 |
| 31 | Overall Phase                                                                                                                                              |                        |                                       | Vapour Fraction 1.0000                                                            |               |                                 |
| 32 | COMPONENTS                                                                                                                                                 | MOLAR FLOW (lbmole/hr) | MOLE FRACTION                         | MASS FLOW (lb/hr)                                                                 | MASS FRACTION | LIQUID VOLUME FLOW (barrel/day) |
| 33 |                                                                                                                                                            |                        |                                       |                                                                                   |               | LIQUID VOLUME FRACTION          |
| 34 | Nitrogen                                                                                                                                                   | 0.0130 *               | 0.01780584 *                          | 0.3628 *                                                                          | 0.03047773 *  | 0.0308 *                        |
| 35 | CO2                                                                                                                                                        | 0.0000 *               | 0.00004983 *                          | 0.0016 *                                                                          | 0.00013401 *  | 0.0001 *                        |
| 36 | H2S                                                                                                                                                        | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 37 | Methane                                                                                                                                                    | 0.7089 *               | 0.97461524 *                          | 11.3725 *                                                                         | 0.95538108 *  | 2.6010 *                        |
| 38 | Ethane                                                                                                                                                     | 0.0053 *               | 0.00733136 *                          | 0.1603 *                                                                          | 0.01347030 *  | 0.0309 *                        |
| 39 | Propane                                                                                                                                                    | 0.0001 *               | 0.00019297 *                          | 0.0062 *                                                                          | 0.00051995 *  | 0.0008 *                        |
| 40 | i-Butane                                                                                                                                                   | 0.0000 *               | 0.00000267 *                          | 0.0001 *                                                                          | 0.00000949 *  | 0.0000 *                        |
| 41 | n-Butane                                                                                                                                                   | 0.0000 *               | 0.00000201 *                          | 0.0001 *                                                                          | 0.00000715 *  | 0.0000 *                        |
| 42 | i-Pentane                                                                                                                                                  | 0.0000 *               | 0.00000005 *                          | 0.0000 *                                                                          | 0.00000021 *  | 0.0000 *                        |
| 43 | n-Pentane                                                                                                                                                  | 0.0000 *               | 0.00000002 *                          | 0.0000 *                                                                          | 0.00000008 *  | 0.0000 *                        |
| 44 | n-Hexane                                                                                                                                                   | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 45 | n-Heptane                                                                                                                                                  | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 46 | n-Octane                                                                                                                                                   | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 47 | n-Nonane                                                                                                                                                   | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 48 | H2O                                                                                                                                                        | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 49 | Oxygen                                                                                                                                                     | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 50 | THEOL-59                                                                                                                                                   | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 51 | 22-Mbutane                                                                                                                                                 | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 52 | 23-Mbutane                                                                                                                                                 | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 53 | Cyclopentane                                                                                                                                               | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 54 | 2-Mpentane                                                                                                                                                 | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 55 | 3-Mpentane                                                                                                                                                 | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 56 | 22-Mpentane                                                                                                                                                | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 57 | Mcyclopentan                                                                                                                                               | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 58 | 223-Mpentane                                                                                                                                               | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 59 | 24-Mpentane                                                                                                                                                | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 60 | Benzene                                                                                                                                                    | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 61 | 33-Mpentane                                                                                                                                                | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 62 | Cyclohexane                                                                                                                                                | 0.0000 *               | 0.00000000 *                          | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *                        |
| 63 | Aspen Technology Inc.                                                                                                                                      |                        | Aspen HYSYS Version 7.3 (25.0.4.7337) |                                                                                   |               | Page 2 of 5                     |

|    |                                                                                                                                                            |             |               |                                                                                   |               |                   |                 |               |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|-----------------------------------------------------------------------------------|---------------|-------------------|-----------------|---------------|
| 1  | <div></div> <div>KOCH BUSINESS SOLUTIONS<br/>Burlington, MA<br/>USA</div> |             |               | Case Name: Case 2 - Orla Cryo Plant with NGL Stabilizer - Summer - Design Case.hs |               |                   |                 |               |
| 2  |                                                                                                                                                            |             |               | Unit Set: Sri1e«1                                                                 |               |                   |                 |               |
| 3  |                                                                                                                                                            |             |               | Date/Time: Tue Jun 21 17:16:11 2016                                               |               |                   |                 |               |
| 4  |                                                                                                                                                            |             |               |                                                                                   |               |                   |                 |               |
| 5  |                                                                                                                                                            |             |               |                                                                                   |               |                   |                 |               |
| 6  | Material Stream: South Eddy Purge Gas (cont                                                                                                                |             |               |                                                                                   |               | Fluid Package:    | Basis-1         |               |
| 7  |                                                                                                                                                            |             |               |                                                                                   |               | Property Package: |                 | Peng-Robinson |
| 8  |                                                                                                                                                            |             |               |                                                                                   |               |                   |                 |               |
| 9  | COMPOSITION                                                                                                                                                |             |               |                                                                                   |               |                   |                 |               |
| 10 |                                                                                                                                                            |             |               |                                                                                   |               |                   |                 |               |
| 11 | Overall Phase (continued)                                                                                                                                  |             |               |                                                                                   |               |                   |                 |               |
| 12 |                                                                                                                                                            |             |               |                                                                                   |               |                   | Vapour Fraction | 1.0000        |
| 13 | COMPONENTS                                                                                                                                                 | MOLAR FLOW  | MOLE FRACTION | MASS FLOW                                                                         | MASS FRACTION | LIQUID VOLUME     | LIQUID VOLUME   |               |
| 14 |                                                                                                                                                            | (lbmole/hr) |               | (lb/hr)                                                                           |               | FLOW (barrel/day) | FRACTION        |               |
| 15 | 2-Mhexane                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 16 | 23-Mpentane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 17 | 3-Mhexane                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 18 | 11Mcycpentan                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 19 | Mcyclohexane                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 20 | 22-Mhexane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 21 | 233-Mpentane                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 22 | Toluene                                                                                                                                                    | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 23 | 23-Mhexane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 24 | 2M-3Epentane                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 25 | 2-Mheptane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 26 | 4-Mheptane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 27 | 34-Mhexane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 28 | 3-Mheptane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 29 | 112-MCC5                                                                                                                                                   | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 30 | 11-Mcychexan                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 31 | 235-Mhexane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 32 | 224-Mhexane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 33 | 22-Mheptane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 34 | 223-Mhexane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 35 | 25-Mheptane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 36 | 2-Moctane                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 37 | 24-Mheptane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 38 | Ecyclohexane                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 39 | 33-Mheptane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 40 | 26-Mheptane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 41 | E-Benzene                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 42 | 23-Mheptane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 43 | m-Xylene                                                                                                                                                   | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 44 | p-Xylene                                                                                                                                                   | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 45 | 34-Mheptane                                                                                                                                                | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 46 | 3-Eheptane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 47 | 4-Moctane                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 48 | 3-Moctane                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 49 | o-Xylene                                                                                                                                                   | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 50 | i-Bcycpentan                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 51 | 2-Mnonane                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 52 | 1-M-1-ECC5                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 53 | Cumene                                                                                                                                                     | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 54 | 23-Moctane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 55 | 3-Eoctane                                                                                                                                                  | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 56 | n-Bcychexane                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 57 | n-PBenzene                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 58 | 1M3-EBenzene                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 59 | 1M4-EBenzene                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 60 | 1M2-EBenzene                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 61 | 22-Moctane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 62 | tert-Bbenzen                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *    |               |
| 63 | Aspen Technology Inc. Aspen HYSYS Version 7.3 (25.0.4.7337) Page 3 of 5                                                                                    |             |               |                                                                                   |               |                   |                 |               |

|    |                                                                                                                                                            |             |               |                                                                                   |               |                   |               |               |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|-----------------------------------------------------------------------------------|---------------|-------------------|---------------|---------------|
| 1  | <div></div> <div>KOCH BUSINESS SOLUTIONS<br/>Burlington, MA<br/>USA</div> |             |               | Case Name: Case 2 - Orla Cryo Plant with NGL Stabilizer - Summer - Design Case.hs |               |                   |               |               |
| 2  |                                                                                                                                                            |             |               | Unit Set: Sri1e«1                                                                 |               |                   |               |               |
| 3  |                                                                                                                                                            |             |               | Date/Time: Tue Jun 21 17:16:11 2016                                               |               |                   |               |               |
| 4  |                                                                                                                                                            |             |               |                                                                                   |               |                   |               |               |
| 5  |                                                                                                                                                            |             |               |                                                                                   |               |                   |               |               |
| 6  | Material Stream: South Eddy Purge Gas (cont                                                                                                                |             |               |                                                                                   |               | Fluid Package:    | Basis-1       |               |
| 7  |                                                                                                                                                            |             |               |                                                                                   |               | Property Package: |               | Peng-Robinson |
| 8  |                                                                                                                                                            |             |               |                                                                                   |               |                   |               |               |
| 9  | COMPOSITION                                                                                                                                                |             |               |                                                                                   |               |                   |               |               |
| 10 |                                                                                                                                                            |             |               |                                                                                   |               |                   |               |               |
| 11 | Overall Phase (continued)                                                                                                                                  |             |               |                                                                                   |               | Vapour Fraction   | 1.0000        |               |
| 12 |                                                                                                                                                            |             |               |                                                                                   |               |                   |               |               |
| 13 | COMPONENTS                                                                                                                                                 | MOLAR FLOW  | MOLE FRACTION | MASS FLOW                                                                         | MASS FRACTION | LIQUID VOLUME     | LIQUID VOLUME |               |
| 14 |                                                                                                                                                            | (lbmole/hr) |               | (lb/hr)                                                                           |               | FLOW (barrel/day) | FRACTION      |               |
| 15 | 135-MBenzene                                                                                                                                               | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *  |               |
| 16 | 36-Moctane                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *  |               |
| 17 | i-BBenzene                                                                                                                                                 | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *  |               |
| 18 | n-Decane                                                                                                                                                   | 0.0000 *    | 0.00000000 *  | 0.0000 *                                                                          | 0.00000000 *  | 0.0000 *          | 0.00000000 *  |               |
| 19 | Total                                                                                                                                                      | 0.7273      | 1.0000        | 11.9037                                                                           | 1.0000        | 2.6636            | 1.0000        |               |
| 20 |                                                                                                                                                            |             |               |                                                                                   |               |                   |               |               |
| 21 | Vapour Phase                                                                                                                                               |             |               |                                                                                   |               | Phase Fraction    | 1.000         |               |
| 22 | COMPONENTS                                                                                                                                                 | MOLAR FLOW  | MOLE FRACTION | MASS FLOW                                                                         | MASS FRACTION | LIQUID VOLUME     | LIQUID VOLUME |               |
| 23 |                                                                                                                                                            | (lbmole/hr) |               | (lb/hr)                                                                           |               | FLOW (barrel/day) | FRACTION      |               |
| 24 | Nitrogen                                                                                                                                                   | 0.0130      | 0.01780584    | 0.3628                                                                            | 0.03047773    | 0.0308            | 0.01156572    |               |
| 25 | CO2                                                                                                                                                        | 0.0000      | 0.00004983    | 0.0016                                                                            | 0.00013401    | 0.0001            | 0.00004968    |               |
| 26 | H2S                                                                                                                                                        | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 27 | Methane                                                                                                                                                    | 0.7089      | 0.97461524    | 11.3725                                                                           | 0.95538108    | 2.6010            | 0.97647265    |               |
| 28 | Ethane                                                                                                                                                     | 0.0053      | 0.00733136    | 0.1603                                                                            | 0.01347030    | 0.0309            | 0.01158886    |               |
| 29 | Propane                                                                                                                                                    | 0.0001      | 0.00019297    | 0.0062                                                                            | 0.00051995    | 0.0008            | 0.00031402    |               |
| 30 | i-Butane                                                                                                                                                   | 0.0000      | 0.00000267    | 0.0001                                                                            | 0.00000949    | 0.0000            | 0.00000517    |               |
| 31 | n-Butane                                                                                                                                                   | 0.0000      | 0.00000201    | 0.0001                                                                            | 0.00000715    | 0.0000            | 0.00000375    |               |
| 32 | i-Pentane                                                                                                                                                  | 0.0000      | 0.00000005    | 0.0000                                                                            | 0.00000021    | 0.0000            | 0.00000010    |               |
| 33 | n-Pentane                                                                                                                                                  | 0.0000      | 0.00000002    | 0.0000                                                                            | 0.00000008    | 0.0000            | 0.00000004    |               |
| 34 | n-Hexane                                                                                                                                                   | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 35 | n-Heptane                                                                                                                                                  | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 36 | n-Octane                                                                                                                                                   | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 37 | n-Nonane                                                                                                                                                   | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 38 | H2O                                                                                                                                                        | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 39 | Oxygen                                                                                                                                                     | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 40 | THEOL-59                                                                                                                                                   | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 41 | 22-Mbutane                                                                                                                                                 | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 42 | 23-Mbutane                                                                                                                                                 | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 43 | Cyclopentane                                                                                                                                               | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 44 | 2-Mpentane                                                                                                                                                 | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 45 | 3-Mpentane                                                                                                                                                 | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 46 | 22-Mpentane                                                                                                                                                | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 47 | Mcyclopentan                                                                                                                                               | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 48 | 223-Mpentane                                                                                                                                               | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 49 | 24-Mpentane                                                                                                                                                | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 50 | Benzene                                                                                                                                                    | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 51 | 33-Mpentane                                                                                                                                                | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 52 | Cyclohexane                                                                                                                                                | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 53 | 2-Mhexane                                                                                                                                                  | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 54 | 23-Mpentane                                                                                                                                                | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 55 | 3-Mhexane                                                                                                                                                  | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 56 | 11Mcycpentan                                                                                                                                               | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 57 | Mcyclohexane                                                                                                                                               | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 58 | 22-Mhexane                                                                                                                                                 | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 59 | 233-Mpentane                                                                                                                                               | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 60 | Toluene                                                                                                                                                    | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 61 | 23-Mhexane                                                                                                                                                 | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 62 | 2M-3Epentane                                                                                                                                               | 0.0000      | 0.00000000    | 0.0000                                                                            | 0.00000000    | 0.0000            | 0.00000000    |               |
| 63 | Aspen Technology Inc.                                                                                                                                      |             |               | Aspen HYSYS Version 7.3 (25.0.4.7337)                                             |               |                   | Page 4 of 5   |               |

|    |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------|-----------------------------------------------------------------------------------|---------------------------------|-------------------|
| 1  |  <div> <div>KOCH BUSINESS SOLUTIONS</div> <div>Burlington, MA</div> <div>USA</div> </div> |             |                                       | Case Name: Case 2 - Orla Cryo Plant with NGL Stabilizer - Summer - Design Case.hs |                                 |                   |
| 2  |                                                                                                                                                                            |             |                                       | Unit Set: Sri1e«1                                                                 |                                 |                   |
| 3  |                                                                                                                                                                            |             |                                       | Date/Time: Tue Jun 21 17:16:11 2016                                               |                                 |                   |
| 4  |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 5  |                                                                                                                                                                            |             |                                       |                                                                                   | Fluid Package: Basis-1          |                   |
| 6  | <b>Material Stream: South Eddy Purge Gas (cont</b>                                                                                                                         |             |                                       |                                                                                   | Property Package: Peng-Robinson |                   |
| 7  |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 8  |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 9  | COMPOSITION                                                                                                                                                                |             |                                       |                                                                                   |                                 |                   |
| 10 |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 11 | Vapour Phase (continued)                                                                                                                                                   |             |                                       |                                                                                   |                                 |                   |
| 12 |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 13 | COMPONENTS                                                                                                                                                                 | MOLAR FLOW  | MOLE FRACTION                         | MASS FLOW                                                                         | MASS FRACTION                   | LIQUID VOLUME     |
| 14 |                                                                                                                                                                            | (lbmole/hr) |                                       | (lb/hr)                                                                           |                                 | FLOW (barrel/day) |
| 15 | 2-Mheptane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 16 | 4-Mheptane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 17 | 34-Mhexane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 18 | 3-Mheptane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 19 | 112-MCC5                                                                                                                                                                   | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 20 | 11-Mcyclohexan                                                                                                                                                             | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 21 | 235-Mhexane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 22 | 224-Mhexane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 23 | 22-Mheptane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 24 | 223-Mhexane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 25 | 25-Mheptane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 26 | 2-Moctane                                                                                                                                                                  | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 27 | 24-Mheptane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 28 | Ecyclohexane                                                                                                                                                               | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 29 | 33-Mheptane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 30 | 26-Mheptane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 31 | E-Benzene                                                                                                                                                                  | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 32 | 23-Mheptane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 33 | m-Xylene                                                                                                                                                                   | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 34 | p-Xylene                                                                                                                                                                   | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 35 | 34-Mheptane                                                                                                                                                                | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 36 | 3-Eheptane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 37 | 4-Moctane                                                                                                                                                                  | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 38 | 3-Moctane                                                                                                                                                                  | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 39 | o-Xylene                                                                                                                                                                   | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 40 | i-Bcycpentan                                                                                                                                                               | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 41 | 2-Mnonane                                                                                                                                                                  | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 42 | 1-M-1-ECC5                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 43 | Cumene                                                                                                                                                                     | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 44 | 23-Moctane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 45 | 3-Eoctane                                                                                                                                                                  | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 46 | n-Bcyclohexane                                                                                                                                                             | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 47 | n-PBenzene                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 48 | 1M3-EBenzene                                                                                                                                                               | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 49 | 1M4-EBenzene                                                                                                                                                               | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 50 | 1M2-EBenzene                                                                                                                                                               | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 51 | 22-Moctane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 52 | tert-Bbenzen                                                                                                                                                               | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 53 | 135-MBenzene                                                                                                                                                               | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 54 | 36-Moctane                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 55 | i-BBenzene                                                                                                                                                                 | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 56 | n-Decane                                                                                                                                                                   | 0.0000      | 0.00000000                            | 0.0000                                                                            | 0.00000000                      | 0.0000            |
| 57 | Total                                                                                                                                                                      | 0.7273      | 1.0000                                | 11.9037                                                                           | 1.0000                          | 2.6636            |
| 58 |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 59 |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 60 |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 61 |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 62 |                                                                                                                                                                            |             |                                       |                                                                                   |                                 |                   |
| 63 | Aspen Technology Inc.                                                                                                                                                      |             | Aspen HYSYS Version 7.3 (25.0.4.7337) |                                                                                   |                                 | Page 5 of 5       |

Table 13.5-1 (English Units). THC AND SOOT EMISSIONS FACTORS FOR FLARE OPERATIONS<sup>a</sup>

EMISSIONS FACTOR RATING: B

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

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

<sup>b</sup> Measured as methane equivalent.

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

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

| Pollutant                               | SCC                   | Emissions Factor (lb/10 <sup>6</sup> Btu) | Representativeness |
|-----------------------------------------|-----------------------|-------------------------------------------|--------------------|
| Volatile organic compounds <sup>b</sup> | 30190099;<br>30600904 | 0.57                                      | Poorly             |
| Carbon monoxide <sup>c</sup>            | 30190099;<br>30600904 | 0.31                                      | Poorly             |

<sup>a</sup> These factors apply to well operated flares achieving at least 98% destruction efficiency and operating in compliance with the current General Provisions requirements of 40 CFR Part 60, i.e. >300 btu/scf net heating value in the vent gas and less than the specified maximum flare tip velocity. These factors are based on steam-assisted and air-assisted flares burning a variety of vent gases.

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

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



October 2000  
RG-109 (Draft)

## Air Permit Technical Guidance for Chemical Sources:

# Flares and Vapor Oxidizers

printed on  
recycled paper

Air Permits Division

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TEXAS NATURAL RESOURCE CONSERVATION COMMISSION



**Barry R. McBee, Chairman**  
**R. B. "Ralph" Marquez, Commissioner**  
**John M. Baker, Commissioner**

**Jeffrey A. Saitas, P.E., Executive Director**

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## Technical Disclaimer

This document is intended as guidance to explain the specific requirements for new source review permitting of flares and vapor oxidizers; it does not supersede or replace any state or federal law, regulation, or rule. References to abatement equipment technologies are not intended to represent minimum or maximum levels of Best Available Control Technology (BACT). Determinations of BACT are made on a case-by-case basis as part of the New Source Review of permit applications. BACT determinations are always subject to adjustment in consideration of specific process requirements, air quality concerns, and recent developments in abatement technology. Additionally, specific health effects concerns may indicate stricter abatement than required by the BACT determination.

The represented calculation methods are intended as an aid in the completion of acceptable submittals; alternate calculation methods may be equally acceptable if they are based upon, and adequately demonstrate, sound engineering assumptions or data.

These guidelines are applicable as of this document's publication date but are subject to revision during the permit application preparation and review period. It is the responsibility of the applicants to remain abreast of any guideline or regulation developments that may affect their industries.

The electronic version of this document may not contain attachments or forms (such as the PI-1, Standard Exemptions, or tables) that can be obtained electronically elsewhere on the TNRCC Web site.

The special conditions included with these guidelines are for purposes of example only. Special conditions included in an actual permit are written by the reviewing engineer to address specific permit requirements and operating conditions.

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## Chapter 2—Types of Flare and Oxidizer Systems

This document provides guidance for two classes of vapor combustion control devices: flares and vapor oxidizers. While there may be some overlap between the two, flares have generally been treated separately by the EPA and the TNRCC, in large part because flares have an open flame and often cannot be sampled, so emissions are estimated based on the results of flare testing performed in the early 1980s. Each of the two classes will be dealt with separately in each of the chapters of this document.

***Combustion Control Devices NOT Discussed.*** This document will not cover permitting of RCRA or BIF units because the requirements for these units often go beyond the requirements for state air permitting. Incinerators used to treat solid wastes are covered in another technical guidance document, *Incinerators*. Guidance for combustion control devices associated with spray paint booths, coatings operations, and semiconductor facilities should be obtained by calling the TNRCC New Source Review Permits Division at (512) 239-1250.

### Flares

Flare systems generally are open-flame control devices used for disposing of waste gas streams during both routine process and emergency or upset conditions. In addition to simple, unassisted flares, typical smokeless flare systems include, but are not limited to, the following:

- ***Enclosed Flares/Vapor Combustors.*** Enclosed flares are used in disposing of waste gas streams in instances where a visible flame is unacceptable. Applications include chemical processing, petroleum refining and production, and municipal waste gas treatment. These may be referred to as vapor combustors and can have more than one burner in the stack.
- ***Steam-Assisted Flares.*** Steam-assisted flares are used in disposing of low-pressure waste gas streams when steam is available and practical to minimize smoking from the flare. Applications are similar to those of enclosed flares. Flares might also be assisted with natural gas if readily available on site; these flares would undergo a case-by-case review.
- ***Air-Assisted Flares.*** Air-assisted flares are used in disposing of low-pressure waste gas streams when practical or when steam utilities are not available to minimize smoking from the flare. Applications include chemical processing, petroleum refining and production, and pipeline transportation.
- ***Sonic Flares.*** Sonic flares are used in disposing of high-pressure waste gas streams. Applications include gas production, pipeline transportation, and treatment plants.

- ***Multipoint Flare Systems.*** Multipoint flare systems are used in disposing of both high- and low-pressure waste gas streams. Multiple burner tips in conjunction with a staged control system provide for controlled combustion. Applications are similar to those of air-assisted flares.

## Vapor Oxidizers

These devices generally do not have an open flame but have an exhaust stack which allows for sampling and monitoring of exhaust emissions. The most common type, thermal, relies on the combustion heat of the waste gas and assist fuel (if required) to oxidize the waste gas air contaminants. Other types include:

- ***Recuperative.*** In this case, the waste gas is directed to a heat exchanger to be preheated by the exhaust gas, to minimize the need for additional assist fuel. Recuperative oxidizers are considered a subset of thermal oxidizers in this document.
- ***Regenerative.*** Combustion takes place in a chamber with a heat sink, such as ceramic saddles, which retains the heat of combustion, allowing for combustion of more dilute vapor streams (which have a low heat of combustion) at a lower cost. These units generally have multiple chambers, which allow for the preheat of one chamber by exhaust gases while combustion takes place in another chamber.
- ***Catalytic.*** Combustion takes place over a catalyst that allows for combustion at a lower temperature (in the range of 600 to 800°F as opposed to greater than 1400°F for many thermal oxidizers). Catalytic oxidizers function best with a waste stream with constant flow and composition.

## Chapter 5—Emission Factors, Efficiencies, and Calculations

This chapter provides detailed instructions for the calculations necessary to verify BACT and estimate emissions from flares and vapor oxidizers. Flares must be checked to determine whether they will satisfy the flow and thermal requirements of 40 CFR § 60.18, and their emissions are determined by the use of emission factors. Example calculations are provided for these flare calculations.

Oxidizer emissions are determined by using previous sampling results or emission factors from the manufacturer or AP-42. These calculations are very similar to the flare calculations and are only discussed in general terms.

### Flares: Introduction

Although emissions from emergency flares are not included in a permit when it is issued, emissions should be estimated for both routine process flares and emergency flares. Sometimes, emissions of routine pilot gas combustion may be included in an issued permit for emergency flares (although not required).

In this section, the *flare* emission factors and destruction efficiencies are presented first. This information is followed by sample *calculations* that demonstrate how to ensure that the requirements of 40 CFR § 60.18 are satisfied and how to estimate emissions from a flare. Flare data in Attachment B (typical refinery flare) will be used as a basis in most of the following calculations. Flare data in Attachment C (acid gas flare) will be used as a basis in the example calculations for SO<sub>2</sub> emissions.

### Flare Emission Factors

The usual flare destruction efficiencies and emission factors are provided in Table 4. The high-Btu waste streams referred to in the table have a heating value greater than 1,000 Btu/scf.

### Flare Destruction Efficiencies

Claims for destruction efficiencies greater than those listed in Table 4 will be considered on a case-by-case basis. The applicant may make one of the three following demonstrations to justify the higher destruction efficiency: (1) general method, (2) 99.5 percent justification, or (3) flare stack sampling.

**Table 4. Flare Factors**

| Waste Stream            | Destruction/Removal Efficiency (DRE)                                                                                                                                                                                                                   |                     |                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------|
| VOC                     | 98 percent (generic)<br><br>99 percent for compounds containing no more than 3 carbons that contain no elements other than carbon and hydrogen in addition to the following compounds: methanol, ethanol, propanol, ethylene oxide and propylene oxide |                     |                                    |
| H <sub>2</sub> S        | 98 percent                                                                                                                                                                                                                                             |                     |                                    |
| NH <sub>3</sub>         | case by case                                                                                                                                                                                                                                           |                     |                                    |
| CO                      | case by case                                                                                                                                                                                                                                           |                     |                                    |
| Air Contaminants        | Emission Factors                                                                                                                                                                                                                                       |                     |                                    |
| thermal NO <sub>x</sub> | steam-assist:                                                                                                                                                                                                                                          | high Btu<br>low Btu | 0.0485 lb/MMBtu<br>0.068 lb/MMBtu  |
|                         | other:                                                                                                                                                                                                                                                 | high Btu<br>low Btu | 0.138 lb/MMBtu<br>0.0641 lb/MMBtu  |
| fuel NO <sub>x</sub>    | NO <sub>x</sub> is 0.5 wt percent of inlet NH <sub>3</sub> , other fuels case by case                                                                                                                                                                  |                     |                                    |
| CO                      | steam-assist:                                                                                                                                                                                                                                          | high Btu<br>low Btu | 0.3503 lb/MMBtu<br>0.3465 lb/MMBtu |
|                         | other:                                                                                                                                                                                                                                                 | high Btu<br>low Btu | 0.2755 lb/MMBtu<br>0.5496 lb/MMBtu |
| PM                      | none, required to be smokeless                                                                                                                                                                                                                         |                     |                                    |
| SO <sub>2</sub>         | 100 percent S in fuel to SO <sub>2</sub>                                                                                                                                                                                                               |                     |                                    |

\*The only exception of this is if inorganics might be emitted from the flare. In the case of landfills, the AP-42 PM factor may be used. In other cases, the emissions should be based on the composition of the waste stream routed to the flare.

**FESCO, Ltd.**  
**105 Medical Dr. - Ozona, Texas 76943**

**For:** Enterprise Products Company  
 10500 Heritage Blvd., Suite 150  
 San Antonio, Texas 78216

**Sample:** South Eddy Plant  
 Flare Gas  
 Sampled @ 0 psig & 61 °F

Date Sampled: 12/15/16 @ 12:44 pm

Job Number: 61110.011

**CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286**

| COMPONENT           | MOL%         | GPM          |
|---------------------|--------------|--------------|
| Hydrogen Sulfide*   | < 0.001      |              |
| Nitrogen            | 6.185        |              |
| Carbon Dioxide      | 2.983        |              |
| Methane             | 45.423       |              |
| Ethane              | 7.917        | 2.126        |
| Propane             | 11.723       | 3.242        |
| Isobutane           | 3.527        | 1.159        |
| n-Butane            | 12.527       | 3.965        |
| 2-2 Dimethylpropane | 0.048        | 0.018        |
| Isopentane          | 4.298        | 1.578        |
| n-Pentane           | 4.338        | 1.579        |
| Hexanes             | 0.761        | 0.315        |
| Heptanes Plus       | <u>0.270</u> | <u>0.092</u> |
| Totals              | 100.000      | 14.073       |

**Computed Real Characteristics Of Heptanes Plus:**

Specific Gravity ----- 2.968 (Air=1)  
 Molecular Weight ----- 85.13  
 Gross Heating Value ----- 4268 BTU/CF

**Computed Real Characteristics Of Total Sample:**

Specific Gravity ----- 1.198 (Air=1)  
 Compressibility (Z) ----- 0.9905  
 Molecular Weight ----- 34.36  
 Gross Heating Value  
   Dry Basis ----- 1824 BTU/CF  
   Saturated Basis ----- 1793 BTU/CF

\*Hydrogen Sulfide tested on location by: Stain Tube Method (GPA 2377)  
 <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.650 PSI &amp; 60 Deg F

Sampled By: (08) B. McCollum  
 Analyst: RJ  
 Processor: RJ  
 Cylinder ID: T-2989

Certified: FESCO, Ltd. - Ozona, Texas

---

 Tom Anderson 325-392-3773

## CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

## TOTAL REPORT

| COMPONENT              | MOL %        | GPM          | WT %         |
|------------------------|--------------|--------------|--------------|
| Hydrogen Sulfide*      | < 0.001      |              | < 0.001      |
| Nitrogen               | 6.185        |              | 5.042        |
| Carbon Dioxide         | 2.983        |              | 3.820        |
| Methane                | 45.423       |              | 21.203       |
| Ethane                 | 7.917        | 2.126        | 6.927        |
| Propane                | 11.723       | 3.242        | 15.043       |
| Isobutane              | 3.527        | 1.159        | 5.965        |
| n-Butane               | 12.527       | 3.965        | 21.188       |
| 2,2 Dimethylpropane    | 0.048        | 0.018        | 0.101        |
| Isopentane             | 4.298        | 1.578        | 9.024        |
| n-Pentane              | 4.338        | 1.579        | 9.108        |
| 2,2 Dimethylbutane     | 0.017        | 0.007        | 0.043        |
| Cyclopentane           | 0.000        | 0.000        | 0.000        |
| 2,3 Dimethylbutane     | 0.146        | 0.060        | 0.366        |
| 2 Methylpentane        | 0.270        | 0.113        | 0.677        |
| 3 Methylpentane        | 0.125        | 0.051        | 0.313        |
| n-Hexane               | 0.203        | 0.084        | 0.509        |
| Methylcyclopentane     | 0.086        | 0.030        | 0.211        |
| Benzene                | 0.078        | 0.022        | 0.177        |
| Cyclohexane            | 0.057        | 0.019        | 0.140        |
| 2-Methylhexane         | 0.005        | 0.002        | 0.015        |
| 3-Methylhexane         | 0.005        | 0.002        | 0.015        |
| 2,2,4 Trimethylpentane | 0.000        | 0.000        | 0.000        |
| Other C7's             | 0.019        | 0.008        | 0.055        |
| n-Heptane              | 0.005        | 0.002        | 0.015        |
| Methylcyclohexane      | 0.009        | 0.004        | 0.026        |
| Toluene                | 0.004        | 0.001        | 0.011        |
| Other C8's             | 0.002        | 0.001        | 0.006        |
| n-Octane               | 0.000        | 0.000        | 0.000        |
| Ethylbenzene           | 0.000        | 0.000        | 0.000        |
| M & P Xylenes          | 0.000        | 0.000        | 0.000        |
| O-Xylene               | 0.000        | 0.000        | 0.000        |
| Other C9's             | 0.000        | 0.000        | 0.000        |
| n-Nonane               | 0.000        | 0.000        | 0.000        |
| Other C10's            | 0.000        | 0.000        | 0.000        |
| n-Decane               | 0.000        | 0.000        | 0.000        |
| Undecanes (11)         | <u>0.000</u> | <u>0.000</u> | <u>0.000</u> |
| Totals                 | 100.000      | 14.073       | 100.000      |

## Computed Real Characteristics Of Total Sample:

|                           |        |         |
|---------------------------|--------|---------|
| Specific Gravity -----    | 1.198  | (Air=1) |
| Compressibility (Z) ----- | 0.9905 |         |
| Molecular Weight -----    | 34.36  |         |
| Gross Heating Value       |        |         |
| Dry Basis -----           | 1824   | BTU/CF  |
| Saturated Basis -----     | 1793   | BTU/CF  |

# Off-Gas Analysis

|                                   |            |           |
|-----------------------------------|------------|-----------|
| Stream Number                     |            | 518       |
|                                   | Unit       |           |
| Vapour Fraction                   |            | 1.0000    |
| Temperature                       | F          | 297.99    |
| Pressure                          | psia       | 613.10    |
| Molar Flow                        | lbmole/hr  | 3.3       |
| Mass Flow                         | lb/hr      | 15853.8   |
| Molar Enthalpy                    | Btu/lbmole | -45499.1  |
| Heat Flow                         | Btu/hr     | -16721810 |
| Std Gas Flow                      | MMSCFD     | 3.3       |
| Standard Ideal Liquid Volume Flow | barrel/hr  | ---       |
| Molecular Weight                  |            | 43.14     |
| Mass Density                      | lb/ft3     | 4.24      |
| Vapor Actual Volume Flow          | ACFM       | 62.4      |
| Liquid Actual Volume Flow         | USGPM      | ---       |
| Z Factor                          |            | 0.8       |
| Viscosity                         | cP         | 0.0       |

| Component Molar Fraction | Mol Wt. | Mol Frac |
|--------------------------|---------|----------|
| Nitrogen                 | 28.01   | 0.162%   |
| CO2                      | 44.01   | 2.123%   |
| H2S                      | 34.08   | 0.000%   |
| Methane                  | 16.04   | 25.042%  |
| Ethane                   | 30.07   | 15.403%  |
| Propane                  | 44.10   | 20.376%  |
| i-Butane                 | 58.12   | 5.847%   |
| n-Butane                 | 58.12   | 15.108%  |
| i-Pentane                | 72.15   | 5.876%   |
| n-Pentane                | 72.15   | 5.934%   |
| n-Hexane                 | 86.18   | 2.492%   |
| n-Heptane                | 100.21  | 1.125%   |
| n-Octane                 | 114.23  | 0.473%   |
| H2O                      | 18.02   | 0.037%   |
| Therminol-59             | 207.00  | 0.000%   |
| Ucarsol AP-814           | ~120.00 | 0.000%   |
| Triethylene Glycol       | 138.46  | 0.000%   |

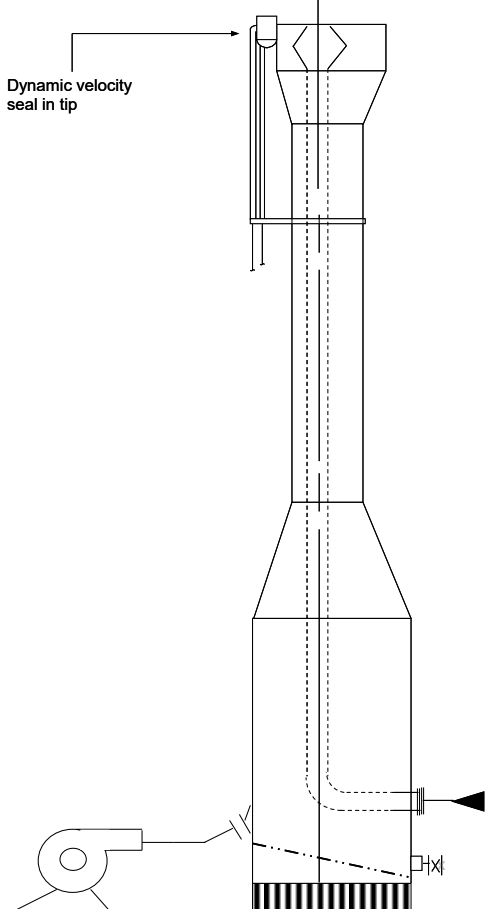
# OPD

## Optimized Process Designs

25610 Clay Road/Katy, Texas 77493

P.O. Box 810/Katy, TX 77492

### FLARE STACK SPECIFICATION SHEET

|    |                                                                                                                                                              |                                 |                        |              |            |                                                                                     |                   |             |                      |      |    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------|--------------|------------|-------------------------------------------------------------------------------------|-------------------|-------------|----------------------|------|----|
| 1  | CUSTOMER                                                                                                                                                     | ENTERPRISE PRODUCTS             |                        |              |            | -DESIGN DATA-                                                                       |                   |             |                      | 1    |    |
| 2  | PROJECT                                                                                                                                                      | SOUTH EDDY GAS PROCESSING PLANT |                        |              |            | CODE                                                                                | API 521           |             | STAMP                | No   | 2  |
| 3  | LOCATION                                                                                                                                                     | EDDY COUNTY, NEW MEXICO         |                        |              |            | DESIGN PRESS. (PSIG)                                                                |                   |             | OPER. PRESS. (PSIG)  |      | 3  |
| 4  | JOB NUMBER                                                                                                                                                   | 13070                           |                        |              |            | DESIGN TEMP (°F)                                                                    |                   |             | OPER. TEMP TOP (°F)  |      | 4  |
| 5  | ITEM NUMBER                                                                                                                                                  | FS-1001                         | NUMBER REQUIRED        | 1            |            |                                                                                     |                   |             | OPER. TEMP BOTT (°F) |      | 5  |
| 6  | SERVICE OF UNIT                                                                                                                                              | Flare Stack                     |                        |              |            | WIND LOAD (MPH)                                                                     | See Project Spec. |             | CORROSION ALLOW.     | None | 6  |
| 7  | MANUFACTURER                                                                                                                                                 |                                 |                        |              |            | E.Q. FACTOR                                                                         |                   |             | IMPACT TESTS         |      | 7  |
| 8  | SIZE                                                                                                                                                         | Vendor to specify               |                        |              |            | STRESS RELIEVE                                                                      | No                |             | X-RAY                |      | 8  |
| 9  |                                                                                                                                                              | (VERTICAL / HORIZONTAL)         |                        |              |            | PHYS. & CHEM TESTS                                                                  |                   |             |                      |      | 9  |
| 10 | SHIPPING WEIGHT                                                                                                                                              |                                 |                        |              |            |  |                   |             |                      |      | 10 |
| 11 | SPECIFICATION REFERENCE                                                                                                                                      |                                 |                        |              |            |                                                                                     |                   |             |                      |      | 11 |
| 12 | MATERIAL                                                                                                                                                     | SPEC                            | MATERIAL               | SPEC         | 12         |                                                                                     |                   |             |                      |      |    |
| 13 | SHELL                                                                                                                                                        |                                 | INTERALS               |              | 13         |                                                                                     |                   |             |                      |      |    |
| 14 | CONSTRUCTION                                                                                                                                                 |                                 |                        |              | 14         |                                                                                     |                   |             |                      |      |    |
| 15 | HEADS                                                                                                                                                        |                                 | DAVIT/HINGE            |              | 15         |                                                                                     |                   |             |                      |      |    |
| 16 |                                                                                                                                                              |                                 | PLATFORMS              |              | 16         |                                                                                     |                   |             |                      |      |    |
| 17 | SUPPORTS                                                                                                                                                     |                                 | LADDER (CAGED)         |              | 17         |                                                                                     |                   |             |                      |      |    |
| 18 |                                                                                                                                                              |                                 | CLIPS                  |              | 18         |                                                                                     |                   |             |                      |      |    |
| 19 | FLANGES                                                                                                                                                      |                                 | PAINTER TROLLEY        |              | 19         |                                                                                     |                   |             |                      |      |    |
| 20 | PIPE                                                                                                                                                         |                                 | LIFTING LUGS           |              | 20         |                                                                                     |                   |             |                      |      |    |
| 21 | COUPLINGS                                                                                                                                                    |                                 | PAINT                  |              | 21         |                                                                                     |                   |             |                      |      |    |
| 22 | GASKETS                                                                                                                                                      |                                 | INSULATION             |              | 22         |                                                                                     |                   |             |                      |      |    |
| 23 | BOLTS                                                                                                                                                        |                                 | INSUL. SUPPORT         |              | 23         |                                                                                     |                   |             |                      |      |    |
| 24 | NUTS                                                                                                                                                         |                                 | GROUNDING LUGS         |              | 24         |                                                                                     |                   |             |                      |      |    |
| 25 | - DESIGN -                                                                                                                                                   |                                 |                        |              |            | 25                                                                                  |                   |             |                      |      |    |
| 26 | DESIGN                                                                                                                                                       | PSV-FIRE-1                      | PSV-REF                | Acid Gas     | STAB VAPOR | 26                                                                                  |                   |             |                      |      |    |
| 27 |                                                                                                                                                              | Cond. Stg. Area                 | Cmp. Disch.            | w/Enrichment | Stab Ovhd  | 27                                                                                  |                   |             |                      |      |    |
| 28 | MASS/FLOW (Lb/hr)                                                                                                                                            | 262320                          | 281232                 | 44520        | 17105      | 28                                                                                  |                   |             |                      |      |    |
| 29 | DENSITY (Lb/ft³)                                                                                                                                             | 0.2013                          | 0.1262                 | 0.1306       | 0.142      | 29                                                                                  |                   |             |                      |      |    |
| 30 | MOLE WT.                                                                                                                                                     | 90.87                           | 44.10                  | 32.57        | 43.81      | 30                                                                                  |                   |             |                      |      |    |
| 31 | TEMP (°F)                                                                                                                                                    | 402                             | 200                    | 112          | 125        | 31                                                                                  |                   |             |                      |      |    |
| 32 | H2S - MOL%                                                                                                                                                   | 0.00                            | 0.00                   | 0.01         | 0.00       | 32                                                                                  |                   |             |                      |      |    |
| 33 | CO2                                                                                                                                                          | 0.00                            | 0.00                   | 58.14        | 1.89       | 33                                                                                  |                   |             |                      |      |    |
| 34 | H2O                                                                                                                                                          | 0.00                            | 0.00                   | 4.39         | 0.01       | 34                                                                                  |                   |             |                      |      |    |
| 35 | METHANE                                                                                                                                                      | 0.00                            | 0.00                   | 36.37        | 12.19      | 35                                                                                  |                   |             |                      |      |    |
| 36 | ETHANE                                                                                                                                                       | 0.00                            | 2.50                   | 0.85         | 22.35      | 36                                                                                  |                   |             |                      |      |    |
| 37 | PROPANE                                                                                                                                                      | 0.16                            | 95.00                  | 0.04         | 22.99      | 37                                                                                  |                   |             |                      |      |    |
| 38 | I-BUTANE                                                                                                                                                     | 1.01                            | 1.25                   | 0.00         | 22.39      | 38                                                                                  |                   |             |                      |      |    |
| 39 | N-BUTANE                                                                                                                                                     | 4.54                            | 1.25                   | 0.01         | 14.5       | 39                                                                                  |                   |             |                      |      |    |
| 40 | I-PENTANE                                                                                                                                                    | 10.43                           | 0.00                   | 0.00         | 1.96       | 40                                                                                  |                   |             |                      |      |    |
| 41 | N-PENTANE                                                                                                                                                    | 12.40                           | 0.00                   | 0.00         | 1.34       | 41                                                                                  |                   |             |                      |      |    |
| 42 | N-HEXANE+                                                                                                                                                    | 71.46                           | 0.00                   | 0.03         | 0.38       | 42                                                                                  |                   |             |                      |      |    |
| 43 | NITROGEN                                                                                                                                                     | 0.00                            | 0.00                   | 0.16         | 0          | 43                                                                                  |                   |             |                      |      |    |
| 44 | TOTAL                                                                                                                                                        | 100%                            | 100%                   | 100%         | 100%       | 44                                                                                  |                   |             |                      |      |    |
| 45 | Z                                                                                                                                                            | 0.9767                          | 0.9873                 | 0.9946       | 0.9832     | 45                                                                                  |                   |             |                      |      |    |
| 46 | Smokelessness Req'd?                                                                                                                                         | NO                              | NO                     | YES          | YES        | 46                                                                                  |                   |             |                      |      |    |
| 47 | Duty                                                                                                                                                         | Emergency                       | Emergency              | Emergency    | Emergency  | 47                                                                                  |                   |             |                      |      |    |
| 48 |                                                                                                                                                              |                                 | (20% added)            |              |            | 48                                                                                  |                   |             |                      |      |    |
| 49 |                                                                                                                                                              |                                 |                        |              |            | 49                                                                                  |                   |             |                      |      |    |
| 50 | - REMARKS -                                                                                                                                                  |                                 |                        |              |            | 50                                                                                  |                   |             |                      |      |    |
| 51 | NOTES:                                                                                                                                                       |                                 |                        |              |            | 51                                                                                  |                   |             |                      |      |    |
| 52 | 1. Guyed flare stack is not acceptable. Stack to be free-standing type.                                                                                      |                                 |                        |              |            | 52                                                                                  |                   |             |                      |      |    |
| 53 | 2. Retractable pilots/thermocouples (minimum of three required). Include automatic pilot monitoring re-ignition system, with type K thermocouples.           |                                 |                        |              |            | 53                                                                                  |                   |             |                      |      |    |
| 54 | 3. Provide fuel gas rate requirement (using 19 MW gas) for pilot gas. Also, instrument air requirements if applicable.                                       |                                 |                        |              |            | 54                                                                                  |                   |             |                      |      |    |
| 55 | 4. Max. back pressure at main stack entry = 1 psig for Acid Gas stream, 5 psig for Stab. Ovhd stream, and 10 psig for other streams.                         |                                 |                        |              |            | 55                                                                                  |                   |             |                      |      |    |
| 56 | 5. Max. thermal radiation @ 7' above grade = 1500 BTU/hr-ft² (including solar radiation). Provide radiation profile to 500 feet from stack.                  |                                 |                        |              |            | 56                                                                                  |                   |             |                      |      |    |
| 57 | 6. Lifting and tailing lugs for single point one piece lift with tailing crane. Shop trial bolt-up of stack/tip sections is required.                        |                                 |                        |              |            | 57                                                                                  |                   |             |                      |      |    |
| 58 | 7. Stack to be carbon steel. Flare tip to be 304L stainless steel. Paint carbon steel portions with 2-coat epoxy/polyurethane Sherwin-Williams system.       |                                 |                        |              |            | 58                                                                                  |                   |             |                      |      |    |
| 59 | 8. Meet FAA aircraft warning lights requirements if stack height dictates. Maximum waste gas exit velocity to meet Federal and New Mexico guidelines.        |                                 |                        |              |            | 59                                                                                  |                   |             |                      |      |    |
| 60 | 9. Include TEFC blower (compatible with VFD by others) or pressure-assist tip for smokelessness and assoc. pr. trans./controller or other controls as req'd. |                                 |                        |              |            | 60                                                                                  |                   |             |                      |      |    |
| 61 | 10. Provide guaranteed destruction efficiency of 98% of all hazardous air pollutants (HAPS).                                                                 |                                 |                        |              |            | 61                                                                                  |                   |             |                      |      |    |
| 62 | REV.                                                                                                                                                         | DATE                            | DESCRIPTION            |              | CHECK      |                                                                                     |                   | DRAWING NO. |                      | 62   |    |
| 63 | A                                                                                                                                                            | 4-Feb-14                        | Preliminary Spec sheet |              | Sri        |                                                                                     |                   |             | FS-1001              | 63   |    |
| 64 | B                                                                                                                                                            | 29-Oct-14                       | Issued for Bid         |              | MEG        |                                                                                     |                   |             |                      | 64   |    |
| 65 | C                                                                                                                                                            | 24-Dec-14                       | Issued for Re-Bid      |              | GWT        |                                                                                     |                   |             | JOB NO. 13070 REV. C | 65   |    |



John Zink Company LLC  
11920 East Apache Street  
Tulsa, Oklahoma 74116  
United States

T : +1.918.234.1800  
F : +1.918.234.2700

February 1, 2017

Enterprise Products  
1100 Louisiana St.  
Houston, TX 77002

Attention:       Jing Li

RE:       South Eddy Gas Processing Plant Flare System  
          John Zink Ref:   PF-49611-A1

Dear Ms. Li:

The hydrocarbon destruction efficiency of the PLA-36 flare tip provided by John Zink Company for your plant under our quotation number PF-49611-A1 will be 99% or higher for C1-C3 hydrocarbons and 98% or higher for all other compounds when the flare is operated and maintained according to the guidance in our operating manual and within the design operating parameters and accepted industry practices for air assisted flare tips.

If you have any questions, please feel free to contact us.

Best Regards,

A handwritten signature in blue ink, appearing to read 'K. Leary', is written over a light blue horizontal line.

Kevin Leary  
Applications Engineering Director – Flare Systems  
John Zink Hamworthy Combustion

# OPD

## Optimized Process Designs

25610 Clay Road/Katy, Texas 77493

P.O. Box 810/Katy, Texas 77492

### THERMAL OXIDIZER SPECIFICATION SHEET

|    |                                                                                                                   |                                  |                                                               |                    |                                  |          |             |
|----|-------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------|--------------------|----------------------------------|----------|-------------|
| 1  | CUSTOMER:                                                                                                         | ENTERPRISE PRODUCTS              |                                                               | ITEM NO.           | TO -1001                         |          | 1           |
| 2  | PROJECT                                                                                                           | 200 MMSCFD SOUTH EDDY CRYO PLANT |                                                               | SERVICE OF UNIT    | THERMAL OXIDIZER                 |          | 2           |
| 3  | LOCATION                                                                                                          | NEW MEXICO                       |                                                               | ORIGINAL DATE:     | 1/27/2014                        | BY: SRI  | 3           |
| 4  | JOB NUMBER                                                                                                        | 13070                            |                                                               | INQUIRY NO.        |                                  |          | 4           |
| 5  | TYPE OF EQUIPMENT                                                                                                 | THERMAL OXIDIZER                 |                                                               | PURCHASE ORDER NO. |                                  |          | 5           |
| 6  |                                                                                                                   | (NO WHRU)                        |                                                               | SPEC. NO.          |                                  |          | 6           |
| 7  |                                                                                                                   |                                  |                                                               |                    |                                  |          | 7           |
| 8  | PAGE 1 OF 2                                                                                                       |                                  |                                                               |                    |                                  |          | 8           |
| 9  |                                                                                                                   |                                  |                                                               |                    |                                  |          | 9           |
| 10 | PROCESS REQUIREMENT: THE MINIMUM GUARANTEED DESTRUCTIVE EFFICIENCY FOR THIS UNIT SHALL BE 99.5%.                  |                                  |                                                               |                    |                                  |          | 10          |
| 11 | CONTAINED IN THE INLET GAS STREAMS AS DEFINED BY THE GAS ANALYSIS.                                                |                                  |                                                               |                    |                                  |          | 11          |
| 12 | OTHER SPECIFICATIONS:                                                                                             |                                  |                                                               |                    |                                  |          | 12          |
| 13 | PAINTING AND SURFACE PREPARATION SHALL BE IN ACCORDANCE WITH THE ATTACHED SPECIFICATIONS.                         |                                  |                                                               |                    |                                  |          | 13          |
| 14 | VENDOR SHALL SUPPLY ALL INSULATING AND GASKETING MATERIAL FOR TRANSITION PIECES, FLANGED CONNECTIONS.             |                                  |                                                               |                    |                                  |          | 14          |
| 15 | THERMAL OXIDIZER WILL BE DESIGNED FOR ACID GAS AND AMINE FLASH GAS RATES SHOWN.                                   |                                  |                                                               |                    |                                  |          | 15          |
| 16 | AN ADDITIONAL 20% HAS BEEN ADDED TO ACID GAS RATE AND 150% HAS BEEN ADDED TO FLASH GAS RATE FROM SIMULATED RATES. |                                  |                                                               |                    |                                  |          | 16          |
| 17 | VENDOR TO PROVIDE BURNER MANAGEMENT SYSTEM/CONTROL PANEL PER THE ATTACHED DRAWINGS.                               |                                  |                                                               |                    |                                  |          | 17          |
| 18 | VENDOR CONTROL PANEL WILL INTERFACE WITH ALLEN BRADLEY BASED PLANT CONTROL SYSTEM.                                |                                  |                                                               |                    |                                  |          | 18          |
| 19 | SOURCES OF EMISSIONS:                                                                                             |                                  |                                                               |                    |                                  |          | 19          |
| 20 | Streams                                                                                                           |                                  | Amine Still OH - Acid gas<br>Summer Case                      |                    | Amine Flash gas -<br>Summer Case |          | 20          |
| 21 | Component                                                                                                         | Mol. Wt                          | Mol%                                                          | lbmol/hr           | Mol%                             | lbmol/hr | 21          |
| 23 | CO2                                                                                                               | 44.01                            | 91.56%                                                        | 792.8913           | 8.28%                            | 4.4670   | 23          |
| 24 | Nitrogen                                                                                                          | 28.01                            | 0.00%                                                         | 0.0038             | 0.44%                            | 0.2382   | 24          |
| 25 | Methane                                                                                                           | 16.0429                          | 0.23%                                                         | 1.9621             | 68.39%                           | 36.9135  | 25          |
| 26 | Ethane                                                                                                            | 30.0699                          | 0.05%                                                         | 0.4729             | 11.29%                           | 6.0938   | 26          |
| 27 | Propane                                                                                                           | 44.097                           | 0.02%                                                         | 0.1553             | 3.85%                            | 2.0767   | 27          |
| 28 | n-Butane                                                                                                          | 58.124                           | 0.01%                                                         | 0.0486             | 0.82%                            | 0.4424   | 28          |
| 29 | i-Butane                                                                                                          | 58.124                           | 0.03%                                                         | 0.2200             | 1.13%                            | 0.6088   | 29          |
| 30 | n-Pentane                                                                                                         | 72.151                           | 0.00%                                                         | 0.0049             | 0.11%                            | 0.0612   | 30          |
| 31 | i-Pentane                                                                                                         | 72.151                           | 0.00%                                                         | 0.0055             | 0.13%                            | 0.0683   | 31          |
| 32 | n-Hexane                                                                                                          | 86.1779                          | 0.00%                                                         | 0.0115             | 0.22%                            | 0.1206   | 32          |
| 33 | n-Heptane                                                                                                         | 100.205                          | 0.00%                                                         | 0.0046             | 0.06%                            | 0.0344   | 33          |
| 34 | n-Octane                                                                                                          | 114.232                          | 0.00%                                                         | 0.0044             | 0.04%                            | 0.0198   | 34          |
| 22 | Water                                                                                                             | 18.02                            | 8.10%                                                         | 70.1851            | 5.24%                            | 2.8281   | 22          |
| 35 | Total                                                                                                             |                                  | 100.00%                                                       | 865.9800           | 100.00%                          | 53.9750  | 35          |
| 36 |                                                                                                                   |                                  |                                                               |                    |                                  |          | 36          |
| 37 | Temp, F                                                                                                           |                                  | 120                                                           |                    | 166.8                            |          | 37          |
| 38 | Press, psig                                                                                                       |                                  | 8                                                             |                    | 80.0                             |          | 38          |
| 39 | Mol Wt                                                                                                            |                                  | 41.84                                                         |                    | 22.38                            |          | 39          |
| 40 | flow rate, lb/hr                                                                                                  |                                  | 36231                                                         |                    | 1208                             |          | 40          |
| 41 | MMSCFD                                                                                                            |                                  | 7.88652                                                       |                    | 0.4915                           |          | 41          |
| 42 | VOC (C3+), lbmol/hr                                                                                               |                                  | 0.45475                                                       |                    | 3.43225                          |          | 42          |
| 43 | BTEX, lbmol/hr                                                                                                    |                                  | 0.00000                                                       |                    | 0.00000                          |          | 43          |
| 44 |                                                                                                                   |                                  |                                                               |                    |                                  |          | 44          |
|    | DATE                                                                                                              | REV.                             | DESCRIPTION                                                   |                    |                                  | CHECK    | DRAWING NO. |
|    | 1/27/2014                                                                                                         | A                                | ISSUED FOR MECHANICAL REVIEW                                  |                    |                                  | Sri      | TO -1001    |
|    | 2/11/2014                                                                                                         | B                                | Added 20% additional flow for acid gas and 150% for flash gas |                    |                                  | Sri      |             |
|    | 5/23/2014                                                                                                         | C                                | Revised Process Conditions                                    |                    |                                  | CR       |             |
|    | 8/15/2014                                                                                                         | D                                | Revised Process Conditions with no H2S                        |                    |                                  | Sri      | JOB NO.     |
|    | 10/29/2014                                                                                                        | E                                | ISSUED FOR BID                                                |                    |                                  | MEG      | REV. E      |

### THERMAL OXIDIZER SPECIFICATION SHEET

|                   |                                  |                    |                   |
|-------------------|----------------------------------|--------------------|-------------------|
| CUSTOMER:         | ENTERPRISE PRODUCTS              | ITEM NO.           | TO -1001          |
| PROJECT           | 200 MMSCFD SOUTH EDDY CRYO PLANT | SERVICE OF UNIT    | THERMAL OXIDIZER  |
| LOCATION          | NEW MEXICO                       | ORIGINAL DATE:     | 1/27/2014 BY: Sri |
| JOB NUMBER        | 13070                            | INQUIRY NO.        |                   |
| TYPE OF EQUIPMENT | THERMAL OXIDIZER                 | PURCHASE ORDER NO. |                   |
|                   | (NO WHRU)                        | SPEC. NO.          |                   |
| PAGE 2 OF 2       |                                  |                    |                   |

|                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------|
| PROVIDE ADDITIONAL BLOWERS FOR INLET GAS IF NECESSARY.                                                                               |
| ALL INLET AND OUTLET CONNECTIONS WILL BE FLANGED.                                                                                    |
| POWER SHALL BE 460V/3PH/60HZ. DRIVERS SHALL BE TEFC, DIV 2.                                                                          |
| PIPING FOR FUEL GAS TRAIN SHALL BE IN ACCORDANCE WITH B31.3.                                                                         |
| THERMAL OXIDIZER SHALL HAVE A 4:1 TURNDOWN RATIO.                                                                                    |
| SEE ATTACHED SITE SPECIFIC EQUIPMENT DESIGN SPECS FOR SEISMIC/WIND LOADS, ETC.                                                       |
| PROVIDE GUARANTEED VOC, HAP, NOX, AND CO EMISSIONS WITH PROPOSAL.                                                                    |
| SPECIFY EXHAUST GAS FLOW AND TEMPERATURE.                                                                                            |
| PROVIDE LOW NOX BURNERS                                                                                                              |
| PROVIDE ESTIMATED EMISSIONS OF PM <sub>10</sub> .                                                                                    |
| PROVIDE OPTION FOR VFD COMPATIBILITY WITH BLOWER MOTORS.                                                                             |
| EQUIPMENT IS TO BE PLACED IN A NON-CLASSIFIED AREA, HOWEVER IF THE PROVIDED EQUIPMENT CREATES A CLASSIFIED AREA, ALL INSTRUMENTATION |
| AND ELECTRICAL ITEMS TO BE DESIGNED FOR THE CLASSIFICATION                                                                           |
| FUEL GAS COMPOSITION:                                                                                                                |

| Components    | C2 Recovery<br>(Design) | C2 Rejection<br>(Off-Design) | INLET GAS<br>(Off-Design) |
|---------------|-------------------------|------------------------------|---------------------------|
| Mol%          | Mol%                    | Mol%                         |                           |
| Nitrogen      | 1.761%                  | 1.536%                       | 1.394%                    |
| CO2           | 0.004%                  | 1.529%                       | 3.018%                    |
| H2S           | 0.000%                  | 0.000%                       | 0.000%                    |
| Methane       | 97.474%                 | 85.175%                      | 77.299%                   |
| Ethane        | 0.740%                  | 11.184%                      | 11.260%                   |
| Propane       | 0.020%                  | 0.560%                       | 4.792%                    |
| i-Butane      | 0.000%                  | 0.008%                       | 0.510%                    |
| n-Butane      | 0.000%                  | 0.006%                       | 0.836%                    |
| i-Pentane     | 0.000%                  | 0.000%                       | 0.200%                    |
| n-Pentane     | 0.000%                  | 0.000%                       | 0.179%                    |
| n-Hexane      | 0.000%                  | 0.000%                       | 0.348%                    |
| n-Heptane     | 0.000%                  | 0.000%                       | 0.087%                    |
| n-Octane      | 0.000%                  | 0.000%                       | 0.039%                    |
| H2O           | 0.000%                  | 0.000%                       | 0.037%                    |
| Others        | 0.000%                  | 0.000%                       | 0.000%                    |
| Total         | 100.000%                | 100.000%                     | 100.000%                  |
| LHV, BTU/FT^3 | 902.4                   | 973.4                        | 1078.5                    |
| HHV, BTU/FT^3 | 1002.1                  | 1077.7                       | 1189.9                    |
| HC DEW PT, F  | -147.3                  | -76.9                        | 80.0                      |
| H2O DEW PT, F | ---                     | ---                          | 51.2                      |

| DATE       | REV. | DESCRIPTION                                                   | CHECK | DRAWING NO. |
|------------|------|---------------------------------------------------------------|-------|-------------|
| 1/27/2014  | A    | ISSUED FOR MECHANICAL REVIEW                                  | Sri   | TO -1001    |
| 2/11/2014  | B    | Added 20% additional flow for acid gas and 150% for flash gas | Sri   |             |
| 5/23/2014  | C    | Revised Process Conditions                                    | CR    |             |
| 8/15/2014  | D    | Revised Process Conditions with no H2S                        |       | JOB NO.     |
| 10/29/2014 | E    | ISSUED FOR BID                                                | MEG   | 13070       |
|            |      |                                                               |       | REV.        |
|            |      |                                                               |       | E           |

### C. Guarantee of Emissions

John Zink Company guarantees the performance as follows provided that the equipment is operated in compliance with John Zink operating and maintenance guidelines, accepted good industry practices, and within the full rate and normal design conditions as defined in the Design Summary.

|                            | <i>Unit</i> | <i>Guarantee</i> |
|----------------------------|-------------|------------------|
| VOC Destruction Efficiency | %           | 99.5             |
| NO <sub>x</sub>            | lb/MMBtu    | 0.080            |
| CO                         | lb/MMBtu    | 0.075            |
| PM10                       | Lb/MMBtu    | 0.02             |

John Zink Company is responsible only for those emissions that pass through the thermal oxidizer system. Performance testing shall be conducted by the customer within sixty (60) days after the equipment has been placed in operation or no longer than one year after notification to ship, whichever occurs first. If performance tests are not executed within this time period, the Performance Guarantee shall be considered to have been met. Test protocol shall be mutually agreed upon. John Zink shall be notified in writing two weeks prior to any testing. It shall be the customer's responsibility to maintain equipment in good working order prior to and during testing. Performance testing is the customer's responsibility.

The PM10 emission level listed above is only for unburned carbon, not inorganic particulate that may be in the inlet flow streams.

Subject to the provisions of John Zink Company's Limitation of Liability Clause, should the equipment not meet the Performance Guarantee, John Zink Company, in accordance with recognized engineering procedures and practices shall determine any design deficiencies. John Zink Company shall take such action as it may determine necessary to correct the equipment to meet such guarantees. Customer agrees to provide John Zink Company all necessary operating and historical data and access to the equipment when requested for the purpose of taking corrective action.

#### Scope of Supply

Our scope of work will include design, engineering, and preparation of all drawings, procurement of all materials, fabrication, inspection, assembly, testing (as agreed) and provision of thermal and mechanical guarantees for the equipment listed herein.

1. One (1) Thermal Oxidizer Burner  
The burner is mounted for up-firing into the thermal oxidizer chamber. It is designed for forced draft and has the following features:
  - a. Electric Ignition Transformer
  - b. Gas/Electric Pilot Assembly
  - c. Type A-36 or Equal Steel Construction
  - d. Air Plenum with Flanged Connection
  - e. Burner Tile
  - f. One (1) Flanged Fuel Gas Connection
  - g. One (1) Flanged Acid Gas Connection
  - h. One (1) Flanged Flash Gas Connection
  - i. Two (2) Flame Scanner Connections

The information in this document is confidential and may constitute proprietary information, trade secrets, or other privileged information. Therefore, it must not be disclosed to any person or entity without the written consent of John Zink Company, LLC.

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

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

| CAS No.    | Pollutant                                      | Emission Factor<br>(lb/10 <sup>6</sup> scf) | Emission Factor Rating |
|------------|------------------------------------------------|---------------------------------------------|------------------------|
| 91-57-6    | 2-Methylnaphthalene <sup>b, c</sup>            | 2.4E-05                                     | D                      |
| 56-49-5    | 3-Methylchloranthrene <sup>b, c</sup>          | <1.8E-06                                    | E                      |
|            | 7,12-Dimethylbenz(a)anthracene <sup>b, c</sup> | <1.6E-05                                    | E                      |
| 83-32-9    | Acenaphthene <sup>b, c</sup>                   | <1.8E-06                                    | E                      |
| 203-96-8   | Acenaphthylene <sup>b, c</sup>                 | <1.8E-06                                    | E                      |
| 120-12-7   | Anthracene <sup>b, c</sup>                     | <2.4E-06                                    | E                      |
| 56-55-3    | Benz(a)anthracene <sup>b, c</sup>              | <1.8E-06                                    | E                      |
| 71-43-2    | Benzene <sup>b</sup>                           | 2.1E-03                                     | B                      |
| 50-32-8    | Benzo(a)pyrene <sup>b, c</sup>                 | <1.2E-06                                    | E                      |
| 205-99-2   | Benzo(b)fluoranthene <sup>b, c</sup>           | <1.8E-06                                    | E                      |
| 191-24-2   | Benzo(g,h,i)perylene <sup>b, c</sup>           | <1.2E-06                                    | E                      |
| 207-08-9   | Benzo(k)fluoranthene <sup>b, c</sup>           | <1.8E-06                                    | E                      |
| 106-97-8   | Butane                                         | 2.1E+00                                     | E                      |
| 218-01-9   | Chrysene <sup>b, c</sup>                       | <1.8E-06                                    | E                      |
| 53-70-3    | Dibenzo(a,h)anthracene <sup>b, c</sup>         | <1.2E-06                                    | E                      |
| 25321-22-6 | Dichlorobenzene <sup>b</sup>                   | 1.2E-03                                     | E                      |
| 74-84-0    | Ethane                                         | 3.1E+00                                     | E                      |
| 206-44-0   | Fluoranthene <sup>b, c</sup>                   | 3.0E-06                                     | E                      |
| 86-73-7    | Fluorene <sup>b, c</sup>                       | 2.8E-06                                     | E                      |
| 50-00-0    | Formaldehyde <sup>b</sup>                      | 7.5E-02                                     | B                      |
| 110-54-3   | Hexane <sup>b</sup>                            | 1.8E+00                                     | E                      |
| 193-39-5   | Indeno(1,2,3-cd)pyrene <sup>b, c</sup>         | <1.8E-06                                    | E                      |
| 91-20-3    | Naphthalene <sup>b</sup>                       | 6.1E-04                                     | E                      |
| 109-66-0   | Pentane                                        | 2.6E+00                                     | E                      |
| 85-01-8    | Phenanthrene <sup>b, c</sup>                   | 1.7E-05                                     | D                      |
| 74-98-6    | Propane                                        | 1.6E+00                                     | E                      |

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

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

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

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

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

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

Table 13.2.2-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIAL  
ON INDUSTRIAL UNPAVED ROADS<sup>a</sup>

| Industry                        | Road Use Or<br>Surface Material | Plant<br>Sites | No. Of<br>Samples | Silt Content (%) |      |
|---------------------------------|---------------------------------|----------------|-------------------|------------------|------|
|                                 |                                 |                |                   | Range            | Mean |
| Copper smelting                 | Plant road                      | 1              | 3                 | 16 - 19          | 17   |
| Iron and steel production       | Plant road                      | 19             | 135               | 0.2 - 19         | 6.0  |
| Sand and gravel processing      | Plant road                      | 1              | 3                 | 4.1 - 6.0        | 4.8  |
|                                 | Material storage<br>area        | 1              | 1                 | -                | 7.1  |
| Stone quarrying and processing  | Plant road                      | 2              | 10                | 2.4 - 16         | 10   |
|                                 | Haul road to/from<br>pit        | 4              | 20                | 5.0-15           | 8.3  |
| Taconite mining and processing  | Service road                    | 1              | 8                 | 2.4 - 7.1        | 4.3  |
|                                 | Haul road to/from<br>pit        | 1              | 12                | 3.9 - 9.7        | 5.8  |
| Western surface coal mining     | Haul road to/from<br>pit        | 3              | 21                | 2.8 - 18         | 8.4  |
|                                 | Plant road                      | 2              | 2                 | 4.9 - 5.3        | 5.1  |
|                                 | Scraper route                   | 3              | 10                | 7.2 - 25         | 17   |
|                                 | Haul road<br>(freshly graded)   | 2              | 5                 | 18 - 29          | 24   |
| Construction sites              | Scraper routes                  | 7              | 20                | 0.56-23          | 8.5  |
| Lumber sawmills                 | Log yards                       | 2              | 2                 | 4.8-12           | 8.4  |
| Municipal solid waste landfills | Disposal routes                 | 4              | 20                | 2.2 - 21         | 6.4  |

<sup>a</sup>References 1,5-15.

The following empirical expressions may be used to estimate the quantity in pounds (lb) of size-specific particulate emissions from an unpaved road, per vehicle mile traveled (VMT):

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation:

$$E = k (s/12)^a (W/3)^b \quad (1a)$$

and, for vehicles traveling on publicly accessible roads, dominated by light duty vehicles, emissions may be estimated from the following:

$$E = \frac{k (s/12)^a (S/30)^d}{(M/0.5)^c} - C \quad (1b)$$

where  $k$ ,  $a$ ,  $b$ ,  $c$  and  $d$  are empirical constants (Reference 6) given below and

- $E$  = size-specific emission factor (lb/VMT)
- $s$  = surface material silt content (%)
- $W$  = mean vehicle weight (tons)
- $M$  = surface material moisture content (%)
- $S$  = mean vehicle speed (mph)
- $C$  = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

The source characteristics  $s$ ,  $W$  and  $M$  are referred to as correction parameters for adjusting the emission estimates to local conditions. The metric conversion from lb/VMT to grams (g) per vehicle kilometer traveled (VKT) is as follows:

$$1 \text{ lb/VMT} = 281.9 \text{ g/VKT}$$

The constants for Equations 1a and 1b based on the stated aerodynamic particle sizes are shown in Tables 13.2.2-2 and 13.2.2-4. The PM-2.5 particle size multipliers ( $k$ -factors) are taken from Reference 27.

Table 13.2.2-2. CONSTANTS FOR EQUATIONS 1a AND 1b

| Constant       | Industrial Roads (Equation 1a) |       |        | Public Roads (Equation 1b) |       |        |
|----------------|--------------------------------|-------|--------|----------------------------|-------|--------|
|                | PM-2.5                         | PM-10 | PM-30* | PM-2.5                     | PM-10 | PM-30* |
| k (lb/VMT)     | 0.15                           | 1.5   | 4.9    | 0.18                       | 1.8   | 6.0    |
| a              | 0.9                            | 0.9   | 0.7    | 1                          | 1     | 1      |
| b              | 0.45                           | 0.45  | 0.45   | -                          | -     | -      |
| c              | -                              | -     | -      | 0.2                        | 0.2   | 0.3    |
| d              | -                              | -     | -      | 0.5                        | 0.5   | 0.3    |
| Quality Rating | B                              | B     | B      | B                          | B     | B      |

\*Assumed equivalent to total suspended particulate matter (TSP)

“-“ = not used in the emission factor equation

Table 13.2.2-2 also contains the quality ratings for the various size-specific versions of Equation 1a and 1b. The equation retains the assigned quality rating, if applied within the ranges of source conditions, shown in Table 13.2.2-3, that were tested in developing the equation:

Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b

| Emission Factor                | Surface Silt Content, % | Mean Vehicle Weight |       | Mean Vehicle Speed |       | Mean No. of Wheels | Surface Moisture Content, % |
|--------------------------------|-------------------------|---------------------|-------|--------------------|-------|--------------------|-----------------------------|
|                                |                         | Mg                  | ton   | km/hr              | mph   |                    |                             |
| Industrial Roads (Equation 1a) | 1.8-25.2                | 1.8-260             | 2-290 | 8-69               | 5-43  | 4-17 <sup>a</sup>  | 0.03-13                     |
| Public Roads (Equation 1b)     | 1.8-35                  | 1.4-2.7             | 1.5-3 | 16-88              | 10-55 | 4-4.8              | 0.03-13                     |

<sup>a</sup> See discussion in text.

As noted earlier, the models presented as Equations 1a and 1b were developed from tests of traffic on unpaved surfaces. Unpaved roads have a hard, generally nonporous surface that usually dries quickly after a rainfall or watering, because of traffic-enhanced natural evaporation. (Factors influencing how fast a road dries are discussed in Section 13.2.2.3, below.) The quality ratings given above pertain to the mid-range of the measured source conditions for the equation. A higher mean vehicle weight and a higher than normal traffic rate may be justified when performing a worst-case analysis of emissions from unpaved roads.

The emission factors for the exhaust, brake wear and tire wear of a 1980's vehicle fleet (C) was obtained from EPA's MOBILE6.2 model <sup>23</sup>. The emission factor also varies with aerodynamic size range

average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual average emissions are inversely proportional to the number of days with measurable (more than 0.254 mm [0.01 inch]) precipitation:

$$E_{\text{ext}} = E [(365 - P)/365] \quad (2)$$

where:

$E_{\text{ext}}$  = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT

$E$  = emission factor from Equation 1a or 1b

$P$  = number of days in a year with at least 0.254 mm (0.01 in) of precipitation (see below)

Figure 13.2.2-1 gives the geographical distribution for the mean annual number of “wet” days for the United States.

Equation 2 provides an estimate that accounts for precipitation on an annual average basis for the purpose of inventorying emissions. It should be noted that Equation 2 does not account for differences in the temporal distributions of the rain events, the quantity of rain during any event, or the potential for the rain to evaporate from the road surface. In the event that a finer temporal and spatial resolution is desired for inventories of public unpaved roads, estimates can be based on a more complex set of assumptions. These assumptions include:

1. The moisture content of the road surface material is increased in proportion to the quantity of water added;
2. The moisture content of the road surface material is reduced in proportion to the Class A pan evaporation rate;
3. The moisture content of the road surface material is reduced in proportion to the traffic volume; and
4. The moisture content of the road surface material varies between the extremes observed in the area. The CHIEF Web site (<http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html>) has a file which contains a spreadsheet program for calculating emission factors which are temporally and spatially resolved. Information required for use of the spreadsheet program includes monthly Class A pan evaporation values, hourly meteorological data for precipitation, humidity and snow cover, vehicle traffic information, and road surface material information.

It is emphasized that the simple assumption underlying Equation 2 and the more complex set of assumptions underlying the use of the procedure which produces a finer temporal and spatial resolution have not been verified in any rigorous manner. For this reason, the quality ratings for either approach should be downgraded one letter from the rating that would be applied to Equation 1.

### 13.2.2.3 Controls<sup>18-22</sup>

A wide variety of options exist to control emissions from unpaved roads. Options fall into the following three groupings:

1. Vehicle restrictions that limit the speed, weight or number of vehicles on the road;

2. Surface improvement, by measures such as (a) paving or (b) adding gravel or slag to a dirt road; and
3. Surface treatment, such as watering or treatment with chemical dust suppressants.

Available control options span broad ranges in terms of cost, efficiency, and applicability. For example, traffic controls provide moderate emission reductions (often at little cost) but are difficult to enforce. Although paving is highly effective, its high initial cost is often prohibitive. Furthermore, paving is not feasible for industrial roads subject to very heavy vehicles and/or spillage of material in transport. Watering and chemical suppressants, on the other hand, are potentially applicable to most industrial roads at moderate to low costs. However, these require frequent reapplication to maintain an acceptable level of control. Chemical suppressants are generally more cost-effective than water but not in cases of temporary roads (which are common at mines, landfills, and construction sites). In summary, then, one needs to consider not only the type and volume of traffic on the road but also how long the road will be in service when developing control plans.

Vehicle restrictions. These measures seek to limit the amount and type of traffic present on the road or to lower the mean vehicle speed. For example, many industrial plants have restricted employees from driving on plant property and have instead instituted bussing programs. This eliminates emissions due to employees traveling to/from their worksites. Although the heavier average vehicle weight of the busses increases the base emission factor, the decrease in vehicle-miles-traveled results in a lower overall emission rate.

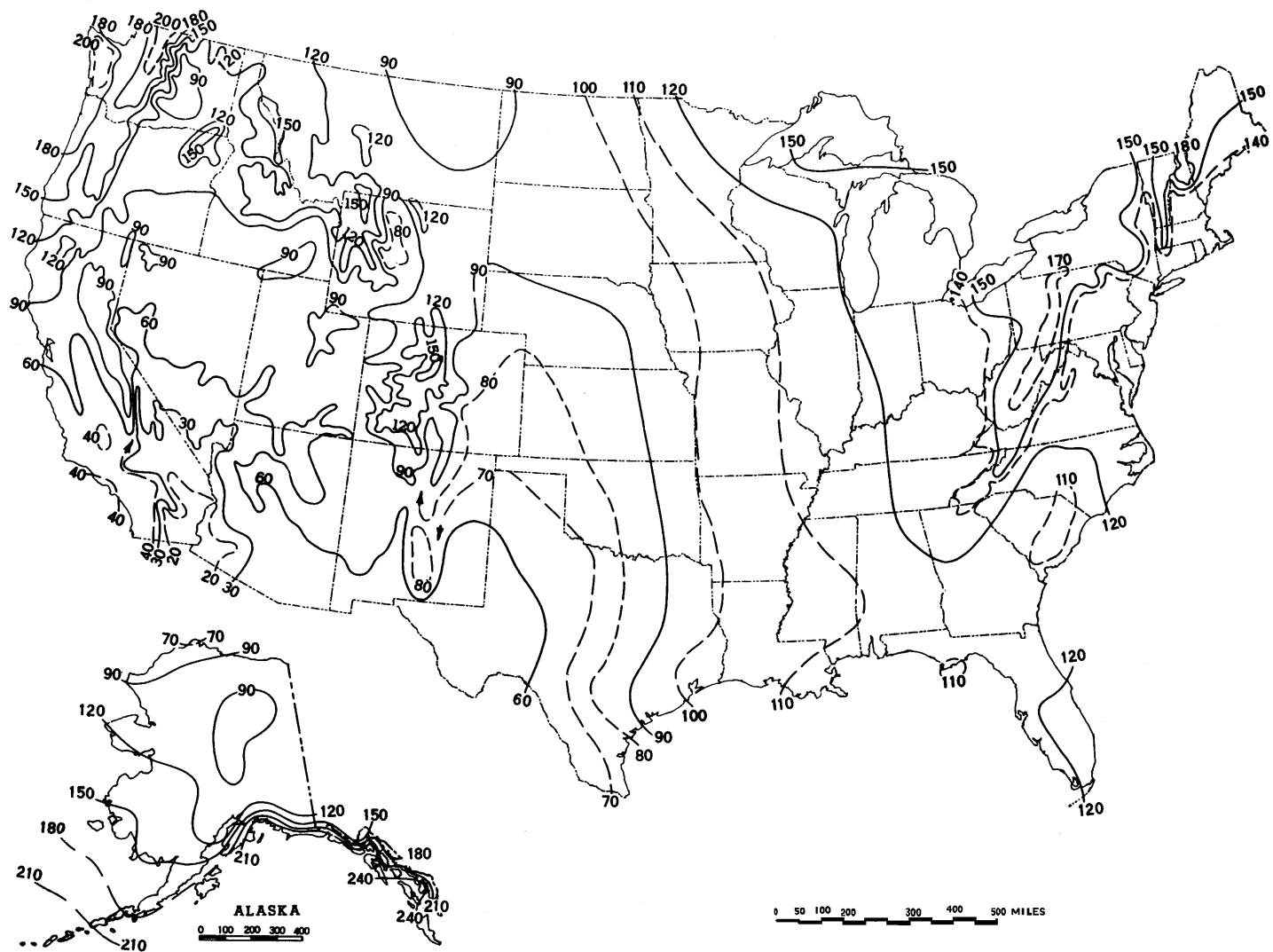


Figure 13.2.2-1. Mean number of days with 0.01 inch or more of precipitation in United States.

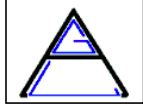
TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

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

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

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

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

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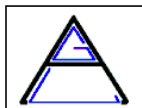
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Monahans, Texas 79756  
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**EXTENDED GAS ANALYSIS REPORT**

Analysis Name: Inlet Gas to S. Turbine Before Dehy\_2

Customer: Enterprise

| <u>Component</u>                                       | <u>Mol. %</u>   | <u>Wt.%</u>     | <u>Real GPM</u> | <b>Producer:</b> Enterprise                      |
|--------------------------------------------------------|-----------------|-----------------|-----------------|--------------------------------------------------|
| Nitrogen                                               | 1.2634          | 1.7903          |                 | <b>Well / Sta. Name:</b> Inlet Gas to S. Turbine |
| Methane                                                | 83.4674         | 67.7391         |                 | <b>Sta. Name Cont.:</b> Before Dehydration       |
| Carbon Dioxide                                         | 1.8210          | 4.0541          |                 | <b>Area:</b> Carlsbad                            |
| Ethane                                                 | 8.2899          | 12.6101         | 2.222           | <b>Field:</b> N/A                                |
| Hydrogen Sulfide                                       | 0.0000          | 0.0000          |                 | <b>County:</b> N/A                               |
| Propane                                                | 3.1883          | 7.1122          | 0.881           | <b>Spot / Composite:</b> Spot                    |
| i-Butane                                               | 0.3922          | 1.1532          | 0.129           | <b>Date / Time On:</b> 02/27/14 11:30 AM         |
| n-Butane                                               | 0.8197          | 2.4101          | 0.259           | <b>Date / Time Off:</b> 02/27/14 11:30 AM        |
| i-Pentane                                              | 0.2064          | 0.7533          | 0.076           | <b>Date to Lab:</b> 02/28/14                     |
| n-Pentane                                              | 0.2032          | 0.7416          | 0.074           | <b>Date Analyzed:</b> 03/03/14 03:08 PM          |
| i-Hexanes                                              | 0.0920          | 0.3865          | 0.036           | <b>Sample Press. (PSIG):</b> 255                 |
| n-Hexane (C-6)                                         | 0.0546          | 0.2380          | 0.023           | <b>Press. @ Lab (PSIG):</b> 255                  |
| Benzene                                                | 0.0158          | 0.0624          | 0.004           | <b>Line Press. (PSIG):</b> 255                   |
| CC6                                                    | 0.0291          | 0.1239          | 0.010           | <b>Sample Temp. (F):</b> 60                      |
| i-Heptanes                                             | 0.0674          | 0.3348          | 0.027           | <b>Fl. Gas Temp. (F):</b> 60                     |
| n-Heptane (C-7)                                        | 0.0164          | 0.0831          | 0.008           | <b>Amb. Temp. (F):</b> N/L                       |
| toluene                                                | 0.0140          | 0.0653          | 0.005           | <b>Del. To:</b> N/A                              |
| i-Octanes                                              | 0.0443          | 0.2560          | 0.023           | <b>Sampled By:</b> D. Miller                     |
| n-Octane (C-8)                                         | 0.0042          | 0.0243          | 0.002           | <b>Cylinder No.:</b> N/L                         |
| Ethylbenzene                                           | 0.0041          | 0.0233          | 0.002           |                                                  |
| p-m-Xylene                                             | 0.0006          | 0.0032          | 0.000           |                                                  |
| o-Xylene                                               | 0.0036          | 0.0193          | 0.001           |                                                  |
| i-Nonanes                                              | 0.0005          | 0.0027          | 0.012           | (GPA 2145/ 2172)                                 |
| n-Nonane (C-9)                                         | 0.0006          | 0.0039          | 0.000           | <b>Ideal BTU (Dry) :</b> 1145.89                 |
| i-Decanes                                              | 0.0010          | 0.0072          | 0.001           | <b>Dry BTU (Real):</b> 1149.38                   |
| n-Decanes+                                             | 0.0001          | 0.0007          | 0.000           | <b>Sat BTU (Real):</b> 1129.81                   |
| I-Undecanes+                                           | 0.0002          | 0.0014          | 0.000           | <b>BTU (As Delivered):</b> N/A                   |
| Hydrogen                                               | N/A             |                 |                 | <b>GPM C2+ (Real):</b> 3.794                     |
| Helium                                                 | N/A             |                 |                 | <b>GPM C3+ (Real):</b> 1.572                     |
| Oxygen                                                 | N/A             |                 |                 | <b>Z Factor:</b> 0.9970                          |
| CO                                                     | N/A             |                 |                 | <b>Pressure Base:</b> 14.730                     |
|                                                        |                 |                 |                 | <b>Temp. Base:</b> 60                            |
|                                                        |                 |                 |                 | <b>Sp. Gravity (Real):</b> 0.6843                |
|                                                        |                 |                 |                 | <b>Field H2S (PPM):</b> N/L                      |
|                                                        |                 |                 |                 | <b>Field H2S (Grains):</b> N/L                   |
|                                                        |                 |                 |                 | <b>H2O (#/mmcf):</b> N/L                         |
|                                                        |                 |                 |                 | <b>Lab O2 PPM:</b> N/A                           |
|                                                        |                 |                 |                 | <b>Lab O2 Mol. %:</b> N/A                        |
|                                                        |                 |                 |                 | <b>Field CO2 %:</b> N/L                          |
| <b>Ideal Totals</b>                                    | <b>100.0000</b> | <b>100.0000</b> |                 |                                                  |
| <b>Field Remarks:</b> Run Extended Analysis. H2O: SAT. |                 |                 |                 |                                                  |
| <b>Lab Remarks:</b>                                    |                 |                 |                 |                                                  |

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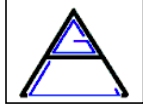
**EXTENDED GAS ANALYSIS REPORT**

Analysis Name: Inlet Gas to S. Turbine after Dehy\_2

Customer: Enterprise

| <u>Component</u>                            | <u>Mol. %</u>   | <u>Wt.%</u>     | <u>Real GPM</u> | <b>Producer:</b> Enterprise                      |
|---------------------------------------------|-----------------|-----------------|-----------------|--------------------------------------------------|
| Nitrogen                                    | 1.2867          | 1.8240          |                 | <b>Well / Sta. Name:</b> Inlet Gas to S. Turbine |
| Methane                                     | 83.2850         | 67.6155         |                 | <b>Sta. Name Cont.:</b> After Dehydration        |
| Carbon Dioxide                              | 1.9050          | 4.2427          |                 | <b>Area:</b> Carlsbad                            |
| Ethane                                      | 8.3922          | 12.7704         | 2.250           | <b>Field:</b> N/A                                |
| Hydrogen Sulfide                            | 0.0000          | 0.0000          |                 | <b>County:</b> N/A                               |
| Propane                                     | 3.2359          | 7.2210          | 0.894           | <b>Spot / Composite:</b> Spot                    |
| i-Butane                                    | 0.3966          | 1.1665          | 0.130           | <b>Date / Time On:</b> 02/27/14 11:40 AM         |
| n-Butane                                    | 0.8315          | 2.4457          | 0.263           | <b>Date / Time Off:</b> 02/27/14 11:40 AM        |
| i-Pentane                                   | 0.1993          | 0.7277          | 0.073           | <b>Date to Lab:</b> 02/28/14                     |
| n-Pentane                                   | 0.1921          | 0.7014          | 0.070           | <b>Date Analyzed:</b> 03/03/14 01:31 PM          |
| i-Hexanes                                   | 0.0818          | 0.3438          | 0.032           | <b>Sample Press. (PSIG):</b> 520                 |
| n-Hexane (C-6)                              | 0.0469          | 0.2045          | 0.019           | <b>Press. @ Lab (PSIG):</b> 520                  |
| Benzene                                     | 0.0099          | 0.0391          | 0.003           | <b>Line Press. (PSIG):</b> 520                   |
| CC6                                         | 0.0232          | 0.0988          | 0.008           | <b>Sample Temp. (F):</b> 78                      |
| i-Heptanes                                  | 0.0540          | 0.2683          | 0.022           | <b>Fl. Gas Temp. (F):</b> 78                     |
| n-Heptane (C-7)                             | 0.0128          | 0.0649          | 0.006           | <b>Amb. Temp. (F):</b> N/L                       |
| toluene                                     | 0.0063          | 0.0294          | 0.002           | <b>Del. To:</b> N/A                              |
| i-Octanes                                   | 0.0333          | 0.1925          | 0.017           | <b>Sampled By:</b> D. Miller                     |
| n-Octane (C-8)                              | 0.0029          | 0.0168          | 0.002           | <b>Cylinder No.:</b> N/L                         |
| Ethylbenzene                                | 0.0027          | 0.0153          | 0.001           |                                                  |
| p-m-Xylene                                  | 0.0002          | 0.0011          | 0.000           |                                                  |
| o-Xylene                                    | 0.0005          | 0.0027          | 0.000           |                                                  |
| i-Nonanes                                   | 0.0002          | 0.0011          | 0.005           | (GPA 2145/ 2172)                                 |
| n-Nonane (C-9)                              | 0.0005          | 0.0032          | 0.000           | <b>Ideal BTU (Dry) :</b> 1143.17                 |
| i-Decanes                                   | 0.0004          | 0.0029          | 0.000           | <b>Dry BTU (Real):</b> 1146.63                   |
| n-Decanes+                                  | 0.0001          | 0.0007          | 0.000           | <b>Sat BTU (Real):</b> 1127.10                   |
| I-Undecanes+                                | 0.0000          | 0.0000          | 0.000           | <b>BTU (As Delivered):</b> N/A                   |
| Hydrogen                                    | N/A             |                 |                 | <b>GPM C2+ (Real):</b> 3.797                     |
| Helium                                      | N/A             |                 |                 | <b>GPM C3+ (Real):</b> 1.547                     |
| Oxygen                                      | N/A             |                 |                 | <b>Z Factor:</b> 0.9970                          |
| CO                                          | N/A             |                 |                 | <b>Pressure Base:</b> 14.730                     |
|                                             |                 |                 |                 | <b>Temp. Base:</b> 60                            |
|                                             |                 |                 |                 | <b>Sp. Gravity (Real):</b> 0.6840                |
|                                             |                 |                 |                 | <b>Field H2S (PPM):</b> N/L                      |
|                                             |                 |                 |                 | <b>Field H2S (Grains):</b> N/L                   |
|                                             |                 |                 |                 | <b>H2O (#/mmcf):</b> N/L                         |
|                                             |                 |                 |                 | <b>Lab O2 PPM:</b> N/A                           |
|                                             |                 |                 |                 | <b>Lab O2 Mol. %:</b> N/A                        |
|                                             |                 |                 |                 | <b>Field CO2 %:</b> N/L                          |
| <b>Ideal Totals</b>                         | <b>100.0000</b> | <b>100.0000</b> |                 |                                                  |
| <b>Field Remarks:</b> Run Extended Analysis |                 |                 |                 |                                                  |
| <b>Lab Remarks:</b>                         |                 |                 |                 |                                                  |

(GPA 2145 /2286/ TP-17)

**ARMSTRONG GAS LABS, INC.**

P.O. Box 988  
Monahans, Texas 79756  
(432) 943-8844 (FAX) 943-8855

**EXTENDED GAS ANALYSIS REPORT**

Analysis Name: Discharge Gas @ S. Turbine\_2

Customer: Enterprise

| <u>Component</u>                            | <u>Mol. %</u>   | <u>Wt.%</u>     | <u>Real GPM</u> | <b>Producer:</b> Enterprise                         |
|---------------------------------------------|-----------------|-----------------|-----------------|-----------------------------------------------------|
| Nitrogen                                    | 1.2691          | 1.8478          |                 | <b>Well / Sta. Name:</b> Discharge Gas @ S. Turbine |
| Methane                                     | 84.4647         | 70.4325         |                 | <b>Sta. No.:</b> N/L                                |
| Carbon Dioxide                              | 1.8974          | 4.3403          |                 | <b>Area:</b> Carlsbad                               |
| Ethane                                      | 8.2628          | 12.9143         | 2.215           | <b>Field:</b> N/A                                   |
| Hydrogen Sulfide                            | 0.0000          | 0.0000          |                 | <b>County:</b> N/A                                  |
| Propane                                     | 2.9411          | 6.7411          | 0.812           | <b>Spot / Composite:</b> Spot                       |
| i-Butane                                    | 0.3192          | 0.9643          | 0.105           | <b>Date / Time On:</b> 02/27/14 12:00 PM            |
| n-Butane                                    | 0.6123          | 1.8498          | 0.194           | <b>Date / Time Off:</b> 02/27/14 12:00 PM           |
| i-Pentane                                   | 0.1023          | 0.3836          | 0.038           | <b>Date to Lab:</b> 02/28/14                        |
| n-Pentane                                   | 0.0862          | 0.3233          | 0.031           | <b>Date Analyzed:</b> 03/03/14 01:21 PM             |
| i-Hexanes                                   | 0.0210          | 0.0897          | 0.008           | <b>Sample Press. (PSIG):</b> 510                    |
| n-Hexane (C-6)                              | 0.0087          | 0.0390          | 0.004           | <b>Press. @ Lab (PSIG):</b> 510                     |
| Benzene                                     | 0.0021          | 0.0085          | 0.001           | <b>Line Press. (PSIG):</b> 510                      |
| CC6                                         | 0.0033          | 0.0144          | 0.001           | <b>Sample Temp. (F):</b> 69                         |
| i-Heptanes                                  | 0.0069          | 0.0352          | 0.003           | <b>Fl. Gas Temp. (F):</b> 69                        |
| n-Heptane (C-7)                             | 0.0008          | 0.0042          | 0.000           | <b>Amb. Temp. (F):</b> N/L                          |
| toluene                                     | 0.0004          | 0.0019          | 0.000           | <b>Del. To:</b> N/A                                 |
| i-Octanes                                   | 0.0016          | 0.0095          | 0.001           | <b>Sampled By:</b> D. Miller                        |
| n-Octane (C-8)                              | 0.0001          | 0.0006          | 0.000           | <b>Cylinder No.:</b> N/L                            |
| Ethylbenzene                                | 0.0000          | 0.0000          | 0.000           |                                                     |
| p-m-Xylene                                  | 0.0000          | 0.0000          | 0.000           |                                                     |
| o-Xylene                                    | 0.0000          | 0.0000          | 0.000           |                                                     |
| i-Nonanes                                   | 0.0000          | 0.0000          | 0.000           | (GPA 2145/ 2172)                                    |
| n-Nonane (C-9)                              | 0.0000          | 0.0000          | 0.000           | <b>Ideal BTU (Dry) :</b> 1115.91                    |
| i-Decanes                                   | 0.0000          | 0.0000          | 0.000           | <b>Dry BTU (Real):</b> 1119.05                      |
| n-Decanes+                                  | 0.0000          | 0.0000          | 0.000           | <b>Sat BTU (Real):</b> 1099.99                      |
| I-Undecanes+                                | 0.0000          | 0.0000          | 0.000           | <b>BTU (As Delivered):</b> N/A                      |
| Hydrogen                                    | N/A             |                 |                 | <b>GPM C2+ (Real):</b> 3.411                        |
| Helium                                      | N/A             |                 |                 | <b>GPM C3+ (Real):</b> 1.197                        |
| Oxygen                                      | N/A             |                 |                 | <b>Z Factor:</b> 0.9972                             |
| CO                                          | N/A             |                 |                 | <b>Pressure Base:</b> 14.730                        |
|                                             |                 |                 |                 | <b>Temp. Base:</b> 60                               |
|                                             |                 |                 |                 | <b>Sp. Gravity (Real):</b> 0.6658                   |
|                                             |                 |                 |                 | <b>Field H2S (PPM):</b> N/L                         |
|                                             |                 |                 |                 | <b>Field H2S (Grains):</b> N/L                      |
|                                             |                 |                 |                 | <b>H2O (#/mmcf):</b> N/L                            |
|                                             |                 |                 |                 | <b>Lab O2 PPM:</b> N/A                              |
|                                             |                 |                 |                 | <b>Lab O2 Mol. %:</b> N/A                           |
|                                             |                 |                 |                 | <b>Field CO2 %:</b> N/L                             |
| <b>Ideal Totals</b>                         | <b>100.0000</b> | <b>100.0000</b> |                 |                                                     |
| <b>Field Remarks:</b> Run Extended Analysis |                 |                 |                 |                                                     |
| <b>Lab Remarks:</b>                         |                 |                 |                 |                                                     |

(GPA 2145 /2286/ TP-17)

| Gas Vapor    | Class      | counts |
|--------------|------------|--------|
|              | Valve      | 2078   |
|              | Connector  | 4174   |
|              | Relief     | 43     |
|              | Compressor | 8      |
|              | Cap        | 1      |
| Light Liquid | Class      |        |
|              | Valve      | 1332   |
|              | Connector  | 3016   |
|              | Relief     | 11     |
|              | Pump       | 10     |
| Totals       |            | 10673  |

# **Physical Properties of Hydrocarbons**

(extract)



4665 INDIAN SCHOOL NE  
SUITE 106  
ALBUQUERQUE  
NEW MEXICO  
87110

**FIG. 16 - 1**  
**PHYSICAL CONSTANTS OF HYDROCARBONS<sup>(27)</sup>**

| No. | Compound               | Formula                         | 1.<br>Molecular weight | 2.<br>Boiling point, °F<br>14.696 psia | Vapor pressure, psia<br>100 °F | 3.<br>Freezing point, °F<br>14.696 psia | Critical constants |                 |                             |
|-----|------------------------|---------------------------------|------------------------|----------------------------------------|--------------------------------|-----------------------------------------|--------------------|-----------------|-----------------------------|
|     |                        |                                 |                        |                                        |                                |                                         | Pressure, psia     | Temperature, °F | Volume, ft <sup>3</sup> /lb |
| 1   | Methane                | CH <sub>4</sub>                 | 16.043                 | -258.74(28)                            | (5000.)                        | -296.45 <sup>d</sup>                    | 667.8              | -116.68         | 0.0988                      |
| 2   | Ethane                 | C <sub>2</sub> H <sub>6</sub>   | 30.070                 | -127.44                                | (800.)                         | -297.04 <sup>d</sup>                    | 707.8              | 90.10           | 0.0788                      |
| 3   | Propane                | C <sub>3</sub> H <sub>8</sub>   | 44.097                 | -43.73                                 | 188.0                          | -305.82 <sup>d</sup>                    | 616.3              | 206.01          | 0.0737                      |
| 4   | <i>n</i> -Butane       | C <sub>4</sub> H <sub>10</sub>  | 58.124                 | 31.12                                  | 51.54                          | -217.05                                 | 550.7              | 305.62          | 0.0703                      |
| 5   | Isobutane              | C <sub>4</sub> H <sub>10</sub>  | 58.124                 | 10.74                                  | 72.39                          | -255.28                                 | 529.1              | 274.96          | 0.0724                      |
| 6   | <i>n</i> -Pentane      | C <sub>5</sub> H <sub>12</sub>  | 72.151                 | 96.91                                  | 15.575                         | -201.51                                 | 488.6              | 385.6           | 0.0674                      |
| 7   | Isopentane             | C <sub>5</sub> H <sub>12</sub>  | 72.151                 | 82.11                                  | 20.444                         | -255.82                                 | 490.4              | 369.03          | 0.0679                      |
| 8   | Neopentane             | C <sub>5</sub> H <sub>12</sub>  | 72.151                 | 49.10                                  | 36.66                          | 2.21                                    | 464.0              | 321.08          | 0.0673                      |
| 9   | <i>n</i> -Hexane       | C <sub>6</sub> H <sub>14</sub>  | 86.178                 | 155.73                                 | 4.960                          | -139.58                                 | 436.9              | 453.6           | 0.0687                      |
| 10  | 2-Methylpentane        | C <sub>6</sub> H <sub>14</sub>  | 86.178                 | 140.47                                 | 6.769                          | -244.59                                 | 436.6              | 435.74          | 0.0682                      |
| 11  | 3-Methylpentane        | C <sub>6</sub> H <sub>14</sub>  | 86.178                 | 145.89                                 | 6.103                          | —                                       | 453.1              | 448.2           | 0.0682                      |
| 12  | Neohexane              | C <sub>6</sub> H <sub>14</sub>  | 86.178                 | 121.51                                 | 9.859                          | -147.77                                 | 446.9              | 420.04          | 0.0668                      |
| 13  | 2,3-Dimethylbutane     | C <sub>6</sub> H <sub>14</sub>  | 86.178                 | 136.36                                 | 7.406                          | -199.37                                 | 453.5              | 440.20          | 0.0665                      |
| 14  | <i>n</i> -Heptane      | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 209.16                                 | 1.6201                         | -131.05                                 | 396.8              | 512.7           | 0.0690                      |
| 15  | 2-Methylhexane         | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 194.09                                 | 2.2719                         | -180.89                                 | 396.5              | 494.89          | 0.0673                      |
| 16  | 3-Methylhexane         | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 197.33                                 | 2.1310                         | —                                       | 408.1              | 503.67          | 0.0646                      |
| 17  | 3-Ethylpentane         | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 200.26                                 | 2.0130                         | -181.48                                 | 419.3              | 513.36          | 0.0665                      |
| 18  | 2,2-Dimethylpentane    | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 174.54                                 | 3.494                          | -190.86                                 | 402.2              | 477.12          | 0.0665                      |
| 19  | 2,4-Dimethylpentane    | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 176.88                                 | 3.293                          | -182.63                                 | 397.0              | 475.84          | 0.0668                      |
| 20  | 3,3-Dimethylpentane    | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 186.91                                 | 2.774                          | -210.03                                 | 427.1              | 505.74          | 0.0662                      |
| 21  | Triptane               | C <sub>7</sub> H <sub>16</sub>  | 100.205                | 177.58                                 | 3.375                          | -12.84                                  | 428.4              | 496.33          | 0.0636                      |
| 22  | <i>n</i> -Octane       | C <sub>8</sub> H <sub>18</sub>  | 114.232                | 258.21                                 | 0.5370                         | -70.17                                  | 360.6              | 564.10          | 0.0690                      |
| 23  | Diisobutyl             | C <sub>8</sub> H <sub>18</sub>  | 114.232                | 228.40                                 | 1.1017                         | -132.16                                 | 360.6              | 530.31          | 0.0676                      |
| 24  | Isooctane              | C <sub>8</sub> H <sub>18</sub>  | 114.232                | 210.63                                 | 1.7089                         | -161.28                                 | 372.5              | 519.33          | 0.0657                      |
| 25  | <i>n</i> -Nonane       | C <sub>9</sub> H <sub>20</sub>  | 128.259                | 303.48                                 | 0.1796                         | -64.28                                  | 331.8              | 610.54          | 0.0684                      |
| 26  | <i>n</i> -Decane       | C <sub>10</sub> H <sub>22</sub> | 142.286                | 345.49                                 | 0.0609                         | -21.35                                  | 304.4              | 651.6           | 0.0679                      |
| 27  | Cyclopentane           | C <sub>5</sub> H <sub>10</sub>  | 70.135                 | 120.65                                 | 9.914                          | -136.96                                 | 653.0              | 461.2           | 0.0594                      |
| 28  | Methylcyclopentane     | C <sub>6</sub> H <sub>12</sub>  | 84.162                 | 161.26                                 | 4.503                          | -224.43                                 | 549.0              | 499.24          | 0.0607                      |
| 29  | Cyclohexane            | C <sub>6</sub> H <sub>12</sub>  | 84.162                 | 177.31                                 | 3.266                          | 43.80                                   | 590.9              | 536.6           | 0.0589                      |
| 30  | Methylcyclohexane      | C <sub>7</sub> H <sub>14</sub>  | 98.189                 | 213.67                                 | 1.6093                         | -195.86                                 | 503.6              | 570.15          | 0.0601                      |
| 31  | Ethene (Ethylene)      | C <sub>2</sub> H <sub>4</sub>   | 28.054                 | -154.79(29)                            | —                              | -272.47 <sup>d</sup>                    | 731.1              | 48.56           | 0.0748                      |
| 32  | Propene (Propylene)    | C <sub>3</sub> H <sub>6</sub>   | 42.081                 | -53.90                                 | 227.6                          | -301.45 <sup>d</sup>                    | 667.2              | 197.06          | 0.0689                      |
| 33  | 1-Butene (Butylene)    | C <sub>4</sub> H <sub>8</sub>   | 56.108                 | 20.79                                  | 62.10                          | -301.63 <sup>d</sup>                    | 583.5              | 295.48          | 0.0686                      |
| 34  | <i>cis</i> -2-Butene   | C <sub>4</sub> H <sub>8</sub>   | 56.108                 | 38.70                                  | 45.95                          | -218.04                                 | 612.1              | 324.37          | 0.0668                      |
| 35  | <i>trans</i> -2-Butene | C <sub>4</sub> H <sub>8</sub>   | 56.108                 | 33.58                                  | 49.94                          | -157.99                                 | 587.0              | 311.86          | 0.0679                      |
| 36  | Isobutene              | C <sub>4</sub> H <sub>8</sub>   | 56.108                 | 19.56                                  | 63.64                          | -220.63                                 | 580.0              | 292.55          | 0.0682                      |
| 37  | 1-Pentene              | C <sub>5</sub> H <sub>10</sub>  | 70.135                 | 85.93                                  | 19.117                         | -265.40                                 | 511.8              | 376.93          | 0.0676                      |
| 38  | 1,2-Butadiene          | C <sub>4</sub> H <sub>6</sub>   | 54.092                 | 51.53                                  | 36.5                           | -213.14                                 | (653.0)            | (340.)          | (0.0649)                    |
| 39  | 1,3-Butadiene          | C <sub>4</sub> H <sub>6</sub>   | 54.092                 | 24.06                                  | 59.40(45)                      | -164.04                                 | 628.0              | 305.            | 0.0655                      |
| 40  | Isoprene               | C <sub>5</sub> H <sub>8</sub>   | 68.119                 | 93.33                                  | 16.68                          | -230.71                                 | (558.4)            | (412.)          | (0.0650)                    |
| 41  | Acetylene              | C <sub>2</sub> H <sub>2</sub>   | 26.038                 | -120.78 <sup>e</sup>                   | —                              | -113.4 <sup>d</sup>                     | 890.4              | 95.32           | 0.0695                      |
| 42  | Benzene                | C <sub>6</sub> H <sub>6</sub>   | 78.114                 | 176.16                                 | 3.225                          | 41.96                                   | 710.4              | 552.22          | 0.0525                      |
| 43  | Toluene                | C <sub>7</sub> H <sub>8</sub>   | 92.141                 | 231.13                                 | 1.0330                         | -138.98                                 | 595.5              | 605.57          | 0.0549                      |
| 44  | Ethylbenzene           | C <sub>8</sub> H <sub>10</sub>  | 106.168                | 277.16                                 | 0.3716                         | -138.96                                 | 523.4              | 651.29          | 0.0565                      |
| 45  | <i>o</i> -Xylene       | C <sub>8</sub> H <sub>10</sub>  | 106.168                | 291.97                                 | 0.2643                         | -13.32                                  | 541.6              | 674.92          | 0.0557                      |
| 46  | <i>m</i> -Xylene       | C <sub>8</sub> H <sub>10</sub>  | 106.168                | 282.42                                 | 0.3265                         | -54.17                                  | 512.9              | 651.02          | 0.0567                      |
| 47  | <i>p</i> -Xylene       | C <sub>8</sub> H <sub>10</sub>  | 106.168                | 281.05                                 | 0.3424                         | 55.87                                   | 509.2              | 649.54          | 0.0570                      |
| 48  | Styrene                | C <sub>8</sub> H <sub>8</sub>   | 104.152                | 293.25                                 | 0.238                          | -23.10                                  | 580.0              | 706.0           | 0.0541                      |
| 49  | Isopropylbenzene       | C <sub>9</sub> H <sub>12</sub>  | 120.195                | 306.34                                 | 0.188                          | -140.86                                 | 465.4              | 676.3           | 0.0572                      |
| 50  | Methyl Alcohol         | CH <sub>4</sub> O               | 32.042                 | 148.17                                 | 4.631                          | -143.79                                 | 1174.              | 463.08          | 0.0589                      |
| 51  | Ethyl Alcohol          | C <sub>2</sub> H <sub>6</sub> O | 46.069                 | 172.92                                 | 2.3125                         | -173.4                                  | 925.8              | 465.39          | 0.0580                      |
| 52  | Carbon Monoxide        | CO                              | 28.010                 | -312.68                                | —                              | -337.00 <sup>d</sup>                    | 507.5(33)          | -220.41(33)     | 0.0532(33)                  |
| 53  | Carbon Dioxide         | CO <sub>2</sub>                 | 44.010                 | -109.32 <sup>e</sup>                   | —                              | -69.77 <sup>d</sup>                     | 1071.(33)          | 87.87(33)       | 0.0342(33)                  |
| 54  | Hydrogen Sulfide       | H <sub>2</sub> S                | 34.076                 | -76.56                                 | 387.1(44)                      | -121.58 <sup>d</sup>                    | 1036.              | 212.6           | 0.0460                      |
| 55  | Sulfur Dioxide         | SO <sub>2</sub>                 | 64.059                 | 13.96                                  | 85.46(44)                      | -103.81 <sup>d</sup>                    | 1145.              | 315.8           | 0.0304                      |
| 56  | Ammonia                | NH <sub>3</sub>                 | 17.031                 | -27.99(30)                             | 211.9(44)                      | -107.88 <sup>d</sup>                    | 1636.              | 270.4           | 0.0681                      |
| 57  | Air                    | N <sub>2</sub> + O <sub>2</sub> | 28.964                 | -317.8(36)                             | —                              | —                                       | 546.9(2)           | -221.4(2)       | 0.0517(3)                   |
| 58  | Hydrogen               | H <sub>2</sub>                  | 2.016                  | -423.17 <sup>v</sup>                   | —                              | -434.81 <sup>d,v</sup>                  | 188.1              | -399.9          | 0.5164                      |
| 59  | Oxygen                 | O <sub>2</sub>                  | 31.999                 | -297.332 <sup>v</sup>                  | —                              | -361.820 <sup>d,v</sup>                 | 736.9              | -181.2(33)      | 0.0367                      |
| 60  | Nitrogen               | N <sub>2</sub>                  | 28.013                 | -320.44(31)                            | —                              | -346.00 <sup>d</sup>                    | 493.0              | -232.7          | 0.0516                      |
| 61  | Chlorine               | Cl <sub>2</sub>                 | 70.906                 | -29.25                                 | 154.9(44)                      | -149.73 <sup>d</sup>                    | 1118.              | 291.            | 0.0280                      |
| 62  | Water                  | H <sub>2</sub> O                | 18.015                 | 212.00 <sup>v</sup>                    | 0.9495                         | 32.00                                   | 3207.9             | 705.5           | 0.0509                      |
| 63  | Helium                 | He                              | 4.003                  | -452.07(32)                            | —                              | —                                       | 32,990(32)         | -450.308(32)    | 0.2300(32)                  |
| 64  | Hydrogen Chloride      | HCl                             | 36.461                 | -121.00                                | 906.3(44)                      | -173.52 <sup>d</sup>                    | 1205.              | 124.8           | 0.0356                      |

# PHYSICAL CONSTANTS OF HYDROCARBONS<sup>(27)</sup>

| 4.                                                                                                                                                                                                          |                                                                                                                                                                                                                    |                                                                                                                                                                              |                                                                                                                                                                                     | 5.                                                                                                                                                                                              | 6.                                                                                                   | 7.                                                                                                                         | 8.                                                                                               |                                                                                         |                                                                                                                                                                              | 9.                                                                                               |                                                                                                     | No.                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Density of liquid<br>14.696 psia, 60 °F                                                                                                                                                                     |                                                                                                                                                                                                                    |                                                                                                                                                                              |                                                                                                                                                                                     | Temperature coefficient<br>of density at 60 °F • a<br>—1/°F                                                                                                                                     | Pitzer acentric factor                                                                               | Compressibility factor of<br>real gas, Z<br>14.696 psia, 60 °F                                                             | Ideal gas*<br>14.696 psia, 60 °F                                                                 |                                                                                         |                                                                                                                                                                              | Specific heat<br>capacity<br>14.696 psia, 60 °F<br>C <sub>p</sub><br>Btu/(lb • °F)               |                                                                                                     |                                                          |
| Specific gravity<br>60 °F/60 °F <sub>a,b</sub>                                                                                                                                                              | lb/gal • a<br>(Weight in vacuum)                                                                                                                                                                                   | lb/gal • a,c<br>(Apparent weight<br>in air)                                                                                                                                  | gal/lb-mole                                                                                                                                                                         |                                                                                                                                                                                                 |                                                                                                      |                                                                                                                            | Specific gravity<br>Air = 1 •                                                                    | Specific volume<br>ft <sup>3</sup> gas/lb •                                             | Volume ratio<br>ft <sup>3</sup> gas/gal liquid<br>(in vacuum)                                                                                                                | Ideal<br>gas                                                                                     | Liquid                                                                                              |                                                          |
| (0.3) <sup>i</sup><br>0.3563 <sup>h</sup><br>0.5075 <sup>h</sup><br>0.5842 <sup>h</sup><br>0.5630 <sup>h</sup>                                                                                              | (2.5) <sup>i</sup><br>2.970 <sup>h,x</sup><br>4.231 <sup>h,x</sup><br>4.870 <sup>h</sup><br>4.694 <sup>h</sup>                                                                                                     | (2.5) <sup>i</sup><br>2.960 <sup>h</sup><br>4.221 <sup>h</sup><br>4.861 <sup>h</sup><br>4.684 <sup>h</sup>                                                                   | (6.4) <sup>i</sup><br>10.12 <sup>h</sup><br>10.42 <sup>h</sup><br>11.94 <sup>h</sup><br>12.38 <sup>h</sup>                                                                          | —<br>—<br>0.00152 <sup>h</sup><br>0.00117 <sup>h</sup><br>0.00119 <sup>h</sup>                                                                                                                  | 0.0126<br>0.0978<br>0.1541<br>0.2015<br>0.1840                                                       | 0.9981<br>0.9916<br>0.9808<br>0.9637<br>0.9661                                                                             | 0.5539<br>1.0382<br>1.5225<br>2.0068<br>2.0068                                                   | 23.65<br>12.620<br>8.606<br>6.529<br>6.529                                              | (59.1) <sup>i</sup><br>37.48 <sup>h</sup><br>36.41 <sup>h</sup><br>31.80 <sup>h</sup><br>30.65 <sup>h</sup>                                                                  | 0.5266<br>0.4080<br>0.3887<br>0.3951<br>0.3867                                                   | —<br>0.9256<br>0.5920<br>0.566(41)<br>0.566(41)                                                     | 2<br>3<br>4<br>5                                         |
| 0.6311<br>0.6244<br>0.5966 <sup>h</sup>                                                                                                                                                                     | 5.261<br>5.206<br>4.974 <sup>h</sup>                                                                                                                                                                               | 5.252<br>5.196<br>4.965 <sup>h</sup>                                                                                                                                         | 13.71<br>13.86<br>14.51 <sup>h</sup>                                                                                                                                                | 0.00087<br>0.00090<br>0.00104 <sup>h</sup>                                                                                                                                                      | 0.2524<br>0.2286<br>0.1967                                                                           | 0.942 <sup>†</sup><br>0.948 <sup>†</sup><br>0.9534                                                                         | 2.4911<br>2.4911<br>2.4911                                                                       | 5.260<br>5.260<br>5.260                                                                 | 27.67<br>27.38<br>26.16 <sup>h</sup>                                                                                                                                         | 0.3880<br>0.3829<br>0.3885                                                                       | 0.548(41)<br>0.5353<br>0.5540                                                                       | 6<br>7<br>8                                              |
| 0.6640<br>0.6579<br>0.6689<br>0.6540<br>0.6664                                                                                                                                                              | 5.536<br>5.485<br>5.577<br>5.453<br>5.556                                                                                                                                                                          | 5.527<br>5.476<br>5.568<br>5.444<br>5.547                                                                                                                                    | 15.59<br>15.71<br>15.48<br>15.80<br>15.51                                                                                                                                           | 0.00075<br>0.00078<br>0.00075<br>0.00078<br>0.00075                                                                                                                                             | 0.2998<br>0.2784<br>0.2741<br>0.2333<br>0.2475                                                       | 0.910 <sup>†</sup><br>—<br>—<br>—<br>—                                                                                     | 2.9753<br>2.9753<br>2.9753<br>2.9753<br>2.9753                                                   | 4.404<br>4.404<br>4.404<br>4.404<br>4.404                                               | 24.38<br>24.16<br>24.56<br>24.02<br>24.47                                                                                                                                    | 0.3857<br>0.3833<br>0.3776<br>0.3812<br>0.3748                                                   | 0.5332<br>0.5272<br>0.5187<br>0.5136<br>0.5130                                                      | 9<br>10<br>11<br>12<br>13                                |
| 0.6883<br>0.6830<br>0.6917<br>0.7028<br>0.6782<br>0.6773<br>0.6977<br>0.6946                                                                                                                                | 5.738<br>5.694<br>5.767<br>5.859<br>5.654<br>5.647<br>5.817<br>5.791                                                                                                                                               | 5.729<br>5.685<br>5.758<br>5.850<br>5.645<br>5.638<br>5.808<br>5.782                                                                                                         | 17.46<br>17.60<br>17.38<br>17.10<br>17.75<br>17.74<br>17.25<br>17.33                                                                                                                | 0.00069<br>0.00068<br>0.00069<br>0.00070<br>0.00072<br>0.00072<br>0.00065<br>0.00069                                                                                                            | 0.3494<br>0.3303<br>0.3239<br>0.3107<br>0.2876<br>0.3031<br>0.2681<br>0.2509                         | 0.852 <sup>†</sup><br>—<br>—<br>—<br>—<br>—<br>—<br>—                                                                      | 3.4596<br>3.4596<br>3.4596<br>3.4596<br>3.4596<br>3.4596<br>3.4596<br>3.4596                     | 3.787<br>3.787<br>3.787<br>3.787<br>3.787<br>3.787<br>3.787<br>3.787                    | 21.73<br>21.56<br>21.84<br>22.19<br>21.41<br>21.39<br>22.03<br>21.93                                                                                                         | 0.3842<br>0.3816<br>0.3790<br>0.3858<br>0.3858<br>0.3951<br>0.3838<br>0.3776                     | 0.5280<br>0.5219<br>0.5110<br>0.5140<br>0.5167<br>0.5243<br>0.5018<br>0.4991                        | 14<br>15<br>16<br>17<br>18<br>19<br>20<br>21             |
| 0.7070<br>0.6980<br>0.6962<br>0.7219<br>0.7342<br>0.7504<br>0.7536<br>0.7834<br>0.7740                                                                                                                      | 5.894<br>5.819<br>5.804<br>6.019<br>6.121<br>6.256<br>6.283<br>6.531<br>6.453                                                                                                                                      | 5.885<br>5.810<br>5.795<br>6.010<br>6.112<br>6.247<br>6.274<br>6.522<br>6.444                                                                                                | 19.38<br>19.63<br>19.68<br>21.31<br>23.26<br>11.21<br>13.40<br>12.89<br>15.22                                                                                                       | 0.00062<br>0.00065<br>0.00065<br>0.00063<br>0.00055<br>0.00070<br>0.00071<br>0.00068<br>0.00063                                                                                                 | 0.3981<br>0.3564<br>0.3041<br>0.4452<br>0.4904<br>0.1945<br>0.2308<br>0.2098<br>0.2364               | 0.783 <sup>†</sup><br>—<br>—<br>—<br>—<br>0.949 <sup>†</sup><br>—<br>—<br>—                                                | 3.9439<br>3.9439<br>3.9439<br>4.4282<br>4.9125<br>2.4215<br>2.9057<br>2.9057<br>3.3900           | 3.322<br>3.322<br>3.322<br>2.959<br>2.667<br>5.411<br>4.509<br>4.509<br>3.865           | 19.58<br>19.33<br>19.28<br>17.81<br>16.32<br>33.85<br>28.33<br>29.45<br>24.92                                                                                                | 0.3831<br>0.3764<br>0.3825<br>0.3822<br>0.3816<br>0.2712<br>0.3010<br>0.2900<br>0.3170           | 0.5238<br>0.5112<br>0.4900<br>0.5220<br>0.5207<br>0.4216<br>0.4407<br>0.4332<br>0.4397              | 22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30       |
| —<br>0.5217 <sup>h</sup><br>0.6013 <sup>h</sup><br>0.6271 <sup>h</sup><br>0.6101 <sup>h</sup><br>0.6005 <sup>h</sup><br>0.6457<br>0.658 <sup>h</sup><br>0.6272 <sup>h</sup><br>0.6861                       | —<br>4.348 <sup>h,x</sup><br>5.013 <sup>h</sup><br>5.228 <sup>h</sup><br>5.086 <sup>h</sup><br>5.006 <sup>h</sup><br>5.383<br>5.49 <sup>h</sup><br>5.229 <sup>h</sup><br>5.720                                     | —<br>4.338 <sup>h</sup><br>5.004 <sup>h</sup><br>5.219 <sup>h</sup><br>5.077 <sup>h</sup><br>4.997 <sup>h</sup><br>5.374<br>5.48 <sup>h</sup><br>5.220 <sup>h</sup><br>5.711 | —<br>9.678 <sup>h</sup><br>11.19 <sup>h</sup><br>10.73 <sup>h</sup><br>11.03 <sup>h</sup><br>11.21 <sup>h</sup><br>13.03<br>9.86 <sup>h</sup><br>10.34 <sup>h</sup><br>11.91        | —<br>0.00189 <sup>h</sup><br>0.00116 <sup>h</sup><br>0.00098 <sup>h</sup><br>0.00107 <sup>h</sup><br>0.00120 <sup>h</sup><br>0.00089<br>0.00098 <sup>h</sup><br>0.00113 <sup>h</sup><br>0.00086 | 0.0869<br>0.1443<br>0.1949<br>0.2033<br>0.2126<br>0.2026<br>0.2334<br>(0.2540)<br>0.1971<br>(0.1567) | 0.9938<br>0.9844<br>0.9704<br>0.9661<br>0.9662<br>0.9689<br>0.948 <sup>†</sup><br>(0.969)<br>(0.965)<br>0.949 <sup>†</sup> | 0.9686<br>1.4529<br>1.9372<br>1.9372<br>1.9372<br>1.9372<br>2.4215<br>1.8676<br>1.8676<br>2.3519 | 13.527<br>9.018<br>6.764<br>6.764<br>6.764<br>6.764<br>5.411<br>7.016<br>7.016<br>5.571 | —<br>39.25 <sup>h</sup><br>33.91 <sup>h</sup><br>35.36 <sup>h</sup><br>34.40 <sup>h</sup><br>33.86 <sup>h</sup><br>29.13<br>38.4 <sup>h</sup><br>36.69 <sup>h</sup><br>31.87 | 0.3622<br>0.3541<br>0.3548<br>0.3269<br>0.3654<br>0.3701<br>0.3635<br>0.3458<br>0.3412<br>0.3570 | —<br>0.5835<br>0.5343<br>0.5352(42)<br>0.5345<br>0.5484<br>0.5353(43)<br>0.5403<br>0.5073<br>0.5185 | 31<br>32<br>33<br>34<br>35<br>36<br>37<br>38<br>39<br>40 |
| 0.615 <sup>h</sup><br>0.8845<br>0.8719<br>0.8717<br>0.8847<br>0.8688<br>0.8658<br>0.9110<br>0.8664                                                                                                          | —<br>7.374<br>7.269<br>7.267<br>7.376<br>7.242<br>7.218<br>7.595<br>7.223                                                                                                                                          | —<br>7.365<br>7.260<br>7.258<br>7.367<br>7.233<br>7.209<br>7.586<br>7.214                                                                                                    | —<br>10.59<br>12.68<br>14.61<br>14.39<br>14.66<br>14.71<br>13.71<br>16.64                                                                                                           | —<br>0.00066<br>0.00060<br>0.00054<br>0.00055<br>0.00054<br>0.00054<br>0.00057<br>0.00054                                                                                                       | 0.1893<br>0.2095<br>0.2633<br>0.3031<br>0.3113<br>0.3257<br>0.3214<br>0.1997<br>0.3260               | 0.9925<br>0.929 <sup>†</sup><br>0.903 <sup>†</sup><br>—<br>—<br>—<br>—<br>—<br>—                                           | 0.8990<br>2.6969<br>3.1812<br>3.6655<br>3.6655<br>3.6655<br>3.6655<br>3.5959<br>4.1498           | 14.574<br>4.858<br>4.119<br>3.574<br>3.574<br>3.574<br>3.574<br>3.644<br>3.157          | —<br>35.82<br>29.94<br>25.97<br>26.36<br>25.88<br>25.80<br>27.68<br>22.80                                                                                                    | 0.3966<br>0.2422<br>0.2598<br>0.2795<br>0.2914<br>0.2782<br>0.2769<br>0.2706<br>0.2917           | —<br>0.4098<br>0.4009<br>0.4113<br>0.4161<br>0.4054<br>0.4083<br>0.4122<br>0.4041                   | 41<br>42<br>43<br>44<br>45<br>46<br>47<br>48<br>49       |
| 0.7963<br>0.7916<br>0.7894 <sup>m</sup><br>0.8176 <sup>h</sup><br>0.7871 <sup>h</sup><br>1.397 <sup>h</sup>                                                                                                 | 6.639<br>6.599<br>6.581 <sup>m</sup> (34)<br>6.817 <sup>h</sup> (35)<br>6.562 <sup>h,x</sup> (36)<br>11.65 <sup>h,x</sup> (36)                                                                                     | 6.630<br>6.590<br>—<br>6.808 <sup>h</sup><br>6.553 <sup>h</sup><br>11.64 <sup>h</sup>                                                                                        | 4.826<br>6.981<br>4.256 <sup>m</sup><br>6.456 <sup>h</sup><br>5.193 <sup>h</sup><br>5.498 <sup>h</sup>                                                                              | 0.00065<br>0.00059<br>—<br>—<br>—<br>—                                                                                                                                                          | 0.5648<br>0.6608<br>0.0442<br>0.2667<br>0.0920<br>0.2548                                             | —<br>—<br>0.9995<br>0.9943<br>0.9903<br>0.9801 <sup>†</sup>                                                                | 1.1063<br>1.5906<br>0.9671<br>1.5195<br>1.1765<br>2.2117                                         | 11.843<br>8.237<br>13.55<br>8.623<br>11.136<br>5.924                                    | 78.61<br>54.36<br>—<br>58.78 <sup>h</sup><br>73.07 <sup>h</sup><br>69.01 <sup>h</sup>                                                                                        | 0.3229<br>0.3318<br>0.2484<br>0.1990<br>0.2379<br>0.1448                                         | 0.5933<br>0.5608<br>—<br>—<br>0.4968(36)<br>0.3246(36)                                              | 50<br>51<br>52<br>53<br>54<br>55                         |
| 0.6175 <sup>h</sup><br>0.856 <sup>m</sup> (36)<br>0.07107 <sup>m</sup><br>1.1421 <sup>m</sup> (25)<br>0.8094 <sup>m</sup> (26)<br>1.424 <sup>h</sup><br>1.000<br>0.12510 <sup>m</sup><br>0.851 <sup>h</sup> | 5.148 <sup>h,x</sup> (30)<br>7.32 <sup>m</sup><br>0.5931 <sup>m</sup> (37)<br>9.522 <sup>m</sup> (38)<br>6.748 <sup>m</sup> (31)<br>11.87 <sup>h</sup><br>8.337<br>1.0430 <sup>m</sup> (32)<br>7.10 <sup>h,x</sup> | 5.139 <sup>h</sup><br>—<br>—<br>—<br>—<br>11.86 <sup>h</sup><br>8.328<br>—<br>7.09 <sup>h</sup>                                                                              | 3.308 <sup>h</sup><br>4.06 <sup>m</sup><br>3.399 <sup>m</sup><br>3.360 <sup>m</sup><br>4.151 <sup>m</sup><br>5.974 <sup>h</sup><br>2.160<br>3.837 <sup>m</sup><br>5.14 <sup>h</sup> | —<br>—<br>—<br>—<br>—<br>—<br>0.00008<br>0<br>0.00335                                                                                                                                           | 0.2576<br>—<br>-0.219 <sup>w</sup><br>0.0200<br>0.0372<br>0.0737<br>0.3434<br>0<br>0.1232            | 0.9899(30)<br>0.9996<br>1.0006<br>0.9993(39)<br>0.9997<br>(0.9875) <sup>†</sup> (36)<br>—<br>1.0005(40)<br>—               | 0.5880<br>1.0000<br>0.0696<br>1.1048<br>0.9672<br>2.4481<br>0.6220<br>0.1382<br>1.2588           | 22.28<br>13.102<br>188.2<br>11.859<br>13.547<br>5.352<br>21.06<br>94.80<br>10.408       | 114.71<br>—<br>—<br>—<br>—<br>63.53<br>175.6<br>—<br>73.88                                                                                                                   | 0.4967<br>0.2400<br>3.401<br>0.2189<br>0.2484<br>0.1137<br>0.4447<br>1.240<br>0.1909             | 1.121(30)<br>—<br>—<br>—<br>—<br>—<br>1.001<br>—<br>—                                               | 56<br>57<br>58<br>59<br>60<br>61<br>62<br>63<br>64       |

# PHYSICAL CONSTANTS OF HYDROCARBONS<sup>(27)</sup>

| No. | See Note No. →<br><br>Compound | 10.                                              |                                                  |                                        |                     | 11.                                                              | 12.                                                            | 13.                                                                                        | Flammability                       |                  | ASTM                  |                                 |
|-----|--------------------------------|--------------------------------------------------|--------------------------------------------------|----------------------------------------|---------------------|------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------|------------------|-----------------------|---------------------------------|
|     |                                | Heating value, 60 °F <sup>P</sup>                |                                                  |                                        |                     |                                                                  |                                                                |                                                                                            | limits, vol %<br>in<br>air mixture | octane<br>number |                       |                                 |
|     |                                | Net                                              | Gross                                            |                                        |                     |                                                                  |                                                                |                                                                                            |                                    |                  |                       |                                 |
|     |                                | Btu/ft <sup>3</sup><br>Ideal gas,<br>14.696 psia | Btu/ft <sup>3</sup><br>Ideal gas,<br>14.696 psia | Btu/lb<br>Liquid<br>(weight in vacuum) | Btu/gal<br>Liquid*  | Heat of vaporization,<br>14.696 psia at boiling<br>point, Btu/lb | Refractive index <sup>a</sup> , <i>n</i> <sub>D</sub><br>68 °F | Air required for combus-<br>tion ideal gas*<br>ft <sup>3</sup> (air)/ft <sup>3</sup> (gas) | Lower                              | Higher           | Motor method<br>D-357 | Research<br>method<br>D-908     |
| 1   | Methane                        | 909.1                                            | 1009.7                                           | —                                      | —                   | 219.20                                                           | —                                                              | 9.54                                                                                       | 5.0                                | 15.0             | —                     | —                               |
| 2   | Ethane                         | 1617.8                                           | 1768.7                                           | 22178 <sup>h</sup>                     | 65889 <sup>h</sup>  | 210.39                                                           | 1.19949 <sup>h</sup>                                           | 16.70                                                                                      | 2.9                                | 13.0             | +0.05 <sup>f</sup>    | +1.6 <sup>f</sup> <sub>J</sub>  |
| 3   | Propane                        | 2315.9                                           | 2517.2                                           | 21499 <sup>h</sup>                     | 90962 <sup>h</sup>  | 183.03                                                           | 1.28624 <sup>h</sup>                                           | 23.86                                                                                      | 2.1                                | 9.5              | 97.1                  | +1.8 <sup>f</sup> <sub>J</sub>  |
| 4   | <i>n</i> -Butane               | 3010.5                                           | 3262.0                                           | 21133 <sup>h</sup>                     | 102918 <sup>h</sup> | 165.63                                                           | 1.32943 <sup>h</sup>                                           | 31.02                                                                                      | 1.8                                | 8.4              | 89.6 <sup>f</sup>     | 93.8 <sup>f</sup>               |
| 5   | Isobutane                      | 3001.0                                           | 3252.6                                           | 21084 <sup>h</sup>                     | 98968 <sup>h</sup>  | 157.52                                                           | —                                                              | 31.02                                                                                      | 1.8                                | 8.4              | 97.6                  | +0.10 <sup>f</sup> <sub>J</sub> |
| 6   | <i>n</i> -Pentane              | 3706.8                                           | 4008.7                                           | 20922                                  | 110071              | 153.58                                                           | 1.35748                                                        | 38.18                                                                                      | 1.4                                | 8.3              | 62.6 <sup>f</sup>     | 61.7 <sup>f</sup> <sub>J</sub>  |
| 7   | Isopentane                     | 3697.9                                           | 3999.7                                           | 20884                                  | 108722              | 147.12                                                           | 1.35373                                                        | 38.18                                                                                      | 1.4                                | (8.3)            | 90.3                  | 92.3                            |
| 8   | Neopentane                     | 3682.3                                           | 3984.2                                           | 20819 <sup>h</sup>                     | 103554 <sup>h</sup> | 135.57                                                           | 1.342                                                          | 38.18                                                                                      | 1.4                                | (8.3)            | 80.2                  | 85.5                            |
| 9   | <i>n</i> -Hexane               | 4403.9                                           | 4756.1                                           | 20783                                  | 115055              | 143.94                                                           | 1.37486                                                        | 45.34                                                                                      | 1.2                                | 7.7              | 26.0                  | 24.8                            |
| 10  | 2-Methylpentane                | 4395.2                                           | 4747.3                                           | 20753                                  | 113830              | 138.66                                                           | 1.37145                                                        | 45.34                                                                                      | 1.2                                | (7.7)            | 73.5                  | 73.4                            |
| 11  | 3-Methylpentane                | 4398.2                                           | 4750.3                                           | 20764                                  | 115801              | 140.08                                                           | 1.37652                                                        | 45.34                                                                                      | (1.2)                              | (7.7)            | 74.3                  | 74.5                            |
| 12  | Neohexane                      | 4384.6                                           | 4736.8                                           | 20718                                  | 112975              | 131.23                                                           | 1.36876                                                        | 45.34                                                                                      | 1.2                                | (7.7)            | 93.4                  | 91.8                            |
| 13  | 2,3-Dimethylbutane             | 4393.8                                           | 4746.0                                           | 20751                                  | 115293              | 136.07                                                           | 1.37495                                                        | 45.34                                                                                      | (1.2)                              | (7.7)            | 94.3                  | +0.3 <sup>f</sup>               |
| 14  | <i>n</i> -Heptane              | 5100.3                                           | 5502.8                                           | 20680                                  | 118662              | 136.00                                                           | 1.38764                                                        | 52.50                                                                                      | 1.0                                | 7.0              | 0.0                   | 0.0                             |
| 15  | 2-Methylhexane                 | 5092.3                                           | 5494.8                                           | 20657                                  | 117621              | 131.58                                                           | 1.38485                                                        | 52.50                                                                                      | (1.0)                              | (7.0)            | 46.4                  | 42.4                            |
| 16  | 3-Methylhexane                 | 5096.1                                           | 5498.6                                           | 20671                                  | 119210              | 132.10                                                           | 1.38864                                                        | 52.50                                                                                      | (1.0)                              | (7.0)            | 55.8                  | 52.0                            |
| 17  | 3-Ethylpentane                 | 5098.4                                           | 5500.9                                           | 20679                                  | 121158              | 132.82                                                           | 1.39339                                                        | 52.50                                                                                      | (1.0)                              | (7.0)            | 69.3                  | 65.0                            |
| 18  | 2,2-Dimethylpentane            | 5079.7                                           | 5482.2                                           | 20620                                  | 116585              | 125.12                                                           | 1.38215                                                        | 52.50                                                                                      | (1.0)                              | (7.0)            | 95.6                  | 92.8                            |
| 19  | 2,4-Dimethylpentane            | 5084.4                                           | 5486.8                                           | 20636                                  | 116531              | 126.57                                                           | 1.38145                                                        | 52.50                                                                                      | (1.0)                              | (7.0)            | 83.8                  | 83.1                            |
| 20  | 3,3-Dimethylpentane            | 5086.5                                           | 5489.0                                           | 20644                                  | 120086              | 127.20                                                           | 1.39092                                                        | 52.50                                                                                      | (1.0)                              | (7.0)            | 86.6                  | 80.8                            |
| 21  | Triptane                       | 5081.3                                           | 5483.8                                           | 20628                                  | 119457              | 124.20                                                           | 1.38944                                                        | 52.50                                                                                      | (1.0)                              | (7.0)            | +0.1 <sup>f</sup>     | +1.8 <sup>f</sup>               |
| 22  | <i>n</i> -Octane               | 5796.1                                           | 6248.9                                           | 20601                                  | 121422              | 129.52                                                           | 1.39743                                                        | 59.65                                                                                      | 0.96                               | —                | —                     | —                               |
| 23  | Diisobutyl                     | 5780.7                                           | 6233.4                                           | 20563                                  | 119656              | 122.82                                                           | 1.39246                                                        | 59.65                                                                                      | (0.98)                             | —                | 55.7                  | 55.2                            |
| 24  | Isooctane                      | 5778.9                                           | 6231.7                                           | 20568                                  | 119377              | 116.70                                                           | 1.39145                                                        | 59.65                                                                                      | 1.0                                | —                | 100.                  | 100.                            |
| 25  | <i>n</i> -Nonane               | 6493.3                                           | 6996.3                                           | 20542                                  | 123642              | 124.17                                                           | 1.40542                                                        | 66.81                                                                                      | 0.87 <sup>g</sup>                  | 2.9              | —                     | —                               |
| 26  | <i>n</i> -Decane               | 7189.7                                           | 7743.1                                           | 20494                                  | 125444              | 118.68                                                           | 1.41189                                                        | 73.97                                                                                      | 0.78 <sup>g</sup>                  | 2.6              | —                     | —                               |
| 27  | Cyclopentane                   | 3512.2                                           | 3763.7                                           | 20186                                  | 126284              | 167.33                                                           | 1.40645                                                        | 35.79                                                                                      | (1.4)                              | —                | 84.9 <sup>f</sup>     | +0.1 <sup>f</sup>               |
| 28  | Methylcyclopentane             | 4199.1                                           | 4501.0                                           | 20131                                  | 126483              | 148.54                                                           | 1.40970                                                        | 42.95                                                                                      | (1.2)                              | 8.35             | 80.0                  | 91.3                            |
| 29  | Cyclohexane                    | 4179.7                                           | 4481.6                                           | 20036                                  | 130855              | 153.03                                                           | 1.42623                                                        | 42.95                                                                                      | 1.3                                | 7.8              | 77.2                  | 83.0                            |
| 30  | Methylcyclohexane              | 4863.7                                           | 5215.9                                           | 20002                                  | 129073              | 136.30                                                           | 1.42312                                                        | 50.11                                                                                      | 1.2                                | —                | 71.1                  | 74.8                            |
| 31  | Ethene (Ethylene)              | 1498.5                                           | 1599.2                                           | —                                      | —                   | 207.55                                                           | —                                                              | 14.32                                                                                      | 2.7                                | 34.0             | 75.6                  | +0.03 <sup>f</sup>              |
| 32  | Propene (Propylene)            | 2182.7                                           | 2333.6                                           | —                                      | —                   | 188.17                                                           | —                                                              | 21.48                                                                                      | 2.0                                | 10.0             | 84.9                  | +0.2 <sup>f</sup>               |
| 33  | 1-Butene (Butylene)            | 2879.0                                           | 3080.2                                           | 20670 <sup>h</sup>                     | 103619 <sup>h</sup> | 167.93                                                           | —                                                              | 28.63                                                                                      | 1.6                                | 9.3              | 80.8 <sup>f</sup>     | 97.4                            |
| 34  | <i>cis</i> -2-Butene           | 2871.4                                           | 3072.6                                           | 20604 <sup>h</sup>                     | 107718 <sup>h</sup> | 178.89                                                           | —                                                              | 28.63                                                                                      | (1.6)                              | —                | 83.5                  | 100.                            |
| 35  | <i>trans</i> -2-Butene         | 2865.1                                           | 3066.3                                           | 20568 <sup>h</sup>                     | 104609 <sup>h</sup> | 174.36                                                           | —                                                              | 28.63                                                                                      | (1.6)                              | —                | —                     | —                               |
| 36  | Isobutene                      | 2859.7                                           | 3060.9                                           | 20536 <sup>h</sup>                     | 102803 <sup>h</sup> | 169.47                                                           | —                                                              | 28.63                                                                                      | (1.6)                              | —                | —                     | —                               |
| 37  | 1-Pentene                      | 3575.2                                           | 3826.7                                           | 20545                                  | 110594              | 154.45                                                           | 1.37148                                                        | 35.79                                                                                      | 1.4                                | 8.7              | 77.1                  | 90.9                            |
| 38  | 1,2-Butadiene                  | 2789.1                                           | 2940.0                                           | 20423 <sup>h</sup>                     | 112041 <sup>h</sup> | (193.3)                                                          | —                                                              | 26.25                                                                                      | (2.0)                              | (12.)            | —                     | —                               |
| 39  | 1,3-Butadiene                  | 2730.1                                           | 2881.0                                           | 20037 <sup>h</sup>                     | 104773 <sup>h</sup> | (180.0)                                                          | —                                                              | 26.25                                                                                      | 2.0                                | 11.5             | —                     | —                               |
| 40  | Isoprene                       | 3410.9                                           | 3612.1                                           | 19951                                  | 114120              | (165.6)                                                          | 1.42194                                                        | 33.41                                                                                      | (1.5)                              | —                | 81.0                  | 99.1                            |
| 41  | Acetylene                      | 1422.4                                           | 1472.7                                           | —                                      | —                   | —                                                                | —                                                              | 11.93                                                                                      | 2.5                                | 80.              | —                     | —                               |
| 42  | Benzene                        | 3591.0                                           | 3741.9                                           | 17989                                  | 132651              | 169.10                                                           | 1.50112                                                        | 35.79                                                                                      | 1.3 <sup>g</sup>                   | 7.9 <sup>g</sup> | +2.8 <sup>f</sup>     | —                               |
| 43  | Toluene                        | 4273.5                                           | 4474.8                                           | 18250                                  | 132659              | 154.83                                                           | 1.49693                                                        | 42.95                                                                                      | 1.2 <sup>g</sup>                   | 7.1 <sup>g</sup> | +0.3 <sup>f</sup>     | +5.8 <sup>f</sup>               |
| 44  | Ethylbenzene                   | 4970.6                                           | 5222.1                                           | 18492                                  | 134381              | 144.02                                                           | 1.49588                                                        | 50.11                                                                                      | 0.99 <sup>g</sup>                  | 6.7 <sup>g</sup> | 97.9                  | +0.8 <sup>f</sup>               |
| 45  | <i>o</i> -Xylene               | 4958.1                                           | 5209.7                                           | 18443                                  | 136036              | 149.10                                                           | 1.50545                                                        | 50.11                                                                                      | 1.1 <sup>g</sup>                   | 6.4 <sup>g</sup> | 100.                  | —                               |
| 46  | <i>m</i> -Xylene               | 4956.2                                           | 5207.8                                           | 18440                                  | 133542              | 147.24                                                           | 1.49722                                                        | 50.11                                                                                      | 1.1 <sup>g</sup>                   | 6.4 <sup>g</sup> | +2.8 <sup>f</sup>     | +4.0 <sup>f</sup>               |
| 47  | <i>p</i> -Xylene               | 4957.0                                           | 5208.6                                           | 18444                                  | 133129              | 145.71                                                           | 1.49582                                                        | 50.11                                                                                      | 1.1 <sup>g</sup>                   | 6.6 <sup>g</sup> | +1.2 <sup>f</sup>     | +3.4 <sup>f</sup>               |
| 48  | Styrene                        | 4829.5                                           | 5030.8                                           | 18148                                  | 137834              | (151.00)                                                         | 1.54682                                                        | 47.72                                                                                      | 1.1                                | 6.1              | +0.2 <sup>f</sup>     | +3.1 <sup>f</sup>               |
| 49  | Isopropylbenzene               | 5661.0                                           | 5962.8                                           | 18663                                  | 134803              | 134.24                                                           | 1.49145                                                        | 57.27                                                                                      | 0.88 <sup>g</sup>                  | 6.5 <sup>g</sup> | 99.3                  | +2.1 <sup>f</sup>               |
| 50  | Methyl Alcohol                 | 766.2                                            | 866.8                                            | 9752                                   | 64744               | 462.58                                                           | 1.32840                                                        | 7.16                                                                                       | 6.72(5)                            | 36.50            | —                     | —                               |
| 51  | Ethyl Alcohol                  | 1448.2                                           | 1599.1                                           | 12771                                  | 84276               | 361.37                                                           | 1.36143                                                        | 14.32                                                                                      | 3.28(5)                            | 18.95            | —                     | —                               |
| 52  | Carbon Monoxide                | 319.79                                           | 319.79                                           | —                                      | —                   | 92.7                                                             | 1.00034                                                        | 2.39                                                                                       | 12.50(5)                           | 74.20            | —                     | —                               |
| 53  | Carbon Dioxide                 | 0                                                | 0                                                | —                                      | —                   | 246.5 <sup>n</sup>                                               | 1.00045                                                        | —                                                                                          | —                                  | —                | —                     | —                               |
| 54  | Hydrogen Sulfide               | 586.71                                           | 637.02                                           | —                                      | —                   | 236.2                                                            | 1.00059                                                        | 7.16                                                                                       | 4.30(5)                            | 45.50            | —                     | —                               |
| 55  | Sulfur Dioxide                 | —                                                | —                                                | —                                      | —                   | 167.                                                             | 1.00061                                                        | —                                                                                          | —                                  | —                | —                     | —                               |
| 56  | Ammonia                        | 358.94                                           | 432.59                                           | —                                      | —                   | 589.4                                                            | 1.00035                                                        | 3.58                                                                                       | 15.50(5)                           | 27.00            | —                     | —                               |
| 57  | Air                            | —                                                | —                                                | —                                      | —                   | 88.22                                                            | —                                                              | —                                                                                          | —                                  | —                | —                     | —                               |
| 58  | Hydrogen                       | 273.85                                           | 324.15                                           | —                                      | —                   | 193.                                                             | 1.00013                                                        | 2.39                                                                                       | 4.00(5)                            | 74.20            | —                     | —                               |
| 59  | Oxygen                         | —                                                | —                                                | —                                      | —                   | 91.62                                                            | 1.00027                                                        | —                                                                                          | —                                  | —                | —                     | —                               |
| 60  | Nitrogen                       | —                                                | —                                                | —                                      | —                   | 85.60                                                            | 1.00028                                                        | —                                                                                          | —                                  | —                | —                     | —                               |
| 61  | Chlorine                       | —                                                | —                                                | —                                      | —                   | 123.7                                                            | 1.3832 <sup>h</sup>                                            | —                                                                                          | —                                  | —                | —                     | —                               |
| 62  | Water                          | 0                                                | 49.4                                             | 0                                      | 0                   | 970.3                                                            | 1.33299                                                        | —                                                                                          | —                                  | —                | —                     | —                               |
| 63  | Helium                         | —                                                | —                                                | —                                      | —                   | —                                                                | 1.00003                                                        | —                                                                                          | —                                  | —                | —                     | —                               |
| 64  | Hydrogen Chloride              | —                                                | —                                                | —                                      | —                   | 185.5                                                            | 1.00042                                                        | —                                                                                          | —                                  | —                | —                     | —                               |

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 TITLE 40—Protection of Environment  
 PART 98—MANDATORY GREENHOUSE GAS REPORTING  
 SUBPART C—General Stationary Fuel Combustion Sources

**Table C-1 to Subpart C of Part 98 —Default CO<sub>2</sub> Emission Factors and High Heat Values for Various Types of Fuel**

| Fuel type                                    | Default high heat value  | Default CO <sub>2</sub> emission factor |
|----------------------------------------------|--------------------------|-----------------------------------------|
| Coal and coke                                | mmBtu/short ton          | kg CO <sub>2</sub> /mmBtu               |
| Anthracite                                   | 25.09                    | 103.69                                  |
| Bituminous                                   | 24.93                    | 93.28                                   |
| Subbituminous                                | 17.25                    | 97.17                                   |
| Lignite                                      | 14.21                    | 97.72                                   |
| Coal Coke                                    | 24.80                    | 113.67                                  |
| Mixed (Commercial sector)                    | 21.39                    | 94.27                                   |
| Mixed (Industrial coking)                    | 26.28                    | 93.90                                   |
| Mixed (Industrial sector)                    | 22.35                    | 94.67                                   |
| Mixed (Electric Power sector)                | 19.73                    | 95.52                                   |
| Natural gas                                  | mmBtu/scf                | kg CO <sub>2</sub> /mmBtu               |
| (Weighted U.S. Average)                      | 1.026 x 10 <sup>-3</sup> | 53.06                                   |
| Petroleum products                           | mmBtu/gallon             | kg CO <sub>2</sub> /mmBtu               |
| Distillate Fuel Oil No. 1                    | 0.139                    | 73.25                                   |
| Distillate Fuel Oil No. 2                    | 0.138                    | 73.96                                   |
| Distillate Fuel Oil No. 4                    | 0.146                    | 75.04                                   |
| Residual Fuel Oil No. 5                      | 0.140                    | 72.93                                   |
| Residual Fuel Oil No. 6                      | 0.150                    | 75.10                                   |
| Used Oil                                     | 0.138                    | 74.00                                   |
| Kerosene                                     | 0.135                    | 75.20                                   |
| Liquefied petroleum gases (LPG) <sup>1</sup> | 0.092                    | 61.71                                   |
| Propane <sup>1</sup>                         | 0.091                    | 62.87                                   |
| Propylene <sup>2</sup>                       | 0.091                    | 67.77                                   |
| Ethane <sup>1</sup>                          | 0.068                    | 59.60                                   |
| Ethanol                                      | 0.084                    | 68.44                                   |
| Ethylene <sup>2</sup>                        | 0.058                    | 65.96                                   |
| Isobutane <sup>1</sup>                       | 0.099                    | 64.94                                   |
| Isobutylene <sup>1</sup>                     | 0.103                    | 68.86                                   |
| Butane <sup>1</sup>                          | 0.103                    | 64.77                                   |
| Butylene <sup>1</sup>                        | 0.105                    | 68.72                                   |
| Naphtha (<401 deg F)                         | 0.125                    | 68.02                                   |
| Natural Gasoline                             | 0.110                    | 66.88                                   |
| Other Oil (>401 deg F)                       | 0.139                    | 76.22                                   |

|                                                  |                        |                           |
|--------------------------------------------------|------------------------|---------------------------|
| Pentanes Plus                                    | 0.110                  | 70.02                     |
| Petrochemical Feedstocks                         | 0.125                  | 71.02                     |
| Petroleum Coke                                   | 0.143                  | 102.41                    |
| Special Naphtha                                  | 0.125                  | 72.34                     |
| Unfinished Oils                                  | 0.139                  | 74.54                     |
| Heavy Gas Oils                                   | 0.148                  | 74.92                     |
| Lubricants                                       | 0.144                  | 74.27                     |
| Motor Gasoline                                   | 0.125                  | 70.22                     |
| Aviation Gasoline                                | 0.120                  | 69.25                     |
| Kerosene-Type Jet Fuel                           | 0.135                  | 72.22                     |
| Asphalt and Road Oil                             | 0.158                  | 75.36                     |
| Crude Oil                                        | 0.138                  | 74.54                     |
| Other fuels—solid                                | mmBtu/short ton        | kg CO <sub>2</sub> /mmBtu |
| Municipal Solid Waste                            | 9.95 <sup>3</sup>      | 90.7                      |
| Tires                                            | 28.00                  | 85.97                     |
| Plastics                                         | 38.00                  | 75.00                     |
| Petroleum Coke                                   | 30.00                  | 102.41                    |
| Other fuels—gaseous                              | mmBtu/scf              | kg CO <sub>2</sub> /mmBtu |
| Blast Furnace Gas                                | $0.092 \times 10^{-3}$ | 274.32                    |
| Coke Oven Gas                                    | $0.599 \times 10^{-3}$ | 46.85                     |
| Propane Gas                                      | $2.516 \times 10^{-3}$ | 61.46                     |
| Fuel Gas <sup>4</sup>                            | $1.388 \times 10^{-3}$ | 59.00                     |
| Biomass fuels—solid                              | mmBtu/short ton        | kg CO <sub>2</sub> /mmBtu |
| Wood and Wood Residuals (dry basis) <sup>5</sup> | 17.48                  | 93.80                     |
| Agricultural Byproducts                          | 8.25                   | 118.17                    |
| Peat                                             | 8.00                   | 111.84                    |
| Solid Byproducts                                 | 10.39                  | 105.51                    |
| Biomass fuels—gaseous                            | mmBtu/scf              | kg CO <sub>2</sub> /mmBtu |
| Landfill Gas                                     | $0.485 \times 10^{-3}$ | 52.07                     |
| Other Biomass Gases                              | $0.655 \times 10^{-3}$ | 52.07                     |
| Biomass Fuels—Liquid                             | mmBtu/gallon           | kg CO <sub>2</sub> /mmBtu |
| Ethanol                                          | 0.084                  | 68.44                     |
| Biodiesel (100%)                                 | 0.128                  | 73.84                     |
| Rendered Animal Fat                              | 0.125                  | 71.06                     |
| Vegetable Oil                                    | 0.120                  | 81.55                     |

<sup>1</sup> The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

<sup>2</sup> Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

<sup>3</sup> Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

<sup>4</sup> Reporters subject to subpart X of this part that are complying with § 98.243(d) or subpart Y of this part may only use the default HHV and the default CO<sub>2</sub> emission factor for fuel gas combustion under the conditions prescribed in § 98.243(d)(2)(i) and (d)(2)(ii) and § 98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

<sup>5</sup> Use the following formula to calculate a wet basis HHV for use in Equation C-1:  $HHV_w = ((100 - M)/100) * HHV_d$  where  $HHV_w$  = wet basis HHV, M = moisture content (percent) and  $HHV_d$  = dry basis HHV from Table C-1.

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Table C-2 to Subpart C of Part 98 —Default CH<sub>4</sub> and N<sub>2</sub> O Emission Factors for Various Types of Fuel

| Fuel type                                                                         | Default CH <sub>4</sub> emission factor<br>(kg CH <sub>4</sub> / mmBtu) | Default N <sub>2</sub> O emission factor<br>(kg N <sub>2</sub> O/ mmBtu) |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Coal and Coke (All fuel types in Table C-1)                                       | $1.1 \times 10^{-02}$                                                   | $1.6 \times 10^{-03}$                                                    |
| Natural Gas                                                                       | $1.0 \times 10^{-03}$                                                   | $1.0 \times 10^{-04}$                                                    |
| Petroleum (All fuel types in Table C-1)                                           | $3.0 \times 10^{-03}$                                                   | $6.0 \times 10^{-04}$                                                    |
| Fuel Gas                                                                          | $3.0 \times 10^{-03}$                                                   | $6.0 \times 10^{-04}$                                                    |
| Municipal Solid Waste                                                             | $3.2 \times 10^{-02}$                                                   | $4.2 \times 10^{-03}$                                                    |
| Tires                                                                             | $3.2 \times 10^{-02}$                                                   | $4.2 \times 10^{-03}$                                                    |
| Blast Furnace Gas                                                                 | $2.2 \times 10^{-05}$                                                   | $1.0 \times 10^{-04}$                                                    |
| Coke Oven Gas                                                                     | $4.8 \times 10^{-04}$                                                   | $1.0 \times 10^{-04}$                                                    |
| Biomass Fuels—Solid (All fuel types in Table C-1, except wood and wood residuals) | $3.2 \times 10^{-02}$                                                   | $4.2 \times 10^{-03}$                                                    |
| Wood and wood residuals                                                           | $7.2 \times 10^{-03}$                                                   | $3.6 \times 10^{-03}$                                                    |
| Biomass Fuels—Gaseous (All fuel types in Table C-1)                               | $3.2 \times 10^{-03}$                                                   | $6.3 \times 10^{-04}$                                                    |
| Biomass Fuels—Liquid (All fuel types in Table C-1)                                | $1.1 \times 10^{-03}$                                                   | $1.1 \times 10^{-04}$                                                    |

Note: Those employing this table are assumed to fall under the IPCC definitions of the “Energy Industry” or “Manufacturing Industries and Construction”. In all fuels except for coal the values for these two categories are identical. For coal combustion, those who fall within the IPCC “Energy Industry” category may employ a value of 1g of CH<sub>4</sub> /mmBtu.

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Federal Environment and Safety Codified Regulations  
TITLE 40—Protection of Environment  
PART 98—MANDATORY GREENHOUSE GAS REPORTING  
SUBPART A—General Provision

Table A-1 to Subpart A of Part 98 —Global Warming Potentials

[100-Year Time Horizon]

| Name                                                                        | CAS No.    | Chemical formula                                                                                 | Global warming potential (100 yr.) |
|-----------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------|------------------------------------|
| Chemical-Specific GWPs                                                      |            |                                                                                                  |                                    |
| Carbon dioxide                                                              | 124-38-9   | CO <sub>2</sub>                                                                                  | 1                                  |
| Methane                                                                     | 74-82-8    | CH <sub>4</sub>                                                                                  | <sup>a</sup> 25                    |
| Nitrous oxide                                                               | 10024-97-2 | N <sub>2</sub> O                                                                                 | <sup>a</sup> 298                   |
| Fully Fluorinated GHGs                                                      |            |                                                                                                  |                                    |
| Sulfur hexafluoride                                                         | 2551-62-4  | SF <sub>6</sub>                                                                                  | <sup>a</sup> 22,800                |
| Trifluoromethyl sulphur pentafluoride                                       | 373-80-8   | SF <sub>5</sub> CF <sub>3</sub>                                                                  | 17,700                             |
| Nitrogen trifluoride                                                        | 7783-54-2  | NF <sub>3</sub>                                                                                  | 17,200                             |
| PFC-14 (Perfluoromethane)                                                   | 75-73-0    | CF <sub>4</sub>                                                                                  | <sup>a</sup> 7,390                 |
| PFC-116 (Perfluoroethane)                                                   | 76-16-4    | C <sub>2</sub> F <sub>6</sub>                                                                    | <sup>a</sup> 12,200                |
| PFC-218 (Perfluoropropane)                                                  | 76-19-7    | C <sub>3</sub> F <sub>8</sub>                                                                    | <sup>a</sup> 8,830                 |
| Perfluorocyclopropane                                                       | 931-91-9   | C-C <sub>3</sub> F <sub>6</sub>                                                                  | 17,340                             |
| PFC-3-1-10 (Perfluorobutane)                                                | 355-25-9   | C <sub>4</sub> F <sub>10</sub>                                                                   | <sup>a</sup> 8,860                 |
| PFC-318 (Perfluorocyclobutane)                                              | 115-25-3   | C-C <sub>4</sub> F <sub>8</sub>                                                                  | <sup>a</sup> 10,300                |
| PFC-4-1-12 (Perfluoropentane)                                               | 678-26-2   | C <sub>5</sub> F <sub>12</sub>                                                                   | <sup>a</sup> 9,160                 |
| PFC-5-1-14 (Perfluorohexane, FC-72)                                         | 355-42-0   | C <sub>6</sub> F <sub>14</sub>                                                                   | <sup>a</sup> 9,300                 |
| PFC-6-1-12                                                                  | 335-57-9   | C <sub>7</sub> F <sub>16</sub> ; CF <sub>3</sub> (CF <sub>2</sub> ) <sub>5</sub> CF <sub>3</sub> | <sup>b</sup> 7,820                 |
| PFC-7-1-18                                                                  | 307-34-6   | C <sub>8</sub> F <sub>18</sub> ; CF <sub>3</sub> (CF <sub>2</sub> ) <sub>6</sub> CF <sub>3</sub> | <sup>b</sup> 7,620                 |
| PFC-9-1-18                                                                  | 306-94-5   | C <sub>10</sub> F <sub>18</sub>                                                                  | 7,500                              |
| PFPME (HT-70)                                                               | NA         | CF <sub>3</sub> OCF(CF <sub>3</sub> )CF <sub>2</sub> OCF <sub>2</sub> OCF <sub>3</sub>           | 10,300                             |
| Perfluorodecalin (cis)                                                      | 60433-11-6 | Z-C <sub>10</sub> F <sub>18</sub>                                                                | <sup>b</sup> 7,236                 |
| Perfluorodecalin (trans)                                                    | 60433-12-7 | E-C <sub>10</sub> F <sub>18</sub>                                                                | <sup>b</sup> 6,288                 |
| Saturated Hydrofluorocarbons (HFCs) With Two or Fewer Carbon-Hydrogen Bonds |            |                                                                                                  |                                    |
| HFC-23                                                                      | 75-46-7    | CHF <sub>3</sub>                                                                                 | <sup>a</sup> 14,800                |
| HFC-32                                                                      | 75-10-5    | CH <sub>2</sub> F <sub>2</sub>                                                                   | <sup>a</sup> 675                   |
| HFC-125                                                                     | 354-33-6   | C <sub>2</sub> HF <sub>5</sub>                                                                   | <sup>a</sup> 3,500                 |
| HFC-134                                                                     | 359-35-3   | C <sub>2</sub> H <sub>2</sub> F <sub>4</sub>                                                     | <sup>a</sup> 1,100                 |
| HFC-134a                                                                    | 811-97-2   | CH <sub>2</sub> FCF <sub>3</sub>                                                                 | <sup>a</sup> 1,430                 |
| HFC-227ca                                                                   | 2252-84-8  | CF <sub>3</sub> CF <sub>2</sub> CHF <sub>2</sub>                                                 |                                    |

| Fluorinated GHG Group <sup>d</sup>                                                                                                                                                                                  | Global warming potential (100 yr.) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Default GWPs for Compounds for Which Chemical-Specific GWPs Are Not Listed Above                                                                                                                                    |                                    |
| Fully fluorinated GHGs                                                                                                                                                                                              | 10,000                             |
| Saturated hydrofluorocarbons (HFCs) with 2 or fewer carbon-hydrogen bonds                                                                                                                                           | 3,700                              |
| Saturated HFCs with 3 or more carbon-hydrogen bonds                                                                                                                                                                 | 930                                |
| Saturated hydrofluoroethers (HFEs) and hydrochlorofluoroethers (HCFEs) with 1 carbon-hydrogen bond                                                                                                                  | 5,700                              |
| Saturated HFEs and HCFEs with 2 carbon-hydrogen bonds                                                                                                                                                               | 2,600                              |
| Saturated HFEs and HCFEs with 3 or more carbon-hydrogen bonds                                                                                                                                                       | 270                                |
| Fluorinated formates                                                                                                                                                                                                | 350                                |
| Fluorinated acetates, carbonofluoridates, and fluorinated alcohols other than fluorotelomer alcohols                                                                                                                | 30                                 |
| Unsaturated perfluorocarbons (PFCs), unsaturated HFCs, unsaturated hydrochlorofluorocarbons (HCFCs), unsaturated halogenated ethers, unsaturated halogenated esters, fluorinated aldehydes, and fluorinated ketones | 1                                  |
| Fluorotelomer alcohols                                                                                                                                                                                              | 1                                  |
| Fluorinated GHGs with carbon-iodine bond(s)                                                                                                                                                                         | 1                                  |
| Other fluorinated GHGs                                                                                                                                                                                              | 2,000                              |

<sup>a</sup> The GWP for this compound was updated in the final rule published on November 29, 2013 [78 FR 71904] and effective on January 1, 2014.

<sup>b</sup> This compound was added to Table A-1 in the final rule published on December 11, 2014, and effective on January 1, 2015.

<sup>c</sup> The GWP for this compound was updated in the final rule published on December 11, 2014, and effective on January 1, 2015 .

<sup>d</sup> For electronics manufacturing (as defined in § 98.90), the term “fluorinated GHGs” in the definition of each fluorinated GHG group in § 98.6 shall include fluorinated heat transfer fluids (as defined in § 98.98), whether or not they are also fluorinated GHGs.

[78 FR page 71948, Nov. 29, 2013; 79 FR page 73779, Dec. 11, 2014]

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## ELECTRONIC CODE OF FEDERAL REGULATIONS

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[Title 40](#) → [Chapter I](#) → [Subchapter C](#) → [Part 98](#) → [Subpart W](#) → §98.233

Title 40: Protection of Environment

[PART 98—MANDATORY GREENHOUSE GAS REPORTING](#)[Subpart W—Petroleum and Natural Gas Systems](#)**§98.233 Calculating GHG emissions.**

You must calculate and report the annual GHG emissions as prescribed in this section. For calculations that specify measurements in actual conditions, reporters may use a flow or volume measurement system that corrects to standard conditions and determine the flow or volume at standard conditions; otherwise, reporters must use average atmospheric conditions or typical operating conditions as applicable to the respective monitoring methods in this section.

(a) *Natural gas pneumatic device venting.* Calculate CH<sub>4</sub> and CO<sub>2</sub> volumetric emissions from continuous high bleed, continuous low bleed, and intermittent bleed natural gas pneumatic devices using Equation W-1 of this section.

$$E_{s,t} = \sum_{i=1}^n \text{Count}_i * EF_i * GHG_i * T_i \quad (\text{Eq. W-1})$$

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Where:

$E_{s,i}$  = Annual total volumetric GHG emissions at standard conditions in standard cubic feet per year from natural gas pneumatic device vents, of types “t” (continuous high bleed, continuous low bleed, intermittent bleed), for GHG<sub>i</sub>.

$\text{Count}_t$  = Total number of natural gas pneumatic devices of type “t” (continuous high bleed, continuous low bleed, intermittent bleed) as determined in paragraph (a)(1) or (a)(2) of this section.

$EF_t$  = Population emission factors for natural gas pneumatic device vents (in standard cubic feet per hour per device) of each type “t” listed in Tables W-1A, W-3, and W-4 of this subpart for onshore petroleum and natural gas production, onshore natural gas transmission compression, and underground natural gas storage facilities, respectively. Onshore petroleum and natural gas gathering and boosting facilities must use the population emission factors listed in Table W-1A of this subpart.

$GHG_i$  = For onshore petroleum and natural gas production facilities, onshore petroleum and natural gas gathering and boosting facilities, onshore natural gas transmission compression facilities, and underground natural gas storage facilities, concentration of GHG<sub>i</sub>, CH<sub>4</sub> or CO<sub>2</sub>, in produced natural gas or processed natural gas for each facility as specified in paragraphs (u)(2)(i), (iii), and (iv) of this section.

$T_t$  = Average estimated number of hours in the operating year the devices, of each type “t”, were operational using engineering estimates based on best available data. Default is 8,760 hours.

(1) For all industry segments, determine “Count<sub>t</sub>” for Equation W-1 of this subpart for each type of natural gas pneumatic device (continuous high bleed, continuous low bleed, and intermittent bleed) by counting the devices, except as specified in paragraph (a)(2) of this section. The reported number of devices must represent the total number of devices for the reporting year.

(2) For the onshore petroleum and natural gas production industry segment, you have the option in the first two consecutive calendar years to determine “Count<sub>t</sub>” for Equation W-1 of this section for each type of natural gas pneumatic device (continuous high bleed, continuous low bleed, and intermittent bleed) using engineering estimates based on best available data. For the onshore petroleum and natural gas gathering and boosting industry segment, you have the option in the first two consecutive calendar years to determine “Count<sub>t</sub>” for Equation W-1 for each type of natural gas pneumatic device (continuous high bleed, continuous low bleed, and intermittent bleed) using engineering estimates based on best available data.

(3) For all industry segments, determine the type of pneumatic device using engineering estimates based on best available information.

(4) Calculate both CH<sub>4</sub> and CO<sub>2</sub> mass emissions from volumetric emissions using calculations in paragraph (v) of this section.

(2) If you have a continuous gas composition analyzer on gas to the flare, you must use these compositions in calculating emissions. If you do not have a continuous gas composition analyzer on gas to the flare, you must use the appropriate gas compositions for each stream of hydrocarbons going to the flare as specified in paragraphs (n)(2)(i) through (iii) of this section.

(i) For onshore natural gas production and onshore petroleum and natural gas gathering and boosting, determine the GHG mole fraction using paragraph (u)(2)(i) of this section.

(ii) For onshore natural gas processing, when the stream going to flare is natural gas, use the GHG mole fraction in feed natural gas for all streams upstream of the de-methanizer or dew point control, and GHG mole fraction in facility specific residue gas to transmission pipeline systems for all emissions sources downstream of the de-methanizer overhead or dew point control for onshore natural gas processing facilities. For onshore natural gas processing plants that solely fractionate a liquid stream, use the GHG mole fraction in feed natural gas liquid for all streams.

(iii) For any industry segment required to report to flare stack emissions under §98.232, when the stream going to the flare is a hydrocarbon product stream, such as methane, ethane, propane, butane, pentane-plus and mixed light hydrocarbons, then you may use a representative composition from the source for the stream determined by engineering calculation based on process knowledge and best available data.

(3) Determine flare combustion efficiency from manufacturer. If not available, assume that flare combustion efficiency is 98 percent.

(4) Convert GHG volumetric emissions to standard conditions using calculations in paragraph (t) of this section.

(5) Calculate GHG volumetric emissions from flaring at standard conditions using Equations W-19 and W-20 of this section.

$$E_{s,CH_4} = V_s * X_{CH_4} * [(1-\eta) * Z_U + Z_L] \quad (\text{Eq. W-19})$$

$$E_{s,CO_2} = V_s * X_{CO_2} + \sum_{j=1}^5 (\eta * V_s * Y_j * R_j * Z_L) \quad (\text{Eq. W-20})$$

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Where:

$E_{s,CH_4}$  = Annual  $CH_4$  emissions from flare stack in cubic feet, at standard conditions.

$E_{s,CO_2}$  = Annual  $CO_2$  emissions from flare stack in cubic feet, at standard conditions.

$V_s$  = Volume of gas sent to flare in standard cubic feet, during the year as determined in paragraph (n)(1) of this section.

$\eta$  = Flare combustion efficiency, expressed as fraction of gas combusted by a burning flare (default is 0.98).

$X_{CH_4}$  = Mole fraction of  $CH_4$  in the feed gas to the flare as determined in paragraph (n)(2) of this section.

$X_{CO_2}$  = Mole fraction of  $CO_2$  in the feed gas to the flare as determined in paragraph (n)(2) of this section.

$Z_U$  = Fraction of the feed gas sent to an un-lit flare determined by engineering estimate and process knowledge based on best available data and operating records.

$Z_L$  = Fraction of the feed gas sent to a burning flare (equal to  $1 - Z_U$ ).

$Y_j$  = Mole fraction of hydrocarbon constituents  $j$  (such as methane, ethane, propane, butane, and pentanes-plus) in the feed gas to the flare as determined in paragraph (n)(1) of this section.

$R_j$  = Number of carbon atoms in the hydrocarbon constituent  $j$  in the feed gas to the flare: 1 for methane, 2 for ethane, 3 for propane, 4 for butane, and 5 for pentanes-plus).

(6) Calculate both  $CH_4$  and  $CO_2$  mass emissions from volumetric emissions using calculation in paragraph (v) of this section.

(7) Calculate  $N_2O$  emissions from flare stacks using Equation W-40 in paragraph (z) of this section.

(8) If you operate and maintain a CEMS that has both a  $CO_2$  concentration monitor and volumetric flow rate monitor for the combustion gases from the flare, you must calculate only  $CO_2$  emissions for the flare. You must follow the Tier 4 Calculation Method and all associated calculation, quality assurance, reporting, and recordkeeping requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources). If a CEMS is used to calculate flare stack emissions, the requirements specified in paragraphs (n)(1) through (7) of this section are not required.

(9) The flare emissions determined under this paragraph (n) must be corrected for flare emissions calculated and reported under other paragraphs of this section to avoid double counting of these emissions.

(i) Measure at a single point in the manifold downstream of all compressor inputs and, if practical, prior to comingling with other non-compressor emission sources.

(ii) Continuously measure the volumetric flow for the manifolded group of compressor sources at standard conditions using a permanent meter according to methods set forth in §98.234(b).

(iii) If compressor blowdown emissions are included in the metered emissions specified in paragraph (o)(5)(ii) of this section, the compressor blowdown emissions may be included with the reported emissions for the manifolded group of compressor sources and do not need to be calculated separately using the method specified in paragraph (i) of this section for blowdown vent stacks.

(6) *Method for calculating volumetric GHG emissions from as found measurements for individual centrifugal compressor sources.* For compressor sources measured according to paragraph (o)(1)(i) of this section, you must calculate annual GHG emissions from the compressor sources as specified in paragraphs (o)(6)(i) through (iv) of this section.

(i) Using Equation W-21 of this section, calculate the annual volumetric GHG emissions for each centrifugal compressor mode-source combination specified in paragraphs (o)(1)(i)(A) and (B) of this section that was measured during the reporting year.

$$E_{s,i,m} = MT_{s,m} * T_m * GHG_{i,m} \quad (\text{Eq. W-21})$$

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Where:

$E_{s,i,m}$  = Annual volumetric GHG<sub>i</sub> (either CH<sub>4</sub> or CO<sub>2</sub>) emissions for measured compressor mode-source combination m, at standard conditions, in cubic feet.

$MT_{s,m}$  = Volumetric gas emissions for measured compressor mode-source combination m, in standard cubic feet per hour, measured according to paragraph (o)(2) of this section. If multiple measurements are performed for a given mode-source combination m, use the average of all measurements.

$T_m$  = Total time the compressor is in the mode-source combination for which  $E_{s,i,m}$  is being calculated in the reporting year, in hours.

$GHG_{i,m}$  = Mole fraction of GHG<sub>i</sub> in the vent gas for measured compressor mode-source combination m; use the appropriate gas compositions in paragraph (u)(2) of this section.

m = Compressor mode-source combination specified in paragraph (o)(1)(i)(A) or (o)(1)(i)(B) of this section that was measured for the reporting year.

(ii) Using Equation W-22 of this section, calculate the annual volumetric GHG emissions from each centrifugal compressor mode-source combination specified in paragraph (o)(1)(i)(A) and (B) of this section that was not measured during the reporting year.

$$E_{s,i,m} = EF_{s,m} * T_m * GHG_{i,m} \quad (\text{Eq. W-22})$$

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Where:

$E_{s,i,m}$  = Annual volumetric GHG<sub>i</sub> (either CH<sub>4</sub> or CO<sub>2</sub>) emissions for unmeasured compressor mode-source combination m, at standard conditions, in cubic feet.

$EF_{s,m}$  = Reporter emission factor for compressor mode-source combination m, in standard cubic feet per hour, as calculated in paragraph (o)(6)(iii) of this section.

$T_m$  = Total time the compressor was in the unmeasured mode-source combination m, for which  $E_{s,i,m}$  is being calculated in the reporting year, in hours.

$GHG_{i,m}$  = Mole fraction of GHG<sub>i</sub> in the vent gas for unmeasured compressor mode-source combination m; use the appropriate gas compositions in paragraph (u)(2) of this section.

m = Compressor mode-source combination specified in paragraph (o)(1)(i)(A) or (o)(1)(i)(B) of this section that was not measured in the reporting year.

(iii) Using Equation W-23 of this section, develop an emission factor for each compressor mode-source combination specified in paragraph (o)(1)(i)(A) and (B) of this section. These emission factors must be calculated annually and used in Equation W-22 of this section to determine volumetric emissions from a centrifugal compressor in the mode-source combinations that were not measured in the reporting year.

$$EF_{s,m} = \frac{\sum_{p=1}^{Count_m} MT_{s,m,p}}{Count_m} \quad (\text{Eq. W-23})$$

(2) Calculate GHG volumetric emissions at standard conditions using actual GHG emissions temperature and pressure, and Equation W-34 of this section.

$$E_{s,i} = \frac{E_{a,i} * (459.67 + T_s)}{(459.67 + T_a) * P_s * Z_a} \quad (\text{Eq. W-34})$$

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Where:

$E_{s,i}$  = GHG i volumetric emissions at standard temperature and pressure (STP) conditions in cubic feet.

$E_{a,i}$  = GHG i volumetric emissions at actual conditions in cubic feet.

$T_s$  = Temperature at standard conditions (60 °F).

$T_a$  = Temperature at actual emission conditions ( °F).

$P_s$  = Absolute pressure at standard conditions (14.7 psia).

$P_a$  = Absolute pressure at actual conditions (psia).

$Z_a$  = Compressibility factor at actual conditions for GHG i.

You may use either a default compressibility factor of 1, or a site-specific compressibility factor based on actual temperature and pressure conditions.

(3) Reporters using 68 °F for standard temperature may use the ratio 519.67/527.67 to convert volumetric emissions from 68 °F to 60 °F.

(u) *GHG volumetric emissions at standard conditions.* Calculate GHG volumetric emissions at standard conditions as specified in paragraphs (u)(1) and (2) of this section.

(1) Estimate CH<sub>4</sub> and CO<sub>2</sub> emissions from natural gas emissions using Equation W-35 of this section.

$$E_{s,i} = E_{s,n} * M_i \quad (\text{Eq. W-35})$$

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where:

$E_{s,i}$  = GHG i (either CH<sub>4</sub> or CO<sub>2</sub>) volumetric emissions at standard conditions in cubic feet.

$E_{s,n}$  = Natural gas volumetric emissions at standard conditions in cubic feet.

$M_i$  = Mole fraction of GHG i in the natural gas.

(2) For Equation W-35 of this section, the mole fraction,  $M_i$ , shall be the annual average mole fraction for each sub-basin category or facility, as specified in paragraphs (u)(2)(i) through (vii) of this section.

(i) *GHG mole fraction in produced natural gas for onshore petroleum and natural gas production facilities and onshore petroleum and natural gas gathering and boosting facilities.* If you have a continuous gas composition analyzer for produced natural gas, you must use an annual average of these values for determining the mole fraction. If you do not have a continuous gas composition analyzer, then you must use an annual average gas composition based on your most recent available analysis of the sub-basin category or facility, as applicable to the emission source.

(ii) GHG mole fraction in feed natural gas for all emissions sources upstream of the de-methanizer or dew point control and GHG mole fraction in facility specific residue gas to transmission pipeline systems for all emissions sources downstream of the de-methanizer overhead or dew point control for onshore natural gas processing facilities. For onshore natural gas processing plants that solely fractionate a liquid stream, use the GHG mole percent in feed natural gas liquid for all streams. If you have a continuous gas composition analyzer on feed natural gas, you must use these values for determining the mole fraction. If you do not have a continuous gas composition analyzer, then annual samples must be taken according to methods set forth in §98.234(b).

(iii) *GHG mole fraction in transmission pipeline natural gas that passes through the facility for the onshore natural gas transmission compression industry segment and the onshore natural gas transmission pipeline industry segment.* You may use either a default 95 percent methane and 1 percent carbon dioxide fraction for GHG mole fraction in natural gas or site specific engineering estimates based on best available data.

(iv) *GHG mole fraction in natural gas stored in the underground natural gas storage industry segment.* You may use either a default 95 percent methane and 1 percent carbon dioxide fraction for GHG mole fraction in natural gas or site specific engineering estimates based on best available data.

(v) *GHG mole fraction in natural gas stored in the LNG storage industry segment.* You may use either a default 95 percent methane and 1 percent carbon dioxide fraction for GHG mole fraction in natural gas or site specific engineering estimates based on best available data.

(vi) *GHG mole fraction in natural gas stored in the LNG import and export industry segment.* For export facilities that receive gas from transmission pipelines, you may use either a default 95 percent methane and 1 percent carbon dioxide fraction for GHG mole fraction in natural gas or site specific engineering estimates based on best available data.

(vii) *GHG mole fraction in local distribution pipeline natural gas that passes through the facility for natural gas distribution facilities.* You may use either a default 95 percent methane and 1 percent carbon dioxide fraction for GHG mole fraction in natural gas or site specific engineering estimates based on best available data.

(v) *GHG mass emissions.* Calculate GHG mass emissions in metric tons by converting the GHG volumetric emissions at standard conditions into mass emissions using Equation W-36 of this section.

$$Mass_i = E_{s,i} * \rho_i * 10^{-3} \quad (\text{Eq. W-36})$$

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Where:

$Mass_i$  = GHG<sub>i</sub> (either CH<sub>4</sub>, CO<sub>2</sub>, or N<sub>2</sub>O) mass emissions in metric tons.

$E_{s,i}$  = GHG<sub>i</sub> (either CH<sub>4</sub>, CO<sub>2</sub>, or N<sub>2</sub>O) volumetric emissions at standard conditions, in cubic feet.

$\rho_i$  = Density of GHG<sub>i</sub>. Use 0.0526 kg/ft<sup>3</sup> for CO<sub>2</sub> and N<sub>2</sub>O, and 0.0192 kg/ft<sup>3</sup> for CH<sub>4</sub> at 60 °F and 14.7 psia.

(w) *EOR injection pump blowdown.* Calculate CO<sub>2</sub> pump blowdown emissions from each EOR injection pump system as follows:

(1) Calculate the total injection pump system volume in cubic feet (including pipelines, manifolds and vessels) between isolation valves.

(2) Retain logs of the number of blowdowns per calendar year.

(3) Calculate the total annual CO<sub>2</sub> emissions from each EOR injection pump system using Equation W-37 of this section:

$$Mass_{CO_2} = N * V_v * R_c * GHG_{CO_2} * 10^{-3} \quad (\text{Eq. W-37})$$

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Where:

$Mass_{CO_2}$  = Annual EOR injection pump system emissions in metric tons from blowdowns.

$N$  = Number of blowdowns for the EOR injection pump system in the calendar year.

$V_v$  = Total volume in cubic feet of EOR injection pump system chambers (including pipelines, manifolds and vessels) between isolation valves.

$R_c$  = Density of critical phase EOR injection gas in kg/ft<sup>3</sup>. You may use an appropriate standard method published by a consensus-based standards organization if such a method exists or you may use an industry standard practice to determine density of super critical EOR injection gas.

$GHG_{CO_2}$  = Mass fraction of CO<sub>2</sub> in critical phase injection gas.

$1 \times 10^{-3}$  = Conversion factor from kilograms to metric tons.

(x) *EOR hydrocarbon liquids dissolved CO<sub>2</sub>.* Calculate CO<sub>2</sub> emissions downstream of the storage tank from dissolved CO<sub>2</sub> in hydrocarbon liquids produced through EOR operations as follows:

(1) Determine the amount of CO<sub>2</sub> retained in hydrocarbon liquids after flashing in tankage at STP conditions. Annual samples of hydrocarbon liquids downstream of the storage tank must be taken according to methods set forth in §98.234 (b) to determine retention of CO<sub>2</sub> in hydrocarbon liquids immediately downstream of the storage tank. Use the annual analysis for the calendar year.

(2) Estimate emissions using Equation W-38 of this section.

$$Mass_{CO_2} = S_{h1} * V_{h1} \quad (\text{Eq. W-38})$$

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$R_j$  = Number of carbon atoms in the gas hydrocarbon constituent  $j$ ; 1 for methane, 2 for ethane, 3 for propane, 4 for butane, and 5 for pentanes plus, in gas sent to combustion unit.

$Y_{CH_4}$  = Mole fraction of methane constituent in gas sent to combustion unit.

(iv) Calculate GHG volumetric emissions at standard conditions using calculations in paragraph (t) of this section.

(v) Calculate both combustion-related  $CH_4$  and  $CO_2$  mass emissions from volumetric  $CH_4$  and  $CO_2$  emissions using calculation in paragraph (v) of this section.

(vi) Calculate  $N_2O$  mass emissions using Equation W-40 of this section.

$$Mass_{N_2O} = (1 \times 10^{-3}) \times Fuel \times HHV \times EF \quad (\text{Eq. W-40})$$

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Where:

$Mass_{N_2O}$  = Annual  $N_2O$  emissions from the combustion of a particular type of fuel (metric tons).

Fuel = Annual mass or volume of the fuel combusted (mass or volume per year, choose appropriately to be consistent with the units of HHV).

HHV = Higher heating value of fuel, mmBtu/unit of fuel (in units consistent with the fuel quantity combusted). For field gas or process vent gas, you may use either a default higher heating value of  $1.235 \times 10^{-3}$  mmBtu/scf or a site-specific higher heating value. For natural gas that is not of pipeline quality or that has a high heat value less than 950 Btu per standard cubic foot, use a site-specific higher heating value.

EF = Use  $1.0 \times 10^{-4}$  kg  $N_2O$ /mmBtu.

$1 \times 10^{-3}$  = Conversion factor from kilograms to metric tons.

(3) External fuel combustion sources with a rated heat capacity equal to or less than 5 mmBtu/hr do not need to report combustion emissions or include these emissions for threshold determination in §98.231(a). You must report the type and number of each external fuel combustion unit.

(4) Internal fuel combustion sources, not compressor-drivers, with a rated heat capacity equal to or less than 1 mmBtu/hr (or the equivalent of 130 horsepower), do not need to report combustion emissions or include these emissions for threshold determination in §98.231(a). You must report the type and number of each internal fuel combustion unit.

[75 FR 74488, Nov. 30, 2010, as amended at 76 FR 80575, Dec. 23, 2011; 77 FR 51490, Aug. 24, 2012; 78 FR 71960, Nov. 29, 2013; 79 FR 70408, Nov. 25, 2014; 80 FR 64284, Oct. 22, 2015]

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[Need assistance?](#)

Current Results Meter: SE\_TRT\_IN 52902-01 Date: 01/17/2017 12:25:07

|    | Component        | Response Factor | UnNorm % | Norm %  | Peak Areas | Peak Heights | Peak Times | Liquids (USgal/MCF) | Ideal (Btu/SCF) | Relative Density |
|----|------------------|-----------------|----------|---------|------------|--------------|------------|---------------------|-----------------|------------------|
| 1  | Propane          | 2.501           | 6.603    | 6.578   | 23653964   | 229937       | 50.050     | 1.818               | 165.498         | 0.100            |
| 2  | Hydrogen Sulfide | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 3  | IsoButane        | 1.979           | 0.812    | 0.809   | 3473753    | 28302        | 71.875     | 0.266               | 26.320          | 0.016            |
| 4  | Butane           | 8.286           | 2.055    | 2.047   | 8950955    | 65256        | 80.300     | 0.648               | 66.791          | 0.041            |
| 5  | NeoPentane       | 0.361           | 0.004    | 0.004   | 21002      | 132          | 103.600    | 0.002               | 0.173           | 0                |
| 6  | IsoPentane       | 0.332           | 0.417    | 0.415   | 2071148    | 10077        | 136.550    | 0.152               | 16.623          | 0.010            |
| 7  | Pentane          | 1.579           | 0.446    | 0.444   | 2254356    | 9713         | 159.375    | 0.161               | 17.797          | 0.011            |
| 8  | Hexane+          | 0.209           | 0.206    | 0.206   | 1196916    | 14841        | 20.725     | 0                   | 0               | 0                |
| 9  | Nitrogen         | 4.651           | 2.143    | 2.134   | 4984775    | 57594        | 37.550     | 0                   | 0               | 0.021            |
| 10 | Methane          | 1.288           | 75.637   | 75.349  | 142828829  | 591036       | 48.500     | 0                   | 761.020         | 0.417            |
| 11 | Carbon Dioxide   | 1.272           | 0.005    | 0.005   | 17673      | 71           | 90.550     | 0                   | 0               | 0                |
| 12 | Ethylene         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 13 | Ethane           | 1.034           | 12.054   | 12.008  | 38662855   | 66021        | 207.950    | 3.223               | 212.510         | 0.125            |
| 14 | Hexane           | 0               | 0        | 0.098   | 0          | 0            | 0.000      | 0.040               | 4.643           | 0.003            |
| 15 | Heptane          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 16 | Heptane          | 0               | 0        | 0.073   | 0          | 0            | 0.000      | 0.034               | 4.000           | 0.003            |
| 17 | Octane           | 0               | 0        | 0.035   | 0          | 0            | 0.000      | 0.018               | 2.210           | 0.001            |
| 18 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 19 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 20 | Decane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 21 | Undecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 22 | Ethane-          | 0               | 0        | 0       | 156741923  | 1239067      | 36.550     | 0                   | 0               | 0                |
| 23 | Propane +        | 0               | 0        | 0       | 43224952   | 326970       | 26.000     | 0                   | 0               | 0                |
| 24 | Oxygen           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 25 | Water            | 0               | 0        | 1.741   | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 26 | Helium           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 27 | Hydrogen         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 28 | Total            |                 | 100.382  | 100.000 |            |              |            | 6.362               | 1277.583        | 0.749            |

Compressibility: 0.996  
 Density: 0.057 (lbm/ft3)  
 Real RD: 0.751  
 Ideal CV: 1277.583 (Btu/SCF)  
 Inferior Wobbe: 1459.496 (Btu/SCF)  
 Superior Wobbe: 1483.129 (Btu/SCF)  
 Inferior CV: 1263.061 (Btu/SCF)  
 Superior CV: 1285.375 (Btu/SCF)

Current Results Meter: SE\_OVHD\_ST 52502-01 Date: 01/17/2017 12:23:01

|    | Component        | Response Factor | UnNorm % | Norm %  | Peak Areas | Peak Heights | Peak Times | Liquids (USgal/MCF) | Ideal (Btu/SCF) | Relative Density |
|----|------------------|-----------------|----------|---------|------------|--------------|------------|---------------------|-----------------|------------------|
| 1  | Propane          | 2.340           | 22.554   | 22.484  | 80830881   | 627849       | 48.525     | 6.283               | 565.720         | 0.342            |
| 2  | Hydrogen Sulfide | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 3  | IsoButane        | 1.853           | 4.654    | 4.639   | 20914976   | 168278       | 71.250     | 1.540               | 150.862         | 0.093            |
| 4  | Butane           | 7.167           | 15.358   | 15.310  | 63408859   | 397593       | 79.000     | 4.896               | 499.454         | 0.307            |
| 5  | NeoPentane       | 0.325           | 0.033    | 0.033   | 180386     | 1060         | 104.200    | 0.012               | 1.333           | 0.001            |
| 6  | IsoPentane       | 0.309           | 3.778    | 3.766   | 20118618   | 90837        | 138.500    | 1.397               | 150.671         | 0.094            |
| 7  | Pentane          | 1.471           | 4.238    | 4.225   | 22662245   | 91706        | 162.500    | 1.553               | 169.355         | 0.105            |
| 8  | Hexane+          | 0.172           | 1.733    | 1.728   | 12209024   | 136912       | 20.375     | 0                   | 0               | 0                |
| 9  | Nitrogen         | 4.413           | 0.257    | 0.256   | 660980     | 7441         | 41.900     | 0                   | 0               | 0.002            |
| 10 | Methane          | 1.230           | 27.620   | 27.534  | 57904193   | 330082       | 55.850     | 0                   | 278.092         | 0.153            |
| 11 | CarbonDioxide    | 1.222           | 2.638    | 2.630   | 7929918    | 35574        | 93.850     | 0                   | 0               | 0.040            |
| 12 | Ethane           | 0.988           | 17.450   | 17.395  | 58056952   | 103611       | 210.275    | 4.719               | 307.840         | 0.181            |
| 13 | Hexane           | 0               | 0        | 0.820   | 0          | 0            | 0.000      | 0.342               | 39.001          | 0.024            |
| 14 | Heptane+         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 15 | Heptane          | 0               | 0        | 0.611   | 0          | 0            | 0.000      | 0.286               | 33.596          | 0.021            |
| 16 | Octane           | 0               | 0        | 0.297   | 0          | 0            | 0.000      | 0.154               | 18.563          | 0.012            |
| 17 | Nonane+          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 18 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 19 | Decane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 20 | Undecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 21 | Dodecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 22 | Ethane-          | 0               | 0        | 0       | 109613455  | 645805       | 36.050     | 0                   | 0               | 0                |
| 23 | Propane +        | 0               | 0        | 0       | 183539850  | 1080348      | 27.000     | 0                   | 0               | 0                |
| 24 | Oxygen           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 25 | Total            |                 | 100.313  | 100.000 |            |              |            | 21.182              | 2214.487        | 1.375            |

Compressibility: 0.986  
 Density: 0.107 (lbm/ft3)  
 Real RD: 1.395  
 Ideal CV: 2214.487 (Btu/SCF)  
 Inferior Wobbe: 1882.501 (Btu/SCF)  
 Superior Wobbe: 1906.741 (Btu/SCF)  
 Inferior CV: 2212.631 (Btu/SCF)  
 Superior CV: 2251.935 (Btu/SCF)

Current Results Meter: SE\_PRODUCT DEC1 Date: 01/17/2017 12:22:17

|    | Component        | Response Factor | UnNorm % | Norm %  | Peak Areas | Peak Heights | Peak Times | Liquids (USgal/MCF) | Ideal (Btu/SCF) | Relative Density |
|----|------------------|-----------------|----------|---------|------------|--------------|------------|---------------------|-----------------|------------------|
| 1  | Propane          | 2.253           | 29.908   | 29.734  | 108217879  | 751937       | 48.450     | 8.317               | 748.131         | 0.453            |
| 2  | Hydrogen Sulfide | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 3  | IsoButane        | 1.665           | 3.677    | 3.655   | 18466352   | 136630       | 72.150     | 1.214               | 118.868         | 0.073            |
| 4  | Butane           | 6.383           | 9.178    | 9.124   | 46299668   | 286254       | 80.375     | 2.920               | 297.660         | 0.183            |
| 5  | NeoPentane       | 0.315           | 0.019    | 0.019   | 107070     | 622          | 105.450    | 0.007               | 0.764           | 0                |
| 6  | IsoPentane       | 0.294           | 1.905    | 1.894   | 10666425   | 48554        | 139.675    | 0.703               | 75.763          | 0.047            |
| 7  | Pentane          | 1.394           | 2.052    | 2.040   | 11681490   | 46871        | 163.400    | 0.751               | 81.770          | 0.051            |
| 8  | Hexane+          | 0.168           | 0.900    | 0.895   | 6482265    | 72217        | 20.725     | 0                   | 0               | 0                |
| 9  | Nitrogen         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 10 | Methane          | 1.037           | 0.758    | 0.753   | 2049239    | 15074        | 61.250     | 0.130               | 7.608           | 0.004            |
| 11 | CarbonDioxide    | 1.080           | 0.016    | 0.016   | 58079      | 252          | 97.575     | 0.003               | 0               | 0                |
| 12 | Ethane           | 0.856           | 52.174   | 51.870  | 189900023  | 264397       | 196.450    | 14.084              | 917.949         | 0.539            |
| 13 | Hexane           | 0               | 0        | 0.425   | 0          | 0            | 0.000      | 0.177               | 20.196          | 0.013            |
| 14 | Heptane+         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 15 | Heptane          | 0               | 0        | 0.316   | 0          | 0            | 0.000      | 0.148               | 17.397          | 0.011            |
| 16 | Octane           | 0               | 0        | 0.154   | 0          | 0            | 0.000      | 0.080               | 9.612           | 0.006            |
| 17 | Nonane+          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 18 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 19 | Decane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 20 | Undecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 21 | Dodecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 22 | Ethane-          | 0               | 0        | 0       | 137319354  | 1121472      | 34.700     | 0                   | 0               | 0                |
| 23 | Propane +        | 0               | 0        | 0       | 194815126  | 1238752      | 27.000     | 0                   | 0               | 0                |
| 24 | Oxygen           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 25 | Total            |                 | 100.586  | 100.000 |            |              |            | 28.534              | 2295.718        | 1.380            |

Compressibility: 0.985  
 Density: 0.107 (lbm/ft3)  
 Real RD: 1.401  
 Ideal CV: 2295.718 (Btu/SCF)  
 Inferior Wobbe: 1949.025 (Btu/SCF)  
 Superior Wobbe: 1974.144 (Btu/SCF)  
 Inferior CV: 2295.870 (Btu/SCF)  
 Superior CV: 2336.776 (Btu/SCF)

Current Results Meter: SE\_PRODUCT 52212\_PROD Date: 01/17/2017 12:27:32

|    | Component        | Response Factor | UnNorm % | Norm %  | Peak Areas | Peak Heights | Peak Times | Liquids (USgal/MCF) | Ideal (Btu/SCF) | Relative Density |
|----|------------------|-----------------|----------|---------|------------|--------------|------------|---------------------|-----------------|------------------|
| 1  | Propane          | 2.253           | 30.425   | 30.253  | 109876092  | 759021       | 48.400     | 8.463               | 761.200         | 0.461            |
| 2  | Hydrogen Sulfide | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 3  | IsoButane        | 1.665           | 3.753    | 3.732   | 18844022   | 139271       | 72.125     | 1.240               | 121.358         | 0.075            |
| 4  | Butane           | 6.383           | 9.411    | 9.358   | 47317285   | 291191       | 80.325     | 2.996               | 305.292         | 0.188            |
| 5  | NeoPentane       | 0.315           | 0.020    | 0.020   | 110116     | 638          | 105.400    | 0.007               | 0.786           | 0                |
| 6  | IsoPentane       | 0.294           | 1.929    | 1.918   | 10801224   | 49098        | 139.675    | 0.712               | 76.734          | 0.048            |
| 7  | Pentane          | 1.394           | 2.070    | 2.059   | 11786900   | 47244        | 163.375    | 0.758               | 82.528          | 0.051            |
| 8  | Hexane+          | 0.168           | 0.919    | 0.914   | 6623300    | 73385        | 20.725     | 0                   | 0               | 0                |
| 9  | Nitrogen         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 10 | Methane          | 1.037           | 0.624    | 0.621   | 1706501    | 12533        | 61.275     | 0.107               | 6.270           | 0.003            |
| 11 | CarbonDioxide    | 1.080           | 0.021    | 0.021   | 76771      | 334          | 97.450     | 0.004               | 0               | 0                |
| 12 | Ethane           | 0.856           | 51.395   | 51.104  | 187278703  | 261869       | 196.675    | 13.878              | 904.388         | 0.531            |
| 13 | Hexane           | 0               | 0        | 0.434   | 0          | 0            | 0.000      | 0.181               | 20.639          | 0.013            |
| 14 | Heptane+         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 15 | Heptane          | 0               | 0        | 0.323   | 0          | 0            | 0.000      | 0.151               | 17.779          | 0.011            |
| 16 | Octane           | 0               | 0        | 0.157   | 0          | 0            | 0.000      | 0.082               | 9.823           | 0.006            |
| 17 | Nonane+          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 18 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 19 | Decane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 20 | Undecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 21 | Dodecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 22 | Ethane-          | 0               | 0        | 0       | 135336772  | 1113687      | 34.700     | 0                   | 0               | 0                |
| 23 | Propane +        | 0               | 0        | 0       | 197549206  | 1250568      | 27.000     | 0                   | 0               | 0                |
| 24 | Oxygen           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 25 | Total            |                 | 100.569  | 100.000 |            |              |            | 28.580              | 2306.798        | 1.387            |

Compressibility: 0.985  
 Density: 0.108 (lbm/ft3)  
 Real RD: 1.409  
 Ideal CV: 2306.798 (Btu/SCF)  
 Inferior Wobbe: 1953.495 (Btu/SCF)  
 Superior Wobbe: 1978.633 (Btu/SCF)  
 Inferior CV: 2307.337 (Btu/SCF)  
 Superior CV: 2348.450 (Btu/SCF)

Current Results Meter: SE\_IN\_RES 52901 Date: 01/17/2017 12:26:53

|    | Component        | Response Factor | UnNorm % | Norm %  | Peak Areas | Peak Heights | Peak Times | Liquids (USgal/MCF) | Ideal (Btu/SCF) | Relative Density |
|----|------------------|-----------------|----------|---------|------------|--------------|------------|---------------------|-----------------|------------------|
| 1  | Propane          | 2.503           | 6.319    | 6.315   | 22652988   | 208787       | 52.375     | 1.746               | 158.885         | 0.096            |
| 2  | Hydrogen Sulfide | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 3  | IsoButane        | 1.976           | 0.762    | 0.762   | 3265495    | 25038        | 74.850     | 0.250               | 24.776          | 0.015            |
| 4  | Butane           | 8.308           | 1.917    | 1.916   | 8347530    | 57455        | 83.525     | 0.606               | 62.493          | 0.038            |
| 5  | NeoPentane       | 0.352           | 0.004    | 0.004   | 18789      | 113          | 107.550    | 0.001               | 0.151           | 0                |
| 6  | IsoPentane       | 0.340           | 0.378    | 0.378   | 1832945    | 8574         | 141.325    | 0.139               | 15.130          | 0.009            |
| 7  | Pentane          | 1.595           | 0.403    | 0.403   | 2018801    | 8228         | 164.650    | 0.147               | 16.147          | 0.010            |
| 8  | Hexane+          | 0.213           | 0.176    | 0.176   | 1001004    | 12070        | 20.425     | 0                   | 0               | 0                |
| 9  | Nitrogen         | 4.084           | 2.044    | 2.042   | 5419728    | 57065        | 42.350     | 0                   | 0               | 0.020            |
| 10 | Methane          | 1.128           | 73.183   | 73.131  | 158272796  | 606028       | 53.800     | 0                   | 738.621         | 0.405            |
| 11 | Carbon Dioxide   | 1.120           | 3.223    | 3.221   | 10557427   | 43319        | 95.275     | 0                   | 0               | 0.049            |
| 12 | Ethylene         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 13 | Ethane           | 0.914           | 11.661   | 11.653  | 42300556   | 78355        | 216.250    | 3.127               | 206.223         | 0.121            |
| 14 | Hexane           | 0               | 0        | 0.083   | 0          | 0            | 0.000      | 0.034               | 3.970           | 0.002            |
| 15 | Heptane          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 16 | Heptane          | 0               | 0        | 0.062   | 0          | 0            | 0.000      | 0.029               | 3.420           | 0.002            |
| 17 | Octane           | 0               | 0        | 0.030   | 0          | 0            | 0.000      | 0.016               | 1.889           | 0.001            |
| 18 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 19 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 20 | Decane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 21 | Undecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 22 | Ethane-          | 0               | 0        | 0       | 159668077  | 1162544      | 36.650     | 0                   | 0               | 0                |
| 23 | Propane +        | 0               | 0        | 0       | 46068312   | 356212       | 27.000     | 0                   | 0               | 0                |
| 24 | Oxygen           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 25 | Water            | 0               | 0        | 1.741   | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 26 | Helium           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 27 | Hydrogen         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 28 | Total            |                 | 100.071  | 100.000 |            |              |            | 6.095               | 1231.705        | 0.770            |

Compressibility: 0.996  
 Density: 0.059 (lbm/ft3)  
 Real RD: 0.773  
 Ideal CV: 1231.705 (Btu/SCF)  
 Inferior Wobbe: 1387.617 (Btu/SCF)  
 Superior Wobbe: 1409.799 (Btu/SCF)  
 Inferior CV: 1217.683 (Btu/SCF)  
 Superior CV: 1239.191 (Btu/SCF)

|    | Component        | Response Factor | UnNorm % | Norm %  | Peak Areas | Peak Heights | Peak Times | Liquids (USgal/MCF) | Ideal (Btu/SCF) | Relative Density |
|----|------------------|-----------------|----------|---------|------------|--------------|------------|---------------------|-----------------|------------------|
| 1  | Propane          | 2.503           | 0.020    | 0.020   | 75043      | 762          | 53.125     | 0.006               | 0.512           | 0                |
| 2  | Hydrogen Sulfide | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 3  | IsoButane        | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 4  | Butane           | 8.308           | 0        | 0       | 1641       | 31           | 83.900     | 0                   | 0.012           | 0                |
| 5  | NeoPentane       | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 6  | IsoPentane       | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 7  | Pentane          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 8  | Hexane+          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 9  | Nitrogen         | 4.084           | 2.809    | 2.807   | 7408625    | 79089        | 42.225     | 0                   | 0               | 0.027            |
| 10 | Methane          | 1.128           | 96.079   | 96.002  | 202478082  | 696705       | 52.725     | 0                   | 969.616         | 0.532            |
| 11 | Carbon Dioxide   | 1.120           | 0.005    | 0.005   | 20638      | 81           | 96.300     | 0                   | 0               | 0                |
| 12 | Ethylene         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 13 | Ethane           | 0.914           | 1.166    | 1.165   | 4284769    | 8514         | 223.375    | 0.312               | 20.621          | 0.012            |
| 14 | Hexane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 15 | Heptane          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 16 | Heptane          | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 17 | Octane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 18 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 19 | Nonane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 20 | Decane           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 21 | Undecane         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 22 | Ethane-          | 0               | 0        | 0       | 155742071  | 1332043      | 36.650     | 0                   | 0               | 0                |
| 23 | Propane +        | 0               | 0        | 0       | 108842     | 809          | 27.000     | 0                   | 0               | 0                |
| 24 | Oxygen           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 25 | Water            | 0               | 0        | 1.741   | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 26 | Helium           | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 27 | Hydrogen         | 0               | 0        | 0       | 0          | 0            | 0.000      | 0                   | 0               | 0                |
| 28 | Total            |                 | 100.081  | 100.000 |            |              |            | 0.318               | 990.761         | 0.571            |

Compressibility: 0.998  
 Density: 0.044 (lbm/ft3)  
 Real RD: 0.572  
 Ideal CV: 990.761 (Btu/SCF)  
 Inferior Wobbe: 1291.379 (Btu/SCF)  
 Superior Wobbe: 1315.243 (Btu/SCF)  
 Inferior CV: 977.721 (Btu/SCF)  
 Superior CV: 995.001 (Btu/SCF)

**FESCO, Ltd.**  
**105 Medical Dr. - Ozona, Texas 76943**

**For:** Enterprise Products Company  
 10500 Heritage Blvd., Suite 150  
 San Antonio, Texas 78216

**Sample:** South Eddy Plant  
 Amine Contactor  
 Sampled @ 890 psig & 126 °F

Date Sampled: 05/25/2016

Job Number: 60417.021

**CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286**

| COMPONENT           | MOL%         | GPM          |
|---------------------|--------------|--------------|
| Hydrogen Sulfide*   | < 0.001      |              |
| Nitrogen            | 1.938        |              |
| Carbon Dioxide      | 2.070        |              |
| Methane             | 75.911       |              |
| Ethane              | 10.921       | 2.915        |
| Propane             | 5.662        | 1.557        |
| Isobutane           | 0.700        | 0.229        |
| n-Butane            | 1.704        | 0.536        |
| 2-2 Dimethylpropane | 0.000        | 0.000        |
| Isopentane          | 0.374        | 0.136        |
| n-Pentane           | 0.384        | 0.139        |
| Hexanes             | 0.182        | 0.075        |
| Heptanes Plus       | <u>0.154</u> | <u>0.059</u> |
| Totals              | 100.000      | 5.645        |

**Computed Real Characteristics Of Heptanes Plus:**

Specific Gravity ----- 3.198 (Air=1)  
 Molecular Weight ----- 92.30  
 Gross Heating Value ----- 4739 BTU/CF

**Computed Real Characteristics Of Total Sample:**

Specific Gravity ----- 0.750 (Air=1)  
 Compressibility (Z) ----- 0.9964  
 Molecular Weight ----- 21.66  
 Gross Heating Value  
   Dry Basis ----- 1228 BTU/CF  
   Saturated Basis ----- 1207 BTU/CF

\*Hydrogen Sulfide tested on location by Stain Tube Method (GPA 2377)

Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.650 PSI & 60 Deg F

Certified: FESCO, Ltd. - Ozona, Texas

Sampled By: (14) Perez  
 Analyst: BMc  
 Processor: BMc  
 Cylinder ID: T-1463

Tom Anderson 325-392-3773

**CHROMATOGRAPH EXTENDED ANALYSIS  
TOTAL REPORT**

| COMPONENT              | MOL %   | GPM   | WT %    |
|------------------------|---------|-------|---------|
| Hydrogen Sulfide*      | < 0.001 |       | < 0.001 |
| Nitrogen               | 1.938   |       | 2.507   |
| Carbon Dioxide         | 2.070   |       | 4.207   |
| Methane                | 75.911  |       | 56.232  |
| Ethane                 | 10.921  | 2.915 | 15.164  |
| Propane                | 5.662   | 1.557 | 11.529  |
| Isobutane              | 0.700   | 0.229 | 1.879   |
| n-Butane               | 1.704   | 0.536 | 4.573   |
| 2,2 Dimethylpropane    | 0.000   | 0.000 | 0.000   |
| Isopentane             | 0.374   | 0.136 | 1.246   |
| n-Pentane              | 0.384   | 0.139 | 1.279   |
| 2,2 Dimethylbutane     | 0.003   | 0.001 | 0.012   |
| Cyclopentane           | 0.000   | 0.000 | 0.000   |
| 2,3 Dimethylbutane     | 0.022   | 0.009 | 0.088   |
| 2 Methylpentane        | 0.059   | 0.024 | 0.235   |
| 3 Methylpentane        | 0.032   | 0.013 | 0.127   |
| n-Hexane               | 0.066   | 0.027 | 0.263   |
| Methylcyclopentane     | 0.032   | 0.011 | 0.124   |
| Benzene                | 0.013   | 0.004 | 0.047   |
| Cyclohexane            | 0.030   | 0.010 | 0.117   |
| 2-Methylhexane         | 0.006   | 0.003 | 0.028   |
| 3-Methylhexane         | 0.007   | 0.003 | 0.032   |
| 2,2,4 Trimethylpentane | 0.000   | 0.000 | 0.000   |
| Other C7's             | 0.020   | 0.009 | 0.092   |
| n-Heptane              | 0.011   | 0.005 | 0.051   |
| Methylcyclohexane      | 0.016   | 0.006 | 0.073   |
| Toluene                | 0.006   | 0.002 | 0.026   |
| Other C8's             | 0.008   | 0.004 | 0.041   |
| n-Octane               | 0.002   | 0.001 | 0.011   |
| Ethylbenzene           | 0.000   | 0.000 | 0.000   |
| M & P Xylenes          | 0.001   | 0.000 | 0.005   |
| O-Xylene               | 0.000   | 0.000 | 0.000   |
| Other C9's             | 0.002   | 0.001 | 0.012   |
| n-Nonane               | 0.000   | 0.000 | 0.000   |
| Decanes Plus (10)      | 0.000   | 0.000 | 0.000   |
| Totals                 | 100.000 | 5.645 | 100.000 |

**Computed Real Characteristics Of Total Sample:**

|                           |        |         |
|---------------------------|--------|---------|
| Specific Gravity -----    | 0.750  | (Air=1) |
| Compressibility (Z) ----- | 0.9964 |         |
| Molecular Weight -----    | 21.66  |         |
| Gross Heating Value       |        |         |
| Dry Basis -----           | 1228   | BTU/CF  |
| Saturated Basis -----     | 1207   | BTU/CF  |

# Off-Gas Analysis

|                                   |            |           |
|-----------------------------------|------------|-----------|
| Stream Number                     |            | 518       |
|                                   | Unit       |           |
| Vapour Fraction                   |            | 1.0000    |
| Temperature                       | F          | 297.99    |
| Pressure                          | psia       | 613.10    |
| Molar Flow                        | lbmole/hr  | 3.3       |
| Mass Flow                         | lb/hr      | 15853.8   |
| Molar Enthalpy                    | Btu/lbmole | -45499.1  |
| Heat Flow                         | Btu/hr     | -16721810 |
| Std Gas Flow                      | MMSCFD     | 3.3       |
| Standard Ideal Liquid Volume Flow | barrel/hr  | ---       |
| Molecular Weight                  |            | 43.14     |
| Mass Density                      | lb/ft3     | 4.24      |
| Vapor Actual Volume Flow          | ACFM       | 62.4      |
| Liquid Actual Volume Flow         | USGPM      | ---       |
| Z Factor                          |            | 0.8       |
| Viscosity                         | cP         | 0.0       |

| Component Molar Fraction | Mol Wt. | Mol Frac |
|--------------------------|---------|----------|
| Nitrogen                 | 28.01   | 0.162%   |
| CO2                      | 44.01   | 2.123%   |
| H2S                      | 34.08   | 0.000%   |
| Methane                  | 16.04   | 25.042%  |
| Ethane                   | 30.07   | 15.403%  |
| Propane                  | 44.10   | 20.376%  |
| i-Butane                 | 58.12   | 5.847%   |
| n-Butane                 | 58.12   | 15.108%  |
| i-Pentane                | 72.15   | 5.876%   |
| n-Pentane                | 72.15   | 5.934%   |
| n-Hexane                 | 86.18   | 2.492%   |
| n-Heptane                | 100.21  | 1.125%   |
| n-Octane                 | 114.23  | 0.473%   |
| H2O                      | 18.02   | 0.037%   |
| Therminol-59             | 207.00  | 0.000%   |
| Ucarsol AP-814           | ~120.00 | 0.000%   |
| Triethylene Glycol       | 138.46  | 0.000%   |

# Section 8

## Map(s)

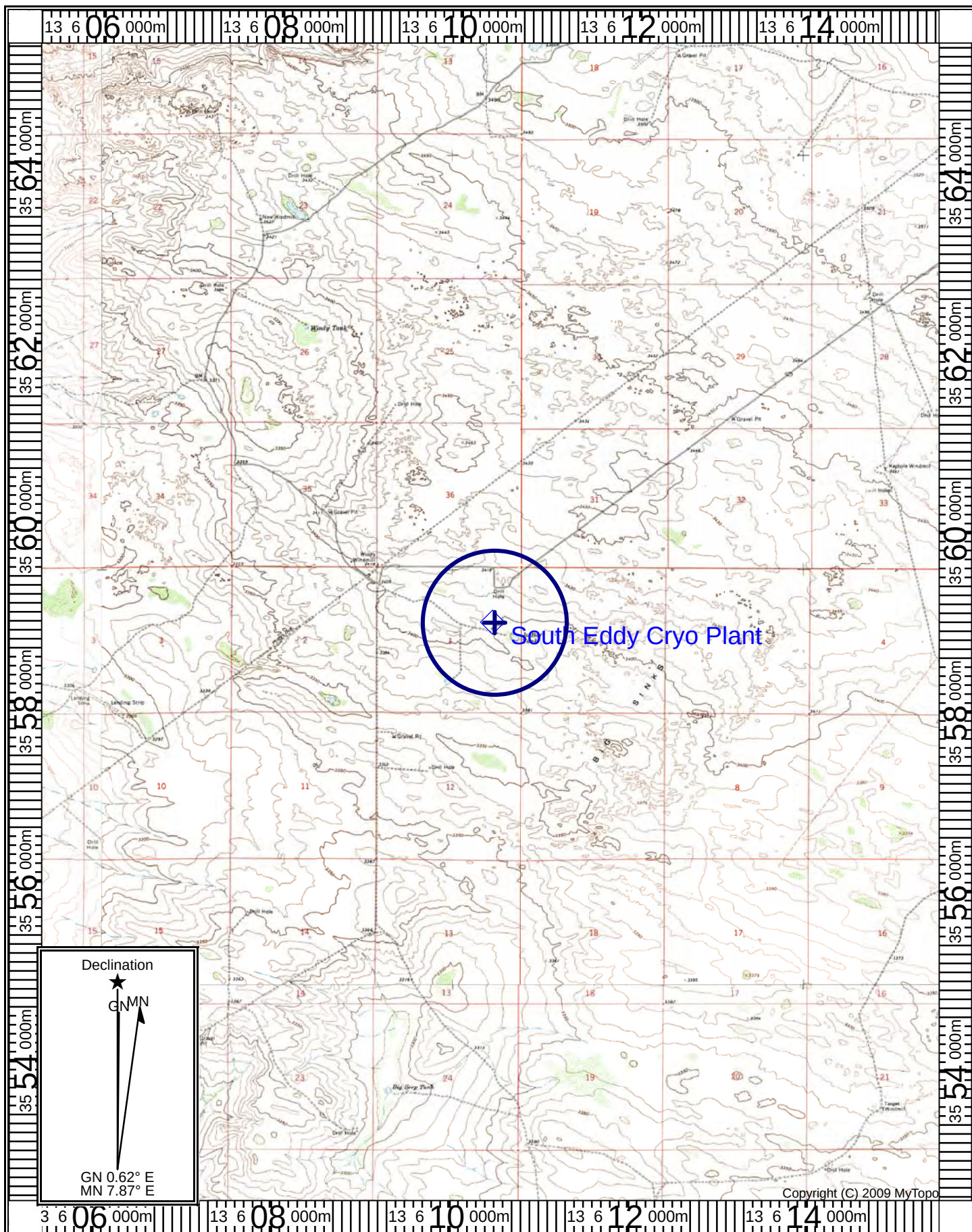
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A map such as a 7.5 minute topographic quadrangle showing the exact location of the source. The map shall also include the following:

|                                                        |                                                    |
|--------------------------------------------------------|----------------------------------------------------|
| The UTM or Longitudinal coordinate system on both axes | An indicator showing which direction is north      |
| A minimum radius around the plant of 0.8km (0.5 miles) | Access and haul roads                              |
| Topographic features of the area                       | Facility property boundaries                       |
| The name of the map                                    | The area which will be restricted to public access |
| A graphical scale                                      |                                                    |

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An appropriate map showing the facility location is included.



Map Name: BIG SINKS (NM)  
Print Date: 02/03/16

Scale: 1 inch = 4,761 ft.  
Map Center: 13 0610388 E 3558948 N

Horizontal Datum: WGS84

# Section 9

## Proof of Public Notice

(for NSR applications submitting under 20.2.72 or 20.2.74 NMAC)

(This proof is required by: 20.2.72.203.A.14 NMAC “Documentary Proof of applicant’s public notice”)

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☒ **I have read the AQB “Guidelines for Public Notification for Air Quality Permit Applications”**

This document provides detailed instructions about public notice requirements for various permitting actions. It also provides public notice examples and certification forms. Material mistakes in the public notice will require a re-notice before issuance of the permit.

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Unless otherwise allowed elsewhere in this document, the following items document proof of the applicant’s Public Notification. Please include this page in your proof of public notice submittal with checkmarks indicating which documents are being submitted with the application.

**New Permit** and **Significant Permit Revision** public notices must include all items in this list.

**Technical Revision** public notices require only items 1, 5, 9, and 10.

Per the Guidelines for Public Notification document mentioned above, include:

1. ☐ A copy of the certified letter receipts with post marks (20.2.72.203.B NMAC)
  2. ☐ A list of the places where the public notice has been posted in at least four publicly accessible and conspicuous places, including the proposed or existing facility entrance. (e.g: post office, library, grocery, etc.)
  3. ☐ A copy of the property tax record (20.2.72.203.B NMAC).
  4. ☐ A sample of the letters sent to the owners of record.
  5. ☐ A sample of the letters sent to counties, municipalities, and Indian tribes.
  6. ☐ A sample of the public notice posted and a verification of the local postings.
  7. ☐ A table of the noticed citizens, counties, municipalities and tribes and to whom the notices were sent in each group.
  8. ☐ A copy of the public service announcement (PSA) sent to a local radio station and documentary proof of submittal.
  9. ☐ A copy of the classified or legal ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
  10. ☐ A copy of the display ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
  11. ☐ A map with a graphic scale showing the facility boundary and the surrounding area in which owners of record were notified by mail. This is necessary for verification that the correct facility boundary was used in determining distance for notifying land owners of record.
- 

N/A – This is Title V operating permit application being submitted pursuant to 20.2.70 NMAC. Public notice is not required.

# Section 10

## Written Description of the Routine Operations of the Facility

---

**A written description of the routine operations of the facility.** Include a description of how each piece of equipment will be operated, how controls will be used, and the fate of both the products and waste generated. For modifications and/or revisions, explain how the changes will affect the existing process. In a separate paragraph describe the major process bottlenecks that limit production. The purpose of this description is to provide sufficient information about plant operations for the permit writer to determine appropriate emission sources.

---

South Eddy Cryo Plant is a 240 MMscf/day cryogenic gas processing plant designed to treat and process natural gas for Enterprise's gathering systems located throughout southeastern New Mexico. The facility consists of one train.

Field gas entering the facility is sent through inlet separation designed to remove entrained solids and dissolved liquids. The liquids are sent to the condensate stabilizer, which will operate with heat from the heat medium heater (unit H-2). The vapors off of the stabilizer are captured, recompressed by electric vapor recovery units (unit VRU-1 (CO-1011) and unit VRU-2 (CO-1012)), and routed back to the plant inlet prior to inlet compression. The condensate is sent to the pressurized condensate tanks; any gases are recovered and routed either into the cryo process or to the inlet compression system. The stabilized condensate is loaded onto pressurized trucks (unit LOAD) and removed (unit HAUL) from the facility.

After inlet separation, the field gas is routed to the inlet compressors (units RC-1 through RC-3, driven by electric engines) and then sent to the amine system (unit Amine-1) to remove carbon dioxide from the gas. Emissions from the amine flash tank are routed to the electric vapor recovery unit (VRU-3) which is the primary control for amine flash. Any uncaptured amine flash will be routed to facility flare (unit FL-1). Additionally, unit FL-1, the thermal oxidizer (unit TO-1), or Heat medium heater (unit H-2) will be used to control amine flash as an alternate scenario to unit VRU-3. The amine still vent is routed to the thermal oxidizer (unit TO-1) to be incinerated. The rich amine is regenerated through use of heat from the heat medium heater (unit H-2).

After the amine treating, the gas is sent to the glycol dehydrator (unit Dehy-1) then the molecular sieve dehydrators (units Mole-1 through Mole-3) for the purpose of removing water from the gas stream. Unit H-1 is used to regenerate the sieves and may be assisted by heat from the heat medium heater (unit H-2). After dehydration, the gas enters the cryo plant. Recovery of the natural gas liquids (NGLs) is achieved by rapidly dropping the temperature. This is accomplished through the use of an expander and propane refrigerant. The rapid temperature drop condenses out the heavier NGLs, while maintaining the methane in a gaseous form. The condensed liquid consists of NGL Y-Grade product that is removed from the facility via pipeline. Units CC-1 and CC-2 are the refrigerant compressors driven by electric turbines.

The dry, pipeline-quality residue gas (consisting primarily of methane) from the top of the demethanizer is sent to the residue gas compressors (units RC-4 through RC-6, driven by electric engines).

Startup, shutdown and maintenance (SSM) emissions are included in this application. SSM emissions include blowdown flaring, flaring during thermal oxidizer downtime, and flaring during plant turnaround events.

# Section 11

## Source Determination

Source submitting under 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC

Sources applying for a construction permit, PSD permit, or operating permit shall evaluate surrounding and/or associated sources (including those sources directly connected to this source for business reasons) and complete this section. Responses to the following questions shall be consistent with the Air Quality Bureau's permitting guidance, Single Source Determination Guidance, which may be found on the Applications Page in the Permitting Section of the Air Quality Bureau website.

Typically, buildings, structures, installations, or facilities that have the same SIC code, that are under common ownership or control, and that are contiguous or adjacent constitute a single stationary source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes. Submission of your analysis of these factors in support of the responses below is optional, unless requested by NMED.

**A. Identify the emission sources evaluated in this section (list and describe):** Three (3) inlet reciprocating compressors used for inlet compression, three (3) residue reciprocating compressors used for dry, pipeline-quality residue gas compression, two (2) refrigeration centrifugal compressors with dry seals used for refrigeration, three (3) stabilizer overhead gas compressors for overhead gas compression, one (1) amine sweetening unit for gas sweetening, one (1) triethylene glycol dehydrator unit for drying the gas, one (1) mole sieve dehydrator regeneration heater to regenerate the mole sieve dehydrator, one (1) heater to assist with regenerating the mole sieves, one (1) thermal oxidizer to control the amine unit and dehydration unit emissions, haul road emissions, condensate loadout emissions, facility fugitive emissions, one (1) facility flare to control process emissions, startup, shutdown, and maintenance (SSM) emissions, and six (6) gas chromatographs for gas chromatography.

**B. Apply the 3 criteria for determining a single source:**

**SIC Code:** Surrounding or associated sources belong to the same 2-digit industrial grouping (2-digit SIC code) as this facility, OR surrounding or associated sources that belong to different 2-digit SIC codes are support facilities for this source.

☒ **Yes**      ☐ **No**

**Common Ownership or Control:** Surrounding or associated sources are under common ownership or control as this source.

☒ **Yes**      ☐ **No**

**Contiguous or Adjacent:** Surrounding or associated sources are contiguous or adjacent with this source.

☒ **Yes**      ☐ **No**

**C. Make a determination:**

- ☒ The source, as described in this application, constitutes the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes. If in "A" above you evaluated only the source that is the subject of this application, all "YES" boxes should be checked. If in "A" above you evaluated other sources as well, you must check **AT LEAST ONE** of the boxes "NO" to conclude that the source, as

described in the application, is the entire source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes.

- ☐ The source, as described in this application, **does not** constitute the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes (A permit may be issued for a portion of a source). The entire source consists of the following facilities or emissions sources (list and describe):

# Section 12

## Section 12.A

### PSD Applicability Determination for All Sources

(Submitting under 20.2.72, 20.2.74 NMAC)

---

**A PSD applicability determination for all sources.** For sources applying for a significant permit revision, apply the applicable requirements of 20.2.74.AG and 20.2.74.200 NMAC and to determine whether this facility is a major or minor PSD source, and whether this modification is a major or a minor PSD modification. It may be helpful to refer to the procedures for Determining the Net Emissions Change at a Source as specified by Table A-5 (Page A.45) of the EPA New Source Review Workshop Manual to determine if the revision is subject to PSD review.

- A. This facility is:
- ☐ a minor PSD source before and after this modification (if so, delete C and D below).
  - ☐ a major PSD source before this modification. This modification will make this a PSD minor source.
  - ☐ an existing PSD Major Source that has never had a major modification requiring a BACT analysis.
  - ☐ an existing PSD Major Source that has had a major modification requiring a BACT analysis
  - ☐ a new PSD Major Source after this modification.
- B. This facility **[is or is not]** one of the listed 20.2.74.501 Table I – PSD Source Categories. The “project” emissions for this modification are **[significant or not significant]**. **[Discuss why.]** The “project” emissions listed below **[do or do not]** only result from changes described in this permit application, thus no emissions from other **[revisions or modifications, past or future]** to this facility. Also, specifically discuss whether this project results in “de-bottlenecking”, or other associated emissions resulting in higher emissions. The project emissions (before netting) for this project are as follows [see Table 2 in 20.2.74.502 NMAC for a complete list of significance levels]:
- a. NO<sub>x</sub>: **XX.X** TPY
  - b. CO: **XX.X** TPY
  - c. VOC: **XX.X** TPY
  - d. SO<sub>x</sub>: **XX.X** TPY
  - e. TSP (PM): **XX.X** TPY
  - f. PM<sub>10</sub>: **XX.X** TPY
  - g. PM<sub>2.5</sub>: **XX.X** TPY
  - h. Fluorides: **XX.X** TPY
  - i. Lead: **XX.X** TPY
  - j. Sulfur compounds (listed in Table 2): **XX.X** TPY
  - k. GHG: **XX.X** TPY
- C. Netting **[is required, and analysis is attached to this document.] OR [is not required (project is not significant)] OR [Applicant is submitting a PSD Major Modification and chooses not to net.]**
- D. BACT is **[not required for this modification, as this application is a minor modification.] OR [required, as this application is a major modification. List pollutants subject to BACT review and provide a full top down BACT determination.]**
- E. If this is an existing PSD major source, or any facility with emissions greater than 250 TPY (or 100 TPY for 20.2.74.501 Table 1 – PSD Source Categories), determine whether any permit modifications are related, or could be considered a single project with this action, and provide an explanation for your determination whether a PSD modification is triggered.
- 

N/A – This is a Title V operating permit application being submitted pursuant to 20.2.70 NMAC.

# Section 13

## Determination of State & Federal Air Quality Regulations

**This section lists each state and federal air quality regulation that may apply to your facility and/or equipment that are stationary sources of regulated air pollutants.**

Not all state and federal air quality regulations are included in this list. Go to the Code of Federal Regulations (CFR) or to the Air Quality Bureau's regulation page to see the full set of air quality regulations.

### **Required Information for Specific Equipment:**

For regulations that apply to specific source types, in the 'Justification' column **provide any information needed to determine if the regulation does or does not apply. For example**, to determine if emissions standards at 40 CFR 60, Subpart IIII apply to your three identical stationary engines, we need to know the construction date as defined in that regulation; the manufacturer date; the date of reconstruction or modification, if any; if they are or are not fire pump engines; if they are or are not emergency engines as defined in that regulation; their site ratings; and the cylinder displacement.

### **Required Information for Regulations that Apply to the Entire Facility:**

See instructions in the 'Justification' column for the information that is needed to determine if an 'Entire Facility' type of regulation applies (e.g. 20.2.70 or 20.2.73 NMAC).

### **Regulatory Citations for Regulations That Do Not, but Could Apply:**

If there is a state or federal air quality regulation that does not apply, but you have a piece of equipment in a source category for which a regulation has been promulgated, you must **provide the low level regulatory citation showing why your piece of equipment is not subject to or exempt from the regulation. For example** if you have a stationary internal combustion engine that is not subject to 40 CFR 63, Subpart ZZZZ because it is an existing 2 stroke lean burn stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions, your citation would be 40 CFR 63.6590(b)(3)(i). **We don't want a discussion of every non-applicable regulation, but if it is possible a regulation could apply, explain why it does not. For example**, if your facility is a power plant, you do not need to include a citation to show that 40 CFR 60, Subpart OOO does not apply to your non-existent rock crusher.

### **Regulatory Citations for Emission Standards:**

**For each unit that is subject to an emission standard in a source specific regulation, such as 40 CFR 60, Subpart OOO or 40 CFR 63, Subpart HH, include the low level regulatory citation of that emission standard.** Emission standards can be numerical emission limits, work practice standards, or other requirements such as maintenance. **Here are examples:** a glycol dehydrator is subject to the general standards at 63.764C(1)(i) through (iii); an engine is subject to 63.6601, Tables 2a and 2b; a crusher is subject to 60.672(b), Table 3 and all transfer points are subject to 60.672(e)(1)

### **Federally Enforceable Conditions:**

All federal regulations are federally enforceable. All Air Quality Bureau State regulations are federally enforceable except for the following: affirmative defense portions at 20.2.7.6.B, 20.2.7.110(B)(15), 20.2.7.11 through 20.2.7.113, 20.2.7.115, and 20.2.7.116; 20.2.37; 20.2.42; 20.2.43; 20.2.62; 20.2.63; 20.2.86; 20.2.89; and 20.2.90 NMAC. Federally enforceable means that EPA can enforce the regulation as well as the Air Quality Bureau and federally enforceable regulations can count toward determining a facility's potential to emit (PTE) for the Title V, PSD, and nonattainment permit regulations.

INCLUDE ANY OTHER INFORMATION NEEDED TO COMPLETE AN APPLICABILITY DETERMINATION OR THAT IS RELEVANT TO YOUR FACILITY'S NOTICE OF INTENT OR PERMIT.

EPA Applicability Determination Index for 40 CFR 60, 61, 63, etc: <http://cfpub.epa.gov/adi/>

---

### **Table for State Regulations:**

| <a href="#">State Regulation Citation</a> | Title                                                    | Applies? Enter Yes or No | Unit(s) or Facility           | Justification:<br>(You may delete instructions or statements that do not apply in the justification column to shorten the document.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------|----------------------------------------------------------|--------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20.2.1 NMAC                               | General Provisions                                       | Yes                      | Facility                      | General Provisions apply to Notice of Intent, Construction, and Title V permit applications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 20.2.3 NMAC                               | Ambient Air Quality Standards NMAAQS                     | Yes                      | Facility                      | 20.2.3 NMAC is a State Implementation Plan (SIP) approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide. The facility meets the maximum allowable concentrations under this regulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 20.2.7 NMAC                               | Excess Emissions                                         | Yes                      | Facility                      | This regulation establishes requirements for the facility if operations at the facility result in any excess emissions. The owner or operator will operate the source at the facility having an excess emission, to the extent practicable, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions. The facility will also notify the NMED of any excess emission per 20.2.7.110 NMAC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 20.2.33 NMAC                              | Gas Burning Equipment - Nitrogen Dioxide                 | No                       | N/A                           | This regulation applies to all gas burning equipment (external combustion emission sources, such as gas fired boilers and heaters) having a heat input greater than 1,000,000 million British Thermal Units per year per unit.<br>The facility is not subject to this regulation, as it will not have emission sources that meet the applicability requirements under 20.2.33.108 NMAC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 20.2.34 NMAC                              | Oil Burning Equipment: NO <sub>2</sub>                   | No                       | N/A                           | This facility does not have oil burning equipment ( <b>external combustion emission sources, such as oil fired boilers and heaters</b> ) having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The facility is not subject to this regulation as it does not have emission sources that meet the applicability requirements under 20.2.34.108 NMAC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 20.2.35 NMAC                              | Natural Gas Processing Plant – Sulfur                    | Yes                      | Facility                      | This regulation establishes sulfur emission standards for natural gas processing plants. This facility meets the definition of a new natural gas processing plant under this regulation and is subject to the requirements of this regulation [20.2.35.7 (B) NMAC]. The facility will comply with all requirements under 20.2.35 NMAC as applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 20.2.37 and 20.2.36 NMAC                  | Petroleum Processing Facilities and Petroleum Refineries | N/A                      | N/A                           | These regulations were repealed by the Environmental Improvement Board. If you had equipment subject to 20.2.37 NMAC before the repeal, your combustion emission sources are now subject to 20.2.61 NMAC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <a href="#">20.2.38</a> NMAC              | Hydrocarbon Storage Facility                             | No                       | N/A                           | The proposed facility is not a tank battery or petroleum production facility as defined in this regulation [20.2.38.7 (D) and (E) NMAC]. The facility does not receive crude oil or condensate from a well. All gas and liquids enter the facility through a pipeline.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <a href="#">20.2.39</a> NMAC              | Sulfur Recovery Plant - Sulfur                           | No                       | N/A                           | This regulation establishes sulfur emission standards for sulfur recovery plants which are not part of petroleum or natural gas processing facilities. This regulation does not apply to the facility because it is superseded by 20.2.35 NMAC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 20.2.50 NMAC                              | Oil and Gas Sector – Ozone Precursor Pollutants          | Yes                      | Units subject to 20.2.50 NMAC | <p>This regulation establishes emission standards for volatile organic compounds (VOC) and oxides of nitrogen (NO<sub>x</sub>) for oil and gas production, processing, compression, and transmission sources. 20.2.50 NMAC subparts below:</p> <p>Include the construction status of applicable units as “New”, “Existing”, “Relocation of Existing”, or “Reconstructed” as defined by this Part in your justification:</p> <p>Check the box for the subparts that are applicable:</p> <p><input type="checkbox"/> 113 – Engines and Turbines – There are no engines or turbines at this facility; therefore, this regulation does not apply.</p> <p><input checked="" type="checkbox"/> 114 – Compressor Seals – Existing compressors at this facility using wet seals are subject to this regulation. The facility will comply with all applicable requirements.</p> <p><input type="checkbox"/> 115 – Control Devices and Closed Vent Systems – There are no control devices and closed vent systems used to comply with the emissions standards and emissions reduction requirements in this Part; therefore, this regulation does not comply.</p> |

| <a href="#">State Regulation Citation</a> | Title                                  | Applies?<br>Enter Yes or No | Unit(s) or Facility  | Justification:<br>(You may delete instructions or statements that do not apply in the justification column to shorten the document.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------|----------------------------------------|-----------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           |                                        |                             |                      | <input checked="" type="checkbox"/> 116 – Equipment Leaks and Fugitive Emissions – Equipment leaks and fugitive emissions at this facility are subject to this regulation. The facility will comply with all applicable requirements.<br><br><input type="checkbox"/> 117 – Natural Gas Well Liquid Unloading – There are no wells associated with this facility; therefore, this regulation does not apply.<br><br><input type="checkbox"/> 118 – Glycol Dehydrators – The glycol dehydrator at this facility has a PTE less than two tpy of VOC; therefore, this regulation does not apply.<br><br><input checked="" type="checkbox"/> 119 – Heaters – Existing unit H-2 has a rated heat input greater than 20 MMBtu/hr; therefore, this regulation applies. The facility will comply with all applicable requirements.<br><br><input checked="" type="checkbox"/> 120 – Hydrocarbon Liquid Transfers – Hydrocarbon liquid transfers at this facility are subject to this regulation. The facility will comply with all applicable requirements.<br><br><input type="checkbox"/> 121 – Pig Launching and Receiving – There are no pig launching or receiving activities at this facility; therefore, this regulation does not apply.<br><br><input type="checkbox"/> 122 – Pneumatic Controllers and Pumps – There are no natural gas pneumatic controllers at this facility; therefore, this regulation does not apply.<br><br><input type="checkbox"/> 123 – Storage Vessels – There are no existing storage vessels with a PTE greater than three tpy VOC at this facility; therefore, this regulation does not apply.<br><br><input type="checkbox"/> 124 – Well Workovers - There are no wells associated with this facility; therefore, this regulation does not apply.<br><br><input type="checkbox"/> 125 – Small Business Facilities<br><br><input type="checkbox"/> 126 – Produced Water Management Unit – There are no produced water management units associated with this facility; therefore, this regulation does not apply.<br><br><input type="checkbox"/> 127 – Flowback Vessels and Preproduction Operations - There are no wells associated with this facility; therefore, this regulation does not apply. |
| 20.2.61.109 NMAC                          | Smoke & Visible Emissions              | Yes                         | H-1, H-2, TO-1, FL-1 | This regulation that limits opacity to 20% applies to Stationary Combustion Equipment, such as engines, boilers, heaters, and flares unless your equipment is subject to another state regulation that limits particulate matter such as 20.2.19 NMAC (see 20.2.61.109 NMAC). Units H-1, H-2, TO-1, and FL-1 are subject to this regulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 20.2.70 NMAC                              | Operating Permits                      | Yes                         | Facility             | This regulation establishes requirements for obtaining an operating permit. With the changes detailed in NSR 5945-M4, the facility became major for CO and VOC. This Title V renewal application is being submitted within twelve (12) months prior to the date of permit expiration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 20.2.71 NMAC                              | Operating Permit Fees                  | Yes                         | Facility             | This regulation establishes a schedule of operating permit emission fees. The facility is subject to 20.2.70 NMAC and is therefore subject to requirements of this regulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 20.2.72 NMAC                              | Construction Permits                   | Yes                         | Facility             | This regulation establishes the requirements for obtaining a construction permit. The facility is a stationary source that has potential emission rates greater than 10 pounds per hour and 25 tons per year of any regulated air contaminant for which there is a National or New Mexico Air Quality Standard. This regulation applies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 20.2.73 NMAC                              | NOI & Emissions Inventory Requirements | Yes                         | Facility             | This regulation establishes emission inventory requirements. The facility meets the applicability requirements of 20.2.73.300 NMAC. The facility will meet all applicable reporting requirements under 20.2.73.300.B.1 NMAC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| <u>State Regulation Citation</u> | Title                                                   | Applies? Enter Yes or No | Unit(s) or Facility        | Justification:<br>(You may delete instructions or statements that do not apply in the justification column to shorten the document.)                                                                                                                                                                                                                      |
|----------------------------------|---------------------------------------------------------|--------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20.2.74 NMAC                     | Permits – Prevention of Significant Deterioration (PSD) | No                       | N/A                        | This regulation establishes requirements for obtaining a prevention of significant deterioration permit. The facility does not have the potential to emit greater than 250 tons per year of any criteria pollutant and, therefore, is not subject to this regulation.                                                                                     |
| 20.2.75 NMAC                     | Construction Permit Fees                                | Yes                      | Facility                   | This facility is subject to 20.2.72 NMAC and is in turn subject to 20.2.75 NMAC for NSR permit application fees only.                                                                                                                                                                                                                                     |
| 20.2.77 NMAC                     | New Source Performance                                  | Yes                      | Units subject to 40 CFR 60 | This is a stationary source, which is subject to the requirements of 40 CFR Part 60. The facility is subject to this regulation because 40 CFR Part 60 Subpart Dc (applies to unit H-2) and Subpart OOOO applies (applies to units Amine-1, Dehy-1, reciprocating compressors, RC-1 through RC-6, FUG, CO-1011, CO-1012, CO-1015, and pneumatic devices). |
| 20.2.78 NMAC                     | Emission Standards for HAPS                             | No                       | N/A                        | This regulation establishes state authority to implement emission standards for hazardous air pollutants subject to 40 CFR Part 61. This facility does not emit hazardous air pollutants, which are subject to the requirements of 40 CFR Part 61, and is therefore not subject to this regulation.                                                       |
| 20.2.79 NMAC                     | Permits – Nonattainment Areas                           | No                       | N/A                        | This regulation establishes the requirements for obtaining a non-attainment area permit. The facility is not located in a non-attainment area and therefore is not subject to this regulation.                                                                                                                                                            |
| 20.2.80 NMAC                     | Stack Heights                                           | No                       | N/A                        | This regulation establishes requirements for the evaluation of stack heights and other dispersion techniques. This regulation does not apply as all stacks at the facility will follow good engineering practice.                                                                                                                                         |
| 20.2.82 NMAC                     | MACT Standards for source categories of HAPS            | Yes                      | Units Subject to 40 CFR 63 | This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63, as amended through August 29, 2013. Unit Dehy-1 is subject to 40 CFR 63 Subpart HH. Accordingly, this regulation applies.                                                                                              |
| 20.2.1 NMAC                      | General Provisions                                      | Yes                      | Facility                   | General Provisions apply to Notice of Intent, Construction, and Title V permit applications.                                                                                                                                                                                                                                                              |
| 20.2.3 NMAC                      | Ambient Air Quality Standards NMAAQS                    | Yes                      | Facility                   | 20.2.3 NMAC is a State Implementation Plan (SIP) approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide. The facility meets the maximum allowable concentrations under this regulation.                                                              |

**Table for Applicable Federal Regulations:**

| <u>FEDERAL REGULATIONS CITATION</u> | Title              | Applies? Enter Yes or No | Unit(s) or Facility        | JUSTIFICATION:                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|--------------------|--------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 40 CFR 50                           | NAAQS              | Yes                      | Facility                   | This regulation defines national ambient air quality standards. The facility meets all applicable national ambient air quality standards for NO <sub>x</sub> , CO, SO <sub>2</sub> , PM <sub>10</sub> , and PM <sub>2.5</sub> under this regulation.                                                                                 |
| NSPS 40 CFR 60, Subpart A           | General Provisions | Yes                      | Units subject to 40 CFR 60 | This regulation defines general provisions for relevant standards that have been set under this part. The facility is subject to this regulation because 40 CFR Part 60 Subpart Dc (applies to unit H-2) and Subpart OOOO (applies to the amine unit, dehydrator, reciprocating compressors, fugitive leaks, and pneumatic devices). |

| <u>FEDERAL<br/>REGU-<br/>LATIONS<br/>CITATION</u> | <b>Title</b>                                                                                                                                                                                                                                             | <b>Applies?<br/>Enter Yes<br/>or No</b> | <b>Unit(s)<br/>or<br/>Facility</b> | <b>JUSTIFICATION:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| NSPS 40<br>CFR60.40a,<br>Subpart Da               | Subpart Da,<br>Performance<br>Standards for<br><b>Electric Utility<br/>Steam<br/>Generating Units</b>                                                                                                                                                    | No                                      | N/A                                | This regulation establishes standards of performance for electric utility steam generating units. This regulation does not apply because the facility does not operate any steam generating units that have a heat input capacity greater than 250 MMBtu/hr.                                                                                                                                                                                                                                                      |
| NSPS 40<br>CFR60.40b<br>Subpart Db                | Standards of<br>Performance for<br>Industrial-<br>Commercial-<br>Institutional Steam<br>Generating Units                                                                                                                                                 | No                                      | N/A                                | This regulation establishes standards of performance for industrial-commercial-institutional steam generating units. There are no steam generating units that have heat input capacities greater than 100 MMBtu/hr. This regulation does not apply.                                                                                                                                                                                                                                                               |
| NSPS 40<br>CFR 60.40c<br>Subpart Dc               | Standards of<br>Performance for<br>Small Industrial-<br>Commercial-<br>Institutional Steam<br>Generating Units                                                                                                                                           | Yes                                     | H-2                                | This regulation establishes standards of performance for small industrial-commercial-institutional steam generating units. Unit H-2 was installed or modified after June 9, 1989 with a heat input capacity greater than or equal to 10 MMBtu/hr but less than 100 MMBtu/hr. The unit will only burn natural gas and therefore will not be subject to performance tests, reporting requirements, or emission limits under this regulation. The facility will follow all recordkeeping requirements for this unit. |
| NSPS<br>40 CFR 60,<br>Subpart Ka                  | Standards of<br>Performance for<br><b>Storage Vessels<br/>for Petroleum<br/>Liquids</b> for which<br>Construction,<br>Reconstruction, or<br>Modification<br>Commenced After<br>May 18, 1978, and<br><b>Prior</b> to July 23,<br>1984                     | No                                      | N/A                                | This regulation does not apply because the facility doesn't have any storage vessels for petroleum liquids which were constructed, reconstructed, or modified after May 18, 1978 and prior to July 23, 1984.                                                                                                                                                                                                                                                                                                      |
| NSPS<br>40 CFR 60,<br>Subpart Kb                  | Standards of<br>Performance for<br><b>Volatile Organic<br/>Liquid Storage<br/>Vessels</b> (Including<br>Petroleum Liquid<br>Storage Vessels) for<br>Which Construction,<br>Reconstruction, or<br>Modification<br>Commenced <b>After</b><br>July 23, 1984 | No                                      | N/A                                | The pressurized condensate storage tanks at the proposed facility are exempt from this regulation per 40 CFR 60.110b(d)(2).                                                                                                                                                                                                                                                                                                                                                                                       |
| NSPS<br>40 CFR<br>60.330<br>Subpart GG            | <b>Stationary Gas<br/>Turbines</b>                                                                                                                                                                                                                       | No                                      | N/A                                | This regulation establishes standards of performance for certain stationary gas turbines. South Eddy Cryo Plant will not have stationary gas turbines; therefore, this regulation is not applicable.                                                                                                                                                                                                                                                                                                              |
| NSPS<br>40 CFR 60,<br>Subpart<br>KKK              | Leaks of VOC<br>from <b>Onshore<br/>Gas Plants</b>                                                                                                                                                                                                       | No                                      | N/A                                | This regulation defines standards of performance for equipment leaks of VOC emissions from onshore natural gas processing plants for which construction, reconstruction, or modification commenced after January 20, 1984, and on or before August 23, 2011. The facility was constructed after August 23, 2011 and is therefore not subject to this regulation.                                                                                                                                                  |

| <u>FEDERAL<br/>REGU-<br/>LATIONS<br/>CITATION</u> | <b>Title</b>                                                                                                                                                                                                           | <b>Applies?<br/>Enter Yes<br/>or No</b> | <b>Unit(s)<br/>or<br/>Facility</b>                                                                                   | <b>JUSTIFICATION:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| NSPS<br>40 CFR Part<br>60 Subpart<br>LLL          | Standards of Performance for <b>Onshore Natural Gas Processing:</b> SO <sub>2</sub> Emissions                                                                                                                          | No                                      | N/A                                                                                                                  | This regulation establishes standards of performance for SO <sub>2</sub> emissions from onshore natural gas processing for which construction, reconstruction, or modification of the amine sweetening unit commenced after January 20, 1984 and on or before August 23, 2011. The facility was constructed after August 23, 2011 and is therefore not subject to this regulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| NSPS<br>40 CFR Part<br>60 Subpart<br>OOOO         | Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which construction, modification or reconstruction commenced after August 23, 2011 and before September 18, 2015 | Yes                                     | RC-1,<br>RC-2,<br>RC-3,<br>RC-4,<br>RC-5,<br>RC-6,<br>Amine-1,<br>Dehy-1,<br>FUG,<br>CO-1011,<br>CO-1012,<br>CO-1015 | <p>This regulation establishes emission standards and compliance schedule for the control of volatile organic compounds (VOC) and sulfur dioxide (SO<sub>2</sub>) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. Since the facility was constructed after August 23, 2011, pneumatic devices and equipment leaks are subject to this regulation. The amine unit is also subject to this regulation but only has recordkeeping requirements since it is designed to process less than 2 LT/D of sulfur. The glycol dehydrator is an affected facility [60.5365(f)(2)]. Lastly, the reciprocating compressors are subject to this regulation. Enterprise will comply with any applicable requirements under this subpart.</p> <p>The condensate tanks at the facility are pressurized and do not meet the definition of a storage vessel in this regulation.</p> <p>The pneumatic devices located at the facility will not be continuous bleed and therefore will not have applicable requirements under this regulation [40 CFR 60.5365(d)(2)].</p> |
| NSPS<br>40 CFR Part<br>60 Subpart<br>OOOOa        | Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015                                                            | No                                      | N/A                                                                                                                  | This regulation is not applicable to the facility as the facility was constructed prior to September 18, 2015.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| NSPS<br>40 CFR Part<br>60 Subpart<br>OOOOb        | Standards of Performance for Crude Oil and Natural Gas Facilities for Which Construction, Modification or Reconstruction Commenced After December 6, 2022                                                              | No                                      | N/A                                                                                                                  | This regulation is not applicable to the facility as the facility was constructed prior to December 6, 2022.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| NSPS 40<br>CFR 60<br>Subpart IIII                 | Standards of performance for Stationary Compression Ignition Internal Combustion Engines                                                                                                                               | No                                      | N/A                                                                                                                  | This regulation is not applicable to the facility as there are no emission units subject to this regulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| NSPS<br>40 CFR Part<br>60 Subpart<br>JJJJ         | Standards of Performance for Stationary Spark Ignition Internal Combustion Engines                                                                                                                                     | No                                      | N/A                                                                                                                  | This regulation establishes standards of performance for stationary spark ignition combustion engines. The reciprocating engines at this facility are electric and therefore not subject to the requirements of this subpart.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| <u>FEDERAL<br/>REGU-<br/>LATIONS<br/>CITATION</u>            | <b>Title</b>                                                                                                                                 | <b>Applies?<br/>Enter Yes<br/>or No</b> | <b>Unit(s)<br/>or<br/>Facility</b>  | <b>JUSTIFICATION:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSPS 40<br>CFR 60<br>Subpart<br>TTTT                         | Standards of<br>Performance for<br>Greenhouse Gas<br>Emissions for<br>Electric<br>Generating Units                                           | No                                      | N/A                                 | This regulation is not applicable to the facility as there are no electric generating units in the facility.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| NSPS 40<br>CFR 60<br>Subpart<br>UUUU                         | Emissions<br>Guidelines for<br>Greenhouse Gas<br>Emissions and<br>Compliance Times<br>for Electric Utility<br>Generating Units               | No                                      | N/A                                 | This regulation is not applicable to the facility as there are no electric utility generating units at the facility.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| NSPS 40<br>CFR 60,<br>Subparts<br>WWW,<br>XXX, Cc,<br>and Cf | Standards of<br>performance for<br>Municipal Solid<br>Waste (MSW)<br>Landfills                                                               | No                                      | N/A                                 | This regulation is not applicable to the facility as this facility is not a municipal solid waste landfill.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| NESHAP<br>40 CFR 61<br>Subpart A                             | General Provisions                                                                                                                           | No                                      | N/A                                 | NSPS 40 CFR 61 does not apply to the facility because the facility does not emit or have the triggering substances on site and/or the facility is not involved in the triggering activity. The facility is not subject to this regulation. None of the subparts of Part 61 apply to the facility.                                                                                                                                                                                                                                                    |
| NESHAP<br>40 CFR 61<br>Subpart E                             | National Emission<br>Standards for<br><b>Mercury</b>                                                                                         | No                                      | N/A                                 | This regulation establishes a national emission standard for mercury. The facility does not have stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge [40 CFR Part 61.50]. The facility is not subject to this regulation.                                                                                                                                                                    |
| NESHAP<br>40 CFR 61<br>Subpart V                             | National Emission<br>Standards for<br><b>Equipment Leaks</b><br>(Fugitive Emission<br>Sources)                                               | No                                      | N/A                                 | This regulation establishes national emission standards for equipment leaks (fugitive emission sources). The facility does not have equipment that operates in volatile hazardous air pollutant (VHAP) service [40 CFR Part 61.240]. The regulated activities subject to this regulation do not take place at this facility. The facility is not subject to this regulation.                                                                                                                                                                         |
| MACT<br>40 CFR 63,<br>Subpart A                              | General Provisions                                                                                                                           | Yes                                     | Units<br>Subject<br>to 40<br>CFR 63 | This regulation defines general provisions for relevant standards that have been set under this part. This facility is subject to this regulation because 40 CFR Part 63 Subpart HH applies to unit Dehy-1.                                                                                                                                                                                                                                                                                                                                          |
| MACT<br>40 CFR<br>63.760<br>Subpart HH                       | <b>Oil and Natural<br/>Gas Production<br/>Facilities</b>                                                                                     | Yes                                     | Dehy-1                              | This regulation establishes national emission standards for hazardous air pollutants from oil and natural gas production facilities. The facility is an area source of HAPs and meets the definition of a natural gas processing plant. Unit Dehy-1 is an affected facility [63.760(b)(2)]. The dehydrator is exempt from the requirements of 63.764(d) as actual average benzene emissions to the atmosphere are less than 0.9 megagrams per year [63.764(e)(1)(ii)]. Records of this determination must be maintained as required in 63.774(d)(1). |
| MACT<br>40 CFR 63<br>Subpart<br>HHH                          | National<br>Emissions<br>Standards for<br>Hazardous Air<br>Pollutants from<br><b>Natural Gas<br/>Transmission and<br/>Storage facilities</b> | No                                      | N/A                                 | This regulation establishes national emission standards for hazardous air pollutants from natural gas transmission and storage facilities. This regulation does not apply because this facility is not a natural gas transmission or storage facility as defined in this regulation [40 CFR Part 63.1270(a)].                                                                                                                                                                                                                                        |

| <u><b>FEDERAL<br/>REGU-<br/>LATIONS<br/>CITATION</b></u> | <b>Title</b>                                                                                                                                                           | <b>Applies?<br/>Enter Yes<br/>or No</b> | <b>Unit(s)<br/>or<br/>Facility</b> | <b>JUSTIFICATION:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MACT 40<br>CFR 63<br>Subpart<br>DDDDD                    | National Emission<br>Standards for<br>Hazardous Air<br>Pollutants for<br>Major Industrial,<br>Commercial, and<br>Institutional<br>Boilers & Process<br>Heaters         | No                                      | N/A                                | This regulation is not applicable to the facility.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MACT 40<br>CFR 63<br>Subpart<br>UUUUU                    | National Emission<br>Standards for<br>Hazardous Air<br>Pollutants Coal &<br>Oil Fire Electric<br>Utility Steam<br>Generating Unit                                      | No                                      | N/A                                | This regulation is not applicable to the facility.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MACT<br>40 CFR 63<br>Subpart<br>ZZZZ                     | National<br>Emissions<br>Standards for<br>Hazardous Air<br>Pollutants for<br>Stationary<br>Reciprocating<br>Internal<br>Combustion<br>Engines ( <b>RICE<br/>MACT</b> ) | No                                      | N/A                                | Facilities are subject to this subpart if they own or operate a stationary RICE, except if the stationary RICE is being tested at a stationary RICE test cell/stand. The electric engines at this facility are not subject to the requirements of this regulation.                                                                                                                                                                                                     |
| 40 CFR 64                                                | <b>Compliance<br/>Assurance<br/>Monitoring</b>                                                                                                                         | Yes                                     | Amine-1                            | This regulation defines compliance assurance monitoring. Emissions from the amine unit at the facility are subject to a CAM plan. The unit has potential pre-control emission levels of an applicable major source threshold [40 CFR 64.2(a)(3) ]. The control devices for the amine unit at the facility is the thermal oxidizer and the flare during SSM.<br><br>The dehydrator (Unit Dehy) is subject to NSPS Subpart HH and is therefore not subject to 40 CFR 64. |
| 40 CFR 68                                                | <b>Chemical<br/>Accident<br/>Prevention</b>                                                                                                                            | No                                      | N/A                                | The facility does not store or handle any chemicals listed under 40 CFR 68.130 therefore this regulation does not apply.                                                                                                                                                                                                                                                                                                                                               |
| Title IV –<br>Acid Rain<br>40 CFR 72                     | <b>Acid Rain</b>                                                                                                                                                       | No                                      | N/A                                | This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation [40 CFR Part 72.6].                                                                                                                                                                                                                                                                                                                       |
| Title IV –<br>Acid Rain<br>40 CFR 73                     | <b>Sulfur Dioxide<br/>Allowance<br/>Emissions</b>                                                                                                                      | No                                      | N/A                                | This regulation establishes sulfur dioxide allowance emissions for certain types of facilities. This part does not apply because the facility is not the type covered by this regulation [40 CFR Part 73.2].                                                                                                                                                                                                                                                           |
| Title IV-Acid<br>Rain 40 CFR<br>75                       | <b>Continuous<br/>Emissions<br/>Monitoring</b>                                                                                                                         | No                                      | N/A                                | This regulation is not applicable to the facility.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Title IV –<br>Acid Rain<br>40 CFR 76                     | <b>Acid Rain<br/>Nitrogen Oxides<br/>Emission<br/>Reduction<br/>Program</b>                                                                                            | No                                      | N/A                                | This regulation establishes an acid rain nitrogen oxides emission reduction program. This regulation applies to each coal-fired utility unit that is subject to an acid rain emissions limitation or reduction requirement for SO <sub>2</sub> . This part does not apply because the facility does not operate any coal-fired units [40 CFR Part 76.1].                                                                                                               |

| <a href="#">FEDERAL<br/>REGU-<br/>LATIONS</a><br>CITATION | Title                                           | Applies?<br>Enter Yes<br>or No | Unit(s)<br>or<br>Facility | JUSTIFICATION:                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------|-------------------------------------------------|--------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Title VI –<br>40 CFR 82                                   | Protection of<br><b>Stratospheric<br/>Ozone</b> | No                             | N/A                       | This regulation establishes requirements for protection of the stratospheric ozone.<br>The regulation is not applicable because the facility does not “service”,<br>“maintain” or “repair” class I or class II appliances nor “disposes” of the<br>appliances [40 CFR Part 82.1(a)]. |

# Section 14

## Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

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- ☒ **Title V Sources** (20.2.70 NMAC): By checking this box and certifying this application the permittee certifies that it has developed an Operational Plan to Mitigate Emissions During Startups, Shutdowns, and Emergencies defining the measures to be taken to mitigate source emissions during startups, shutdowns, and emergencies as required by 20.2.70.300.D.5(f) and (g) NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.
- ☐ **NSR** (20.2.72 NMAC), **PSD** (20.2.74 NMAC) & **Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has developed an Operational Plan to Mitigate Source Emissions During Malfunction, Startup, or Shutdown defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown as required by 20.2.72.203.A.5 NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.
- ☒ **Title V** (20.2.70 NMAC), **NSR** (20.2.72 NMAC), **PSD** (20.2.74 NMAC) & **Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has established and implemented a Plan to Minimize Emissions During Routine or Predictable Startup, Shutdown, and Scheduled Maintenance through work practice standards and good air pollution control practices as required by 20.2.7.14.A and B NMAC. This plan shall be kept on site or at the nearest field office to be made available to the Department upon request. This plan should not be submitted with this application.
- 

Enterprise will maintain the appropriate documentation at the facility.

# Section 15

## Alternative Operating Scenarios

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

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**Alternative Operating Scenarios:** Provide all information required by the department to define alternative operating scenarios. This includes process, material and product changes; facility emissions information; air pollution control equipment requirements; any applicable requirements; monitoring, recordkeeping, and reporting requirements; and compliance certification requirements. Please ensure applicable Tables in this application are clearly marked to show alternative operating scenario.

**Construction Scenarios:** When a permit is modified authorizing new construction to an existing facility, NMED includes a condition to clearly address which permit condition(s) (from the previous permit and the new permit) govern during the interval between the date of issuance of the modification permit and the completion of construction of the modification(s). There are many possible variables that need to be addressed such as: Is simultaneous operation of the old and new units permitted and, if so for example, for how long and under what restraints? In general, these types of requirements will be addressed in Section A100 of the permit, but additional requirements may be added elsewhere. Look in A100 of our NSR and/or TV permit template for sample language dealing with these requirements. Find these permit templates at: [www.env.nm.gov/air-quality/permitting-section-procedures-and-guidance/](http://www.env.nm.gov/air-quality/permitting-section-procedures-and-guidance/). Compliance with standards must be maintained during construction, which should not usually be a problem unless simultaneous operation of old and new equipment is requested.

In this section, under the bolded title “Construction Scenarios”, specify any information necessary to write these conditions, such as: conservative-realistic estimated time for completion of construction of the various units, whether simultaneous operation of old and new units is being requested (and, if so, modeled), whether the old units will be removed or decommissioned, any PSD ramifications, any temporary limits requested during phased construction, whether any increase in emissions is being requested as SSM emissions or will instead be handled as a separate Construction Scenario (with corresponding emission limits and conditions, etc.

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No new alternative operating scenarios are proposed in this renewal application.

1. Enterprise is currently permitted for an alternative scenario for SSM blowdown venting events. During any period the flare will not be operating due to any form of malfunction then SSM blowdown venting would occur. Emissions for SSM blowdown venting have been proposed in this application under unit Blowdown Venting. Events for various vessels and compressors were taken into account in the emission calculation. Enterprise will keep track of blowdown events that will be vented to the atmosphere along with their duration.
2. Additionally, Enterprise is currently permitted for an alternate operating scenario to control amine flash emissions from the amine unit (unit Amine-1). Emissions from the amine flash tank can be routed to either the thermal oxidizer (unit TO-1), electric vapor recovery (unit VRU-3), flare (unit FL-1), or Heat medium heater (unit H-2) to control amine flash. All four options can occur equally depending on the operations at South Eddy.

# Section 16

## Air Dispersion Modeling

- 1) Minor Source Construction (20.2.72 NMAC) and Prevention of Significant Deterioration (PSD) (20.2.74 NMAC) ambient impact analysis (modeling): Provide an ambient impact analysis as required at 20.2.72.203.A(4) and/or 20.2.74.303 NMAC and as outlined in the Air Quality Bureau's Dispersion Modeling Guidelines found on the Planning Section's modeling website. If air dispersion modeling has been waived for one or more pollutants, attach the AQB Modeling Section modeling waiver approval documentation.
- 2) SSM Modeling: Applicants must conduct dispersion modeling for the total short term emissions during routine or predictable startup, shutdown, or maintenance (SSM) using realistic worst case scenarios following guidance from the Air Quality Bureau's dispersion modeling section. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications ([http://www.env.nm.gov/aqb/permit/app\\_form.html](http://www.env.nm.gov/aqb/permit/app_form.html)) for more detailed instructions on SSM emissions modeling requirements.
- 3) Title V (20.2.70 NMAC) ambient impact analysis: Title V applications must specify the construction permit and/or Title V Permit number(s) for which air quality dispersion modeling was last approved. Facilities that have only a Title V permit, such as landfills and air curtain incinerators, are subject to the same modeling required for preconstruction permits required by 20.2.72 and 20.2.74 NMAC.

| What is the purpose of this application?                                                                                                                                                        | Enter an X for each purpose that applies |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| New PSD major source or PSD major modification (20.2.74 NMAC). See #1 above.                                                                                                                    |                                          |
| New Minor Source or significant permit revision under 20.2.72 NMAC (20.2.72.219.D NMAC). See #1 above. <b>Note:</b> Neither modeling nor a modeling waiver is required for VOC emissions.       |                                          |
| Reporting existing pollutants that were not previously reported.                                                                                                                                |                                          |
| Reporting existing pollutants where the ambient impact is being addressed for the first time.                                                                                                   |                                          |
| Title V application (new, renewal, significant, or minor modification. 20.2.70 NMAC). See #3 above.                                                                                             | X                                        |
| Relocation (20.2.72.202.B.4 or 72.202.D.3.c NMAC)                                                                                                                                               |                                          |
| Minor Source Technical Permit Revision 20.2.72.219.B.1.d.vi NMAC for like-kind unit replacements.                                                                                               |                                          |
| Other: i.e. SSM modeling. See #2 above.                                                                                                                                                         |                                          |
| This application does not require modeling since this is a No Permit Required (NPR) application.                                                                                                |                                          |
| This application does not require modeling since this is a Notice of Intent (NOI) application (20.2.73 NMAC).                                                                                   |                                          |
| This application does not require modeling according to 20.2.70.7.E(11), 20.2.72.203.A(4), 20.2.74.303, 20.2.79.109.D NMAC and in accordance with the Air Quality Bureau's Modeling Guidelines. |                                          |

**Check each box that applies:**

- ☐ See attached, approved modeling **waiver for all** pollutants from the facility.
- ☐ See attached, approved modeling **waiver for some** pollutants from the facility.
- ☐ Attached in Universal Application Form 4 (UA4) is a **modeling report for all** pollutants from the facility.
- ☐ Attached in UA4 is a **modeling report for some** pollutants from the facility.
- ☒ No modeling is required.

# Section 17

## Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

To show compliance with existing NSR permits conditions, you must submit a compliance test history. The table below provides an example.

Compliance Test History Table

| Unit No. | Test Description                                                                                | Test Date         |
|----------|-------------------------------------------------------------------------------------------------|-------------------|
| FL-1     | 40 CFR 60.18 compliance testing                                                                 | June 21, 2016     |
| TO-1     | Periodic testing of thermal oxidizer for NOx, CO, and VOC destruction efficiency.               | February 20, 2024 |
|          |                                                                                                 | August 16, 2022   |
|          |                                                                                                 | July 22, 2021     |
|          |                                                                                                 | October 21, 2020  |
| H-2      | Periodic emissions testing of heater to determine compliance with the allowable emission limits | August 5, 2021    |

# Section 19

## Requirements for Title V Program

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**Who Must Use this Attachment:**

- \* Any major source as defined in 20.2.70 NMAC.
  - \* Any source, including an area source, subject to a standard or other requirement promulgated under Section 111 - Standards of Performance for New Stationary Sources, or Section 112 Hazardous Air Pollutants, of the 1990 federal Clean Air Act ("federal Act"). Non-major sources subject to Sections 111 or 112 of the federal Act are exempt from the obligation to obtain an 20.2.70 NMAC operating permit until such time that the EPA Administrator completes rulemakings that require such sources to obtain operating permits. In addition, sources that would be required to obtain an operating permit solely because they are subject to regulations or requirements under Section 112(r) of the federal Act are exempt from the requirement to obtain an Operating Permit.
  - \* Any Acid Rain source as defined under title IV of the federal Act. The Acid Rain program has additional forms. See [www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/](http://www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/). Sources that are subject to both the Title V and Acid Rain regulations are encouraged to submit both applications simultaneously.
  - \* Any source in a source category designated by the EPA Administrator ("Administrator"), in whole or in part, by regulation, after notice and comment.
- 

**19.1 - 40 CFR 64, Compliance Assurance Monitoring (CAM) (20.2.70.300.D.10.e NMAC)**

Any source subject to 40CFR, Part 64 (Compliance Assurance Monitoring) must submit all the information required by section 64.7 with the operating permit application. The applicant must prepare a separate section of the application package for this purpose; if the information is already listed elsewhere in the application package, make reference to that location. Facilities not subject to Part 64 are invited to submit periodic monitoring protocols with the application to help the AQB to comply with 20.2.70 NMAC. Sources subject to 40 CFR Part 64, must submit a statement indicating your source's compliance status with any enhanced monitoring and compliance certification requirements of the federal Act.

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After reasonable inquiry, Enterprise Field Services, LLC states that the facility amine unit (Amine-1) meets the applicability requirements of 40 CFR 64.2. Enterprise Field Services, LLC will submit the necessary items for this regulation. The CAM plan is provided below:

**Enterprise Field Services, LLC / South Eddy Cryo Plant**  
**CAM Plan for Amine Treater Controlled by Flare and Thermal Oxidizer**

I. Background

A. Emissions Unit

|                 |                            |
|-----------------|----------------------------|
| Description:    | Amine Sweetening Unit      |
| Identification: | Amine-1                    |
| Facility:       | South Eddy Cryogenic Plant |

B. Applicable Regulation, Emission Limit, and Pre-CAM Monitoring Requirements

|             |                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Regulation: | Operation and reporting requirements created in NSR Permit PSD 5945-M5 et seq. to establish federally enforceable recognition of the amine sweetening unit. |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                  |                               |
|------------------|-------------------------------|
| Emission limits: | Uncontrolled – VOC: 928.2 tpy |
|                  | Controlled – VOC: 0 tpy       |

C. Control Technology, Capture System, Bypass, PER

|                 |                                                                                                                                                                                                                                                                         |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Controls:       | Thermal Oxidizer (TO-1) and Flare (unit FL-1)                                                                                                                                                                                                                           |
| Capture System: | N/A                                                                                                                                                                                                                                                                     |
| Bypass:         | Amine flash emissions are controlled by an electric vapor recovery unit (VRU-3). During VRU downtime amine flash will be sent to the flare (unit FL-1). Still Vent emissions are controlled by the Thermal Oxidizer (TO-1). No bypass exists for the still vent stream. |

|                                         |                                                |
|-----------------------------------------|------------------------------------------------|
| Potential pre-control device emissions: | Under 40 CFR 64.2 this is a CAM affected unit. |
|-----------------------------------------|------------------------------------------------|

|                                          |                                                                                                                                                                                                                                                                                               |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Potential post-control device emissions: | Amine flash emissions are 100% controlled by an electric vapor recovery unit (VRU-3). During VRU downtime amine flash will be sent to the flare with a 98% DRE for C3 and 99% DRE for C4+; 98% controlled for acid gas flare. Still Vent emissions are controlled by the TO with a 99.5% DRE. |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

II. Monitoring Approach

The key elements of the monitoring approach are presented in the attached table.

III. Response to Excursion

- ☞ Excursions of the flare or thermal oxidizer will trigger an inspection, corrective action, and reporting. Maintenance personnel will inspect the flare or thermal oxidizer within 24 hours and make needed repairs as soon as practicable.

**Monitoring Approach: South Eddy Cryogenic Plant Flare (Unit FI-1)**

|                                                         | <b>Indicator No. 1</b>                                                                                                                                                                                                                                                                                | <b>Indicator No. 2</b>                                                                                         | <b>Indicator No. 3</b>                                                                                                |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| I. Indicator                                            | Presence of combustion in the flare                                                                                                                                                                                                                                                                   | Presence of visible                                                                                            | Totalized gas flow                                                                                                    |
| Measurement Approach                                    | The presence of combustion in the flare shall be monitored by two well-maintained thermocouples with alarm that signals non-combustion of gas. A back-up thermocouple will be stored on-location so that it may be installed in the instance that the primary thermocouple is not operating properly. | The flare should be monitored for visible emissions once during each week that the flare is operational.       | Flow rate shall be measured continuously with a flow meter and the volume shall be totalized once every 24 hr period. |
| II. Indicator Range                                     | Flame present (sensed) or no flame present (sensed).                                                                                                                                                                                                                                                  | Visible emissions present or not present, in accordance with 40 CFR 60, Appendix A, Reference Method 22.       | Flow rate should be within the operating velocities specified in NSPS Subpart A.                                      |
| III. Performance Criteria<br>A. Data Representativeness | Destruction depends upon the presence of a flame. If the flame is not present, VOC and H <sub>2</sub> S are not being destroyed.                                                                                                                                                                      | Efficient combustion is assumed if no visible emissions are observed.                                          | Efficient combustion is assumed if flow rates are within the operating velocities specified in NSPS Subpart A.        |
| B. QA/QC Practices and Criteria                         | Proper operation of the flare achieved by maintaining the non-combustion thermocouples with alarm system. Operators will record the date and result of each such maintenance activity, as well as repairs or replacements made.                                                                       | Visible emissions to be determined in accordance with Method 22 of Appendix A of 40 CFR 60 Subpart A annually. | Verification will be in accordance with Appendix A Test method used to measure flow.                                  |
| C. Monitoring Frequency                                 | The thermocouples and alarm system will be tested once in January and once in July of each year by turning off the thermocouples and recording the time required for the alarm to respond.                                                                                                            | Visible emissions observation in accordance with Method 22 shall be conducted annually.                        | Continuous monitoring with totalized flow rate determined hourly.                                                     |
| D. Data Collection Procedures                           | Records will be maintained of flare shutdown for any reason, including failure to deliver fuel, and of inspection and maintenance to the flare and flare pilot.                                                                                                                                       | Records shall be maintained of all visible emissions observations.                                             | Totalized flow recorded once per each 24 hr period that the flare is in operation.                                    |
| E. Averaging Period                                     | Not applicable.                                                                                                                                                                                                                                                                                       | A 2-hour Method 22 observation will be performed annually.                                                     | 24 hr.                                                                                                                |

**Monitoring Approach: South Eddy Cryogenic Plant Thermal Oxidizer (unit TO-1)**

|                      | <b>Indicator No. 1</b>                                    | <b>Indicator No. 2</b>                                                                      |
|----------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------|
| I. Indicator         | Chamber temperature                                       | Work practice                                                                               |
| Measurement Approach | The chamber temperature is monitored with a thermocouple. | Inspection and maintenance of the burner; observation of the burner flame.                  |
| II. Indicator Range  | Flame present (sensed) or no flame present (sensed).      | An excursion is defined as failure to perform annual inspection or daily flame observation. |

|                                                         |                                                                                                                                                                                                                                                                                                                                            |                                                                         |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|                                                         | No more than 6 excursions in any semi-annual reporting period.                                                                                                                                                                                                                                                                             |                                                                         |
| III. Performance Criteria<br>A. Data Representativeness | The sensor is located in the incinerator chamber as an integral part of the incinerator design. The minimum tolerance of the thermocouple is $\pm 4^{\circ}\text{F}$ or $\pm 0.75\%$ (of temperature measured in degrees Celsius), whichever is greater. The minimum chart recorder sensitivity (minor division) is $20^{\circ}\text{F}$ . | Not applicable                                                          |
| B. QA/QC Practices and Criteria                         | Accuracy of the thermocouple will be verified by a second, or redundant, thermocouple probe inserted into the incinerator chamber with a handheld meter. This validation check will be conducted at least annually. The acceptance criterion is $\pm 30^{\circ}\text{F}$ .                                                                 | Not applicable                                                          |
| C. Monitoring Frequency                                 | Measured continuously.                                                                                                                                                                                                                                                                                                                     | Annual inspection of the burner; daily observation of the burner flame. |
| D. Data Collection Procedures                           | Recorded continuously on a circular chart recorder.                                                                                                                                                                                                                                                                                        | Record results of annual inspections and daily observations.            |
| E. Averaging Period                                     | Not applicable.                                                                                                                                                                                                                                                                                                                            | Not applicable.                                                         |

## Justification

### I. Background

The monitoring approach outlined here applies to the flare and thermal oxidizer which is a control device for the amine sweetening unit. The amine sweetening unit is the CAM affected unit.

### II. Rationale for Selection of Performance Indicators

The destruction and removal of VOC is dependent upon combustion. Thus, the monitoring approach is based on two primary indicators: correct operation of the vapor combustion device and integrity of the ducting from the process equipment to the Thermal Oxidizer.

### III. Rationale for Selection of Indicator Ranges

#### Flare (Unit FL-1)

When ensuring proper operation of the flare, the presence of a flame to initiate or maintain combustion has only two states: a flame is present, or a flame is not present. By design, a well-maintained thermocouple-based alarm system will indicate the state of combustion. The presence of visible emissions has only two states: there are visible emissions or there are not. Proper operation of the flare would correspond with no visible emissions. The measurement of totalized flow volume will determine if the volumetric flow is in line with the design specifications and the maximum velocity determined from earlier testing of the flare.

#### Thermal Oxidizer (Unit TO-1)

The incinerator chamber temperature was selected because it is indicative of the thermal incinerator operation (combustion occurring within the chamber). If the chamber temperature decreases significantly, complete combustion may not occur.

It has been shown that the control efficiency achieved by a thermal incinerator is a function of its operating temperature, or outlet temperature. By maintaining the operating temperature at or above a minimum, a level of control efficiency can be expected to be achieved.

The work practice comprised of an annual inspection and tuning of the incinerator burner was selected because an inspection verifies equipment integrity and periodic tuning will maintain proper burner operation and efficiency. In addition, a daily observation of the burner flame selected to monitor proper operation of the burner (blue flame) is appropriate.

Amine flash emissions are 100% controlled by an electric vapor recovery unit (VRU-3). During VRU downtime amine flash will be sent to the flare and the permit issued by the NMED requires with a 98% DRE for C3 and 99% DRE for C4+; 98% controlled for the flare. Still Vent emissions are controlled by the thermal oxidizer with a 99.5% DRE.

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## 19.2 - Compliance Status (20.2.70.300.D.10.a & 10.b NMAC)

Describe the facility's compliance status with each applicable requirement at the time this permit application is submitted. This statement should include descriptions of or references to all methods used for determining compliance. This statement should include descriptions of monitoring, recordkeeping and reporting requirements and test methods used to determine compliance with all applicable requirements. Refer to Section 2, Tables 2-N and 2-O of the Application Form as necessary. (20.2.70.300.D.11 NMAC) For facilities with existing Title V permits, refer to most recent Compliance Certification for existing requirements. Address new requirements such as CAM, here, including steps being taken to achieve compliance.

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Enterprise Field Services, LLC believes that South Eddy Cryo Plant is in compliance with each applicable requirement identified in Section 19.2. This belief was formed after reasonable inquiry. In the event that Enterprise Field Services, LLC should discover new information affecting the compliance status of the facility, Enterprise Field Services, LLC will make appropriate notification and/or take corrective action.

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**19.3 - Continued Compliance** (20.2.70.300.D.10.c NMAC)

Provide a statement that your facility will continue to be in compliance with requirements for which it is in compliance at the time of permit application. This statement must also include a commitment to comply with other applicable requirements as they come into effect during the permit term. This compliance must occur in a timely manner or be consistent with such schedule expressly required by the applicable requirement.

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As described in Section 19.2, to the best of our knowledge Enterprise Field Services, LLC states that South Eddy Cryo Plant will continue to operate in compliance with applicable requirements. Additionally, Enterprise Field Services, LLC will meet additional applicable requirements that become effective during the permit term in a timely manner or on such a time schedule as expressly required by the applicable requirement. In the event Enterprise Field Services, LLC should discover new information affecting the compliance status of the facility, Enterprise Field Services, LLC will make appropriate notifications and/or take corrective actions as appropriate.

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**19.4 - Schedule for Submission of Compliance** (20.2.70.300.D.10.d NMAC)

You must provide a proposed schedule for submission to the department of compliance certifications during the permit term. This certification must be submitted annually unless the applicable requirement or the department specifies a more frequent period. A sample form for these certifications will be attached to the permit.

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Enterprise Field Services, LLC proposes to submit compliance certification reports to the New Mexico Environment Department (NMED) Air Quality Bureau (AQB) and to the EPA every 12 months.

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**19.5 - Stratospheric Ozone and Climate Protection**

In addition to completing the four (4) questions below, you must submit a statement indicating your source's compliance status with requirements of Title VI, Section 608 (National Recycling and Emissions Reduction Program) and Section 609 (Servicing of Motor Vehicle Air Conditioners).

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1. Does your facility have any air conditioners or refrigeration equipment that uses CFCs, HCFCs or other ozone-depleting substances? ☐ Yes ☒ No
  2. Does any air conditioner(s) or any piece(s) of refrigeration equipment contain a refrigeration charge greater than 50 lbs? ☐ Yes ☒ No  
(If the answer is yes, describe the type of equipment and how many units are at the facility.)
  3. Do your facility personnel maintain, service, repair, or dispose of any motor vehicle air conditioners (MVACs) or appliances ("appliance" and "MVAC" as defined at 82. 152)? ☐ Yes ☒ No
  4. Cite and describe which Title VI requirements are applicable to your facility (i.e. 40 CFR Part 82, Subpart A through G.)
- 

This regulation establishes requirements for protection of the stratospheric ozone. Enterprise Field Services, LLC complies with the requirements of Title VI, Section 608 and Section 608.

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## 19.6 - Compliance Plan and Schedule

Applications for sources, which are not in compliance with all applicable requirements at the time the permit application is submitted to the department, must include a proposed compliance plan as part of the permit application package. This plan shall include the information requested below:

**A. Description of Compliance Status:** (20.2.70.300.D.11.a NMAC)

A narrative description of your facility's compliance status with respect to all applicable requirements (as defined in 20.2.70 NMAC) at the time this permit application is submitted to the department.

**B. Compliance plan:** (20.2.70.300.D.11.B NMAC)

A narrative description of the means by which your facility will achieve compliance with applicable requirements with which it is not in compliance at the time you submit your permit application package.

**C. Compliance schedule:** (20.2.70.300D.11.c NMAC)

A schedule of remedial measures that you plan to take, including an enforceable sequence of actions with milestones, which will lead to compliance with all applicable requirements for your source. This schedule of compliance must be at least as stringent as that contained in any consent decree or administrative order to which your source is subject. The obligations of any consent decree or administrative order are not in any way diminished by the schedule of compliance.

**D. Schedule of Certified Progress Reports:** (20.2.70.300.D.11.d NMAC)

A proposed schedule for submission to the department of certified progress reports must also be included in the compliance schedule. The proposed schedule must call for these reports to be submitted at least every six (6) months.

**E. Acid Rain Sources:** (20.2.70.300.D.11.e NMAC)

If your source is an acid rain source as defined by EPA, the following applies to you. For the portion of your acid rain source subject to the acid rain provisions of title IV of the federal Act, the compliance plan must also include any additional requirements under the acid rain provisions of title IV of the federal Act. Some requirements of title IV regarding the schedule and methods the source will use to achieve compliance with the acid rain emissions limitations may supersede the requirements of title V and 20.2.70 NMAC. You will need to consult with the Air Quality Bureau permitting staff concerning how to properly meet this requirement.

**NOTE:** The Acid Rain program has additional forms. See [www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/](http://www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/). Sources that are subject to both the Title V and Acid Rain regulations are **encouraged** to submit both applications **simultaneously**.

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Enterprise Field Services, LLC believes that South Eddy Cryo Plant is in compliance with the applicable requirements in this section. No compliance plan, compliance schedule, or compliance reports are required.

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## 19.7 - 112(r) Risk Management Plan (RMP)

Any major sources subject to section 112(r) of the Clean Air Act must list all substances that cause the source to be subject to section 112(r) in the application. The permittee must state when the RMP was submitted to and approved by EPA.

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The current RMP for South Eddy Cryogenic Plant was submitted to EPA in April 2021.

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## 19.8 - Distance to Other States, Bernalillo, Indian Tribes and Pueblos

Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B NMAC)?

(If the answer is yes, state which apply and provide the distances.)

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South Eddy Cryo Plant is approximately 17.7 kilometers from Texas.

**19.9 - Responsible Official**

Provide the Responsible Official as defined in 20.2.70.7.AD NMAC:

Responsible Official: Graham Bacon

R.O. Address: P.O. Box 4324, Houston, TX 77210-4324

Phone: (713) 381-6595

R.O. Email: [environmental@eprod.com](mailto:environmental@eprod.com)

# Section 20

## Other Relevant Information

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**Other relevant information.** Use this attachment to clarify any part in the application that you think needs explaining. Reference the section, table, column, and/or field. Include any additional text, tables, calculations or clarifying information.

Additionally, the applicant may propose specific permit language for AQB consideration. In the case of a revision to an existing permit, the applicant should provide the old language and the new language in track changes format to highlight the proposed changes. If proposing language for a new facility or language for a new unit, submit the proposed operating condition(s), along with the associated monitoring, recordkeeping, and reporting conditions. In either case, please limit the proposed language to the affected portion of the permit.

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No other relevant information.

## Section 22: Certification

Company Name: Enterprise Field Services, LLC

I, Bradley J. Cooley, hereby certify that the information and data submitted in this application are true and as accurate as possible, to the best of my knowledge and professional expertise and experience.

Signed this 4th day of September, 2024, upon my oath or affirmation, before a notary of the State of

Texas.

\*Signature

09/04/2024  
Date

Bradley J. Cooley  
Printed Name

Senior Director  
Title

Scribed and sworn before me on this 4th day of September, 2024.

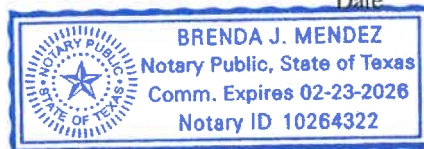
My authorization as a notary of the State of Texas expires on the

23rd day of February, 2026.

Brenda J. Mendez  
Notary's Signature

09/04/2024  
Date

Brenda J. Mendez  
Notary's Printed Name



\*For Title V applications, the signature must be of the Responsible Official as defined in 20.2.70.7.AE NMAC.