Enterprise Products

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

ENTERPRISE PRODUCTS OPERATING LLC

December 20, 2023

FedEx Standard Overnight

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

Re: NSR Permit No. 0220-M12R1 Significant Revision
Enterprise Field Services, LLC – South Carlsbad Compressor Station
Eddy County, New Mexico

Sir or Madam:

Enterprise Products Operating, LLC (Enterprise) is submitting this NSR application for a Significant Revision to the current NSR Permit No. 0220-M12R1, issued on October 30, 2023, for the South Carlsbad Compressor Station. The proposed updates to the NSR Permit include the installation of one (1) Caterpillar G3608 (Unit 11) and four (4) Caterpillar G3612 compressor engines (Units 12-15), one slop storage tank (Unit TK-1000), one (1) Caterpillar G3516A4 emergency generator (Unit GEN-1), and various auxiliary units. The facility will also modify all combustion equipment based on a more recent fuel gas analysis.

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) 381-5766 or via email at jli@eprod.com or Pranav Kulkarni at (713) 381-5830.

Thank you,

Enterprise Field Services, LLC

Jing Li
Staff Environmental Engineer

Pranav Kulkarni, Ph.D.
Manager, Environmental Permitting

/sed
Enclosure

P.O. BOX 4324
HOUSTON, TEXAS 77210-4324
713.381.6500

1100 LOUISIANA STREET
HOUSTON, TEXAS 77002-5227
www.enterpriseproducts.com

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.

Permittee/Applicant Company Name		**Expected Application Submittal Date**
Enterprise Field Services, LLC		December 20, 2023
.Permittee/Company Contact	**Phone**	**Email**
Jing Li	(713) 381-5766	jli@eprod.com

	Within the 10 years preceding the expected date of submittal of the application, has the permittee or applicant:	
1	Knowingly misrepresented a material fact in an application for a permit?	☐ Yes ☒ No
2	Refused to disclose information required by the provisions of the New Mexico Air Quality Control Act?	☐ Yes ☒ No
3	Been convicted of a felony related to environmental crime in any court of any state or the United States?	☐ Yes ☒ 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?	☐ Yes ☒ 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?	☐ Yes ☒ No
5b	If "No" to question 5a, go to question 6. 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: a. The unpermitted facility was discovered after acquisition during a timely environmental audit that was authorized by the Department; or 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.	☐ Yes ☐ No
6	Had any permit revoked or permanently suspended for cause under the environmental laws of any state or the United States?	☐ Yes ☒ No
7	For each "yes" answer, please provide an explanation and documentation.	

Mail Application To:		**For Department use only:**
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		

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: ☐ 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.: ______ in the amount of $500

☒ 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/.

☐ 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/.)

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.72.219.D(1)(a) NMAC**
(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: 218	Updating Permit/NOI #: 0220-M12R1
1	Facility Name: South Carlsbad Compressor Station	Plant primary SIC Code (4 digits): 1311 Plant NAIC code (6 digits): 211130	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): From Loving, NM follow US-285 north 2.5 miles to Roberson Road West. Follow Roberson Road West 1.0 mile to the facility.		
2	Plant Operator Company Name: Enterprise Products Operating, LLC	Phone/Fax: (713) 381-6595 / (713) 381-6811	

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) 381-6500 / (713) 381-6811
a	Plant Owner(s) Mailing Address(s): PO Box 4324, Houston, TX 77210-4324	
4	Bill To (Company): Enterprise Field Services, LLC	Phone/Fax: (713) 381-6595 / (713) 381-6811
a	Mailing Address: PO Box 4324, Houston, TX 77210-4324	E-mail: environmental@eprod.com
5	☒ Preparer: Jing Li ☐ Consultant:	Phone/Fax: (713) 381-5766 / (713) 759-3931
a	Mailing Address: PO Box 4324, Houston, TX 77210-4324	E-mail: jli@eprod.com
6	Plant Operator Contact: Daryl Arredondo	Phone/Fax: (575) 628-6819
a	Address: PO Box 4324, Houston, TX 77210-4324	E-mail: ddarredondo@eprod.com
7	Air Permit Contact: Jing Li	Title: Staff Environmental Engineer
a	E-mail: jli@eprod.com	Phone/Fax: (713) 381-5766 / (713) 759-3931
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? ☒ Yes ☐ No	1.b If yes to question 1.a, is it currently operating in New Mexico? ☒ Yes ☐ 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? ☐ Yes ☒ 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? ☒ Yes ☐ No
3	Is the facility currently shut down? ☐ Yes ☒ 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? ☒ Yes ☐ 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? ☒ Yes ☐ No ☐ N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☒ Yes ☐ No	If yes, the permit No. is: P-130-R3M1
7	Has this facility been issued a No Permit Required (NPR)? ☐ Yes ☒ No	If yes, the NPR No. is: N/A
8	Has this facility been issued a Notice of Intent (NOI)? ☐ Yes No	If yes, the NOI No. is: N/A
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☒ Yes ☐ No	If yes, the permit No. is: 0222-M12R1
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? ☐ Yes ☒ 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: 8.33 MMscf	Daily: 200 MMscf	Annually: 73 Bscf
b	Proposed	Hourly: 18.75 MMscf	Daily: 450 MMscf	Annually: 164 Bscf
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: 8.33 MMscf	Daily: 200 MMscf	Annually: 73 Bscf
b	Proposed	Hourly: 18.75 MMscf	Daily: 450 MMscf	Annually: 164 Bscf

Section 1-D: Facility Location Information

1	Latitude (decimal degrees): 32.313828 N	Longitude (decimal degrees): -104.137132 W	County: Eddy	Elevation (ft): 3,065
2	UTM Zone: ☐ 12 or ☒ 13	Datum: ☐ NAD 83 ☒ WGS 84		
a	UTM E (in meters, to nearest 10 meters): 581,225m E	UTM N (in meters, to nearest 10 meters): 3,575,549m N		
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 Loving, NM follow US-285 north 2.5 miles to Roberson Road West. Follow Roberson Road West 1.0 mile to the facility.			
5	The facility is 2.8 miles northwest of Loving, NM.			
6	Land Status of facility (check one): ☒ Private ☐ Indian/Pueblo ☐ Government ☐ BLM ☐ Forest Service ☐ Military			
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:** Carlsbad, Loving, Malaga; **Indian Tribes:** None; **Counties:** Eddy			
8	**20.2.72** NMAC applications **only**: 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 www.env.nm.gov/air-quality/modeling-publications/)? ☒ Yes ☐ No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: **States:** Texas – 34.7 km; **Class 1 Areas:** Carlsbad Caverns National park – 26.1 km			
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): 26.1 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: 582.2 m			
12	Method(s) used to delineate the Restricted Area: Fencing, gates, and signage "**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? ☐ Yes ☒ No 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? ☒ No ☐ Yes If yes, what is the name and permit number (if known) of the other facility?			

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

1	Facility **maximum** operating ($\frac{hours}{day}$): 24	($\frac{days}{week}$): 7	($\frac{weeks}{year}$): 52	($\frac{hours}{year}$): 8,760
2	Facility's maximum daily operating schedule (if less than 24 $\frac{hours}{day}$)? Start: N/A	AM PM	End: N/A	AM PM
3	Month and year of anticipated start of construction: Upon receipt of permit.			
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? ☒ Yes ☐ 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? ☐ Yes ☒ No If yes, specify:		
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? ☐ Yes ☒ 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? ☒ Yes ☒ 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? ☐ Yes ☒ No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? ☒ Yes ☐ No		
a	If Yes, what type of source? ☐ **Major** (☐ ≥10 tpy of any single HAP **OR** ☐ ≥25 tpy of any combination of HAPS) **OR** ☒ **Minor** (☒ <10 tpy of any single HAP **AND** ☒ <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? ☑ Yes ☐ No		
a	If yes, include the name of company providing commercial electric power to the facility: Excel Energy 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	☐ I have filled out Section 18, "Addendum for Streamline Applications."	☒ 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.) (20.2.70.300.D.2 NMAC): Graham Bacon	Phone:(713) 381-6595
a	R.O. Title: Executive Vice President-EHS&T	R.O. e-mail: environmental@eprod.com
b	R. O. Address:	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC):Bradley Cooley	Phone: (713) 381-6595
a	A. R.O. Title: Senior Director, Environmental	A. R.O. e-mail: environmental@eprod.com
b	A. R. O. Address: PO 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.): 1100 Louisiana St., Houston, TX 77002	
a	Address of Parent Company: N/A	
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: Daryl Arredondo (575) 628-6819 / Jing Li (713) 381-5766 / (713) 759-3931	

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 (~34.7 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-to 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: Jing Li, Email: jli@eprod.com,Phone number: (713) 381-5766.

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.

Table of Contents

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[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2]	Date of Construction/ Reconstruction[2]	Controlled by Unit #	Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
1	Natural Gas Turbine	Solar Centaur	T-4702	OHD10-C-7915	4700 hp	4328 hp	9/1/2004	3/24/2010	N/A	1	20200201	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
C9101	Compressor	Solar Centaur	T-4702	OHD10-C-7915	4700 hp	4328 hp	Unknown	< 8/23/2011	N/A	N/A	20200201	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
2	Natural Gas Turbine	Solar Centaur	T-4702	OHE12-C-7057	4700 hp	4328 hp	9/1/2004	8/31/2013	N/A	2	20200201	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
C9102	Compressor	Solar Centaur	T-4702	OHE12-C-7057	4700 hp	4328 hp	Unknown	< 8/23/2011	N/A	N/A	20200201	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
5	Natural Gas Turbine	Solar Centaur	T40-4700S	OHL20-C1803	4700 hp	4329 hp	12/18/2000	< 8/23/2011	N/A	N/A	20200201	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
C9103	Compressor	Solar Centaur	T40-4700S	OHL20-C1803	4700 hp	4329 hp	N/A	N/A	N/A	N/A	20200201	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
6	Compressor Engine	Caterpillar	G3608A4	XH701915	2500 hp	2500 hp	TBD	TBD	CAT-6	6	20200254	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	4SLB	N/A
7	Compressor Engine	Caterpillar	G3608A4	XH701920	2500 hp	2500 hp	TBD	TBD	CAT-7	7	20200254	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	4SLB	N/A
8	Compressor Engine	Caterpillar	G3608A4	XH701923	2500 hp	2500 hp	TBD	TBD	CAT-8	8	20200254	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	4SLB	N/A
9	Compressor Engine	Caterpillar	G3608A4	TBD	2500 hp	2500 hp	TBD	TBD	CAT-9	9	20200254	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	4SLB	N/A
10	Compressor Engine	Caterpillar	G3608A4	TBD	2500 hp	2500 hp	TBD	TBD	CAT-10	10	20200254	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	4SLB	N/A
11	Compressor Engine	Caterpillar	G3608A4	TBD	2500 hp	2500 hp	TBD	TBD	CAT-11	11	20200254	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
12	Compressor Engine	Caterpillar	G3612A4	TBD	4125 hp	4125 hp	TBD	TBD	CAT-12	12	20200254	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
13	Compressor Engine	Caterpillar	G3612A4	TBD	4125 hp	4125 hp	TBD	TBD	CAT-13	13	20200254	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
14	Compressor Engine	Caterpillar	G3612A4	TBD	4125 hp	4125 hp	TBD	TBD	CAT-14	14	20200254	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
15	Compressor Engine	Caterpillar	G3612A4	TBD	4125 hp	4125 hp	TBD	TBD	CAT-15	15	20200254	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
3a	Gylcol Dehydrator Still Vent	Gas Tech	Unknown	Unknown	200 MMscf/day	200 MMscf/day	1/1/1999	Unknown	3a	3b	31000302	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] Date of Construction/ Reconstruction[2]	Controlled by Unit # Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
3b	Glycol Dehydrator Reboiler	Gas Tech	Unknown	Unknown	3.0 MMBtu/hr	3.0 MMBtu/hr	1/1/1999 Unknown	3b 3b	31000302	☐ Existing (unchanged) ☐ New/Additional ☑ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
TK-1000	Slop Tank	Unknown	Unknown	N/A	400 bbl	400 bbl	TBD TBD	N/A N/A	40400315	☐ Existing (unchanged) ☑ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
T-007	Slop Tank	Unknown	Unknown	N/A	400 bbl	400 bbl	2023 Unknown	N/A N/A	40400315	☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
T-008	Stabilized Condensate Tank	Unknown	Unknown	N/A	300 bbl	300 bbl	2013 Unknown	N/A N/A	40400311	☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
T-009	Stabilized Condensate Tank	Unknown	Unknown	N/A	300 bbl	300 bbl	< 8/23/2011 < 8/23/2011	N/A N/A	40400311	☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
T-011	Stabilized Condensate Tank	Unknown	Unknown	N/A	300 bbl	300 bbl	12/1/2006 Unknown	N/A N/A	40400311	☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
T-012	Stabilized Condensate Tank	Unknown	Unknown	N/A	300 bbl	300 bbl	12/1/2006 Unknown	N/A N/A	40400311	☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
ECD	Enclosed Combustor Device	SpiralX	TBD	TBD	6.50 MMscf/yr	6.50 MMscf/yr	TBD TBD	N/A ECD	30600904	☐ Existing (unchanged) ☐ New/Additional ☑ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
Flare	Process Flare	Unknown	Unknown	N/A	72 Mscf/hr	72 Mscf/hr	Unknown 12/1/2006	N/A Flare	31000215	☐ Existing (unchanged) ☐ New/Additional ☑ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
VENT (SSM)	Vent for Startup, Shutdown and Blowdown Emissions	N/A	N/A	N/A	N/A	N/A	Unknown Unknown	N/A N/A	31000299	☐ Existing (unchanged) ☐ New/Additional ☑ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
F-001	Fugitives	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31088811	☐ Existing (unchanged) ☐ New/Additional ☑ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
Flare (SSM)	SSM Flare	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31000215	☐ Existing (unchanged) ☐ New/Additional ☑ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
LOAD	Truck Loading Emission	N/A	N/A	N/A	69,350 bbl/yr	69,350 bbl/yr	N/A N/A	N/A N/A	31000199	☑ Existing (unchanged) ☐ New/Additional ☐ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A
MALF	Malfunction Emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31088811	☐ Existing (unchanged) ☐ New/Additional ☑ To Be Modified ☐ To be Removed ☐ Replacement Unit ☐ To be Replaced	N/A	N/A

[1] 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.
[2] Specify dates required to determine regulatory applicability.
[3] 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.
[4] "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[1] (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), 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 (e.g. 20.2.72.202.B.5)	Date of Manufacture /Reconstruction[2]	For Each Piece of Equipment, Check Onc
			Serial No.	Capacity Units	Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Installation /Construction[2]	
T-001	Lube Oil Tank	N/A	N/A	24	20.2.72.202.B(2)(a) NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	bbl	IA List Item #5	Unknown	
T-002	Methanol Tank	N/A	N/A	210	20.2.72.202.B(2)(a) NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	bbl	IA List Item #5	Unknown	
T-003	Triethylene Glycol Tank	N/A	N/A	210	20.2.72.202.B(2)(a) NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	bbl	IA List Item #5	Unknown	
T-004	Used Oil Tank	N/A	N/A	210	20.2.72.202.B(2)(a) NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	bbl	IA List Item #5	Unknown	
T-005	Used Oil Tank	N/A	N/A	210	20.2.72.202.B(2)(a) NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	bbl	IA List Item #5	Unknown	
T-006	Slop Tank	N/A	N/A	TBD	20.2.72.202.B(5) NMAC	N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	TBD	IA List Item #1.a.	N/A	
LOAD_SLOP	Slop Loading	N/A	N/A	TBD	20.2.72.202.B(5) NMAC	N/A	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
			N/A	TBD	IA List Item #5	N/A	
Haul	Haul Road Emissions	N/A	N/A	TBD	20.2.72.202.B(5) NMAC	N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	TBD	IA List Item #5	N/A	
Unload	Chemical Unloading	N/A	N/A	TBD	20.2.72.202.B(5) NMAC	N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	TBD	IA List Item #1.a.	N/A	
GC-1	Gas Chromatograph	Daniel	700	350	20.2.72.202.B(5) NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			Unknown	cc/min	IA List Item #1.a.	Unknown	
GC-2	Gas Chromatograph	ABB	NGC 8206	820	20.2.72.202.B(5) NMAC	Unknown	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			Unknown	cc/min	IA List Item #1.a.	Unknown	
Pigging	Pig Receiver and Launcher Emissions	N/A	N/A	280	20.2.72.202.B(5) NMAC	TBD	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
			N/A	scf/event	Insignificant Activity #1a	TBD	
GEN-1	Emergency Generator	Caterpillar G3516A4	N/A	1462	20.2.72.202.B(3) NMAC	TBD	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	hp	Insignificant Activity #1a	TBD	

[1] 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.

[2] 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 (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.

Control Equipment Unit No.	Control Equipment Description	Date Installed	Controlled Pollutant(s)	Controlling Emissions for Unit Number(s)[1]	Efficiency (% Control by Weight)	Method used to Estimate Efficiency
Flare	Condensate Stabilizer Flare	Unknown	VOCs & HAPs	Condensate Stabilizer	98%	Engineering Estimate
3b	Glycol Dehydrator Reboiler	Unknown	VOCs & HAPs	3a	98%	Engineering Estimate
5	SoloNOx	TBD	NO_X	5	25 ppm	Manufacturers Spec.
CAT-6 through CAT-11	Catalyst	TBD	CO, VOC, HCHO	6-11	76% CO 0% VOC 85.625% HCHO	Manufacturers Spec.
CAT-12 through CAT-15	Catalyst	TBD	CO, VOC, HCHO	12-15	79% CO 3% VOC 82% HCHO	Manufacturers Spec.
ECD	Glycol Still Vent and Flash Combustor	TBD	VOCs & HAPS	3a	98%	Manufacturers Spec.

[1] 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[1]		PM10[1]		PM2.5[1]		H_2S		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
1	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03	-	-
2	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03	-	-
5	4.43	19.40	5.89	25.78	1.40	6.15	0.56	2.43	0.27	1.16	0.27	1.16	0.27	1.16	2.78E-04	1.22E-03	-	-
6	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
7	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
8	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
9	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
10	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
11	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
12	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04	-	-
13	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04	-	-
14	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04	-	-
15	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04	-	-
3a	-	-	-	-	73.65	322.57	-	-	-	-	-	-	-	-	0.041	0.18	-	-
3b	0.29	1.29	0.25	1.08	0.016	0.071	0.041	0.18	0.022	0.098	0.022	0.098	0.022	0.098	1.04E-03	4.54E-03	-	-
TK-1000	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-		
T-007	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-	-	-
T-008 T-009 T-011 T-012	-	-	-	-	*	18.85	-	-	-	-	-	-	-	-	-	-	-	-
F-001	-	-	-	-	*	58.61	-	-	-	-	-	-	-	-	-	-	-	-
LOAD	-	-	-	-	*	9.82	-	-	-	-	-	-	-	-	-	-	-	-
ECD	0.010	0.044	8.52E-03	0.037	-	-	6.59E-05	2.89E-04	-	-	-	-	-	-	3.50E-05	1.53E-04	-	-
Flare (Process)	15.78	2.81	42.32	15.26	61.88	22.28	0.11	0.46	-	-	-	-	-	-	0.056	0.020	-	-
MALF	38.24	6.00	102.53	10.00	123.52	10.00	0.26	10.00	-	-	-	-	-	-	0.058	2.00		
Totals	133.53	302.17	353.44	896.56	295.61	603.66	4.92	30.37	3.51	15.37	3.51	15.37	3.51	11.65	0.16	2.21	-	-

[1]**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).

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^{4}).

Unit No.	NOx		CO		VOC		SOx		PM[1]		PM10[1]		PM2.5[1]		H_2S		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
1	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03	-	-
2	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03	-	-
5	4.43	19.40	5.89	25.78	1.40	6.15	0.56	2.43	0.27	1.16	0.27	1.16	0.27	1.16	2.78E-04	1.22E-03	-	-
6	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
7	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
8	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
9	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
10	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
11	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04	-	-
12	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04	-	-
13	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04	-	-
14	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04	-	-
15	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04	-	-
3a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b	0.29	1.29	0.25	1.08	0.016	0.071	0.041	0.18	0.022	0.098	0.022	0.098	0.022	0.098	1.04E-03	4.54E-03	-	-
TK-1000	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-	-	-
T-007	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-	-	-
T-008	-	-	-	-	*	18.85	-	-	-	-	-	-	-	-	-	-	-	-
T-009																		
T-011																		
T-012																		
F-001	-	-	-	-	*	58.61	-	-	-	-	-	-	-	-	-	-	-	-
LOAD	-	-	-	-	*	9.82	-	-	-	-	-	-	-	-	-	-	-	-
ECD	0.15	0.65	0.12	0.54	0.86	3.79	0.067	0.29	0.01	0.046	0.01	0.046	0.01	0.046	7.61E-04	3.33E-03	-	-
Flare (Process)	15.78	2.81	42.32	15.26	61.88	22.28	0.11	0.46	-	-	-	-	-	-	0.056	0.020	-	-
MALF	38.24	6.00	102.53	10.00	123.52	10.00	0.26	10.00	-	-	-	-	-	-	0.058	2.00		
Totals	133.73	303.04	207.57	257.66	237.83	350.57	4.98	30.67	3.52	15.42	3.52	15.42	3.52	15.42	0.12	2.04	-	-

[1] **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).

"*" Denotes an hourly emission rate is not appropriate

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 scehduled 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 our predictable startup, shutdown or scheduled maintenance (SSM)[1], 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) 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[2]		PM10[2]		PM2.5[2]		H_2S		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
Flare (SSM)	22.46	4.59	60.21	12.30	61.64	8.06	0.16	0.047	-	-	-	-	-	-	1.70E-03	5.11E-04		
Vent (SSM)	-	-	-	-	*	29.43	-	-	-	-	-	-	-	-	*	2.13E-03		
Totals	22.46	4.59	60.21	12.30	61.64	37.50	0.16	0.047	-	-	-	-	-	-	1.70E-03	2.64E-03		

[1] **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.

[2] **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).

[3] Flare Malfunction pph emission rates reflect worst case emissions modeled for this unit. Flare Malfunction pph rates are maximums allowed for this unit and not additive with Flare SSM pph rates or Flare Process emission rates in Table 106.A.

"*" Denotes an hourly emission rate is not appropriate

Table 2-G: Stack Exit and Fugitive Emission Rates for Special Stacks

☑ 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.

Use this table to list stack emissions (requested allowable) from split and combined stacks. List Toxic Air Pollutants (TAPs) and Hazardous Air Pollutants (HAPs) in Table 2-I. List all fugitives that are associated with the normal, routine, and non-emergency operation of the facility. Unit and stack numbering must correspond throughout the application package. Refer to Table 2-E for instructions on use of the "-" symbol and on significant figures.

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		PM		PM10		PM2.5		☐ H_2S or ☐ 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
Totals:																	

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:

Stack Number	Serving Unit Number(s) from Table 2-A	Orientation (H-Horizontal V=Vertical)	Rain Caps (Yes or No)	Height Above Ground (ft)	Temp. (F)	Flow Rate		Moisture by Volume (%)	Velocity (ft/sec)	Inside Diameter (ft)
						(acfs)	(dscfs)			
1	1	V	No	25.0	907	1542	-	N/A	177.00	3.30
2	2	V	No	25.0	907	1542	-	N/A	177.00	3.30
5	5	V	No	25.0	907	1542	-	N/A	177.00	3.30
6	6	V	No	28.5	833	268	-	N/A	85.30	2.00
7	7	V	No	28.5	833	268	-	N/A	85.30	2.00
8	8	V	No	28.5	833	268	-	N/A	85.30	2.00
9	9	V	No	28.5	833	268	-	N/A	85.30	2.00
10	10	V	No	28.5	833	268	-	N/A	85.30	2.00
11	11	V	No	28.5	833	268	-	N/A	85.30	2.00
12	12	V	No	47.0	766	428	-	N/A	136.28	2.00
13	13	V	No	47.0	766	428	-	N/A	136.28	2.00
14	14	V	No	47.0	766	428	-	N/A	136.28	2.00
15	15	V	No	47.0	766	428	-	N/A	136.28	2.00
Flare	Flare	V	No	65.0	1832	421	-	N/A	65.60	2.90
3b	3b	V	No	35.0	800	23.98	-	N/A	17.26	1.33
ECD	ECD	V	No	12.0	650	10.60	-	N/A	0.67	4.50

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		Formaldehyde ☑ HAP or ☐ TAP		Acetaldehyde ☑ HAP or ☐ TAP		Benzene ☑ HAP or ☐ TAP		Toluene ☑ HAP or ☐ TAP		Xylenes ☑ HAP or ☐ TAP		Hexane ☑ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ 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	lb/hr	ton/yr
1	1	0.035	0.15	0.026	0.11	1.46E-03	6.39E-03	4.38E-04	1.92E-03	4.74E-03	0.021	2.33E-03	0.010	-	-		
2	2	0.035	0.15	0.026	0.11	1.46E-03	6.39E-03	4.38E-04	1.92E-03	4.74E-03	0.021	2.33E-03	0.010	-	-		
5	5	0.038	0.17	0.029	0.13	1.61E-03	7.04E-03	4.82E-04	2.11E-03	5.23E-03	0.023	2.57E-03	0.011	-	-		
6	6	0.29	1.26	0.13	0.56	0.14	0.63	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	0.019	0.083		
7	7	0.29	1.26	0.13	0.56	0.14	0.63	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	0.019	0.083		
8	8	0.29	1.26	0.13	0.56	0.14	0.63	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	0.019	0.083		
9	9	0.29	1.26	0.13	0.56	0.14	0.63	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	0.019	0.083		
10	10	0.29	1.26	0.13	0.56	0.14	0.63	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	0.019	0.083		
11	11	0.29	1.26	0.13	0.56	0.14	0.63	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	0.019	0.083		
12	12	0.47	2.05	0.209	0.92	0.23	1.01	0.012	0.053	0.011	0.048	5.08E-03	0.022	0.031	0.13		
13	13	0.47	2.05	0.209	0.92	0.23	1.01	0.012	0.053	0.011	0.048	5.08E-03	0.022	0.031	0.13		
14	14	0.47	2.05	0.209	0.92	0.23	1.01	0.012	0.053	0.011	0.048	5.08E-03	0.022	0.031	0.13		
15	15	0.47	2.05	0.209	0.92	0.23	1.01	0.012	0.053	0.011	0.048	5.08E-03	0.022	0.031	0.13		
3a	3a	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
3b	3b	0.022	0.095	1.26E-03	5.50E-03	1.10E-03	4.80E-03	1.12E-03	4.90E-03	1.53E-03	6.70E-03	1.99E-03	8.70E-03	2.10E-03	9.20E-03		
TK-1000	TK-1000	*	0.097	-	-	-	-	*	0.058	*	0.017	*	1.95E-03	*	7.66E-04		
T-007	T-007	*	0.097	-	-	-	-	*	0.058	*	0.017	*	1.95E-03	*	7.66E-04		
T-008	T-008	*	0.79	-	-	-	-	*	0.086	*	0.031	*	2.72E-03	*	0.67		
T-009	T-009	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T-011	T-011	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
T-012	T-012	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
F-001	F-001	*	5.23	-	-	-	-	-	-	-	-	-	-	-	-		
LOAD	LOAD	*	0.45	-	-	-	-	*	0.043	*	7.00E-04	*	1.20E-03	*	0.39		
ECD	ECD	0.16	0.70	-	-	-	-	0.084	0.37	0.052	0.23	0.052	0.23	0.018	0.079		
Flare (Process)	Flare (Process)	0.79	0.28	-	-	-	-	0.075	0.027	0.087	0.031	0.058	0.021	0.56	0.20		
Flare (SSM)	Flare (SSM)	0.38	0.11	-	-	-	-	-	-	-	-	-	-	0.38	0.11		
VENT (SSM)	VENT (SSM)	*	0.47	-	-	-	-	*	0.078	*	0.023	*	-	*	0.35		
MALF	MALF	-	0.16	-	-	-	-	-	0.026	-	7.615E-03	-	-	-	0.12		
Totals:		5.06	24.72	1.68	7.35	1.79	7.83	0.26	1.17	0.24	0.80	0.16	0.47	1.20	2.97		

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
1	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	35.27 Mscf/hr	308.97 MMscf/yr	5%	Negligible
2	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	35.27 Mscf/hr	308.97 MMscf/yr	5%	Negligible
3b	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	2.90 Mscf/hr	25.42 MMscf/yr	5%	Negligible
5	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	38.88 Mscf/hr	340.57 MMscf/yr	5%	Negligible
6	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	16.56 Mscf/hr	25.42 MMscf/yr	5%	Negligible
7	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	16.56 Mscf/hr	25.42 MMscf/yr	5%	Negligible
8	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	16.56 Mscf/hr	25.42 MMscf/yr	5%	Negligible
9	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	16.56 Mscf/hr	25.42 MMscf/yr	5%	Negligible
10	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	16.56 Mscf/hr	25.42 MMscf/yr	5%	Negligible
11	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	16.56 Mscf/hr	25.42 MMscf/yr	5%	Negligible
12	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	26.69 Mscf/hr	25.42 MMscf/yr	5%	Negligible
13	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	26.69 Mscf/hr	16.40 MMscf/yr	5%	Negligible
14	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	26.69 Mscf/hr	16.40 MMscf/yr	5%	Negligible
15	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	26.69 Mscf/hr	16.40 MMscf/yr	5%	Negligible
Flare (Process)	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	0.10 Mscf/hr	0.88 MMscf/yr	5%	Negligible
ECD	Natural Gas	Pipeline Quality Natural Gas	1034 Btu/scf	0.10 Mscf/hr	0.88 MMscf/yr	5%	Negligible

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)
TK-1000	40400315	Produced Water	Water and Mixed Hydrocarbons	62.17	38.15	79.21	12.88	79.21	12.88
T-007	40400315	Produced Water	Water and Mixed Hydrocarbons	62.17	38.15	79.21	12.88	79.21	12.88
T-008	40400311	Stabilized Condensate	Mixed Hydrocarbons	Unknown	65	74.10	7.50	87.10	9.40
T-009	40400311	Stabilized Condensate	Mixed Hydrocarbons	Unknown	65	74.10	7.50	87.10	9.40
T-011	40400311	Stabilized Condensate	Mixed Hydrocarbons	Unknown	65	74.10	7.50	87.10	9.40
T-012	40400311	Stabilized Condensate	Mixed Hydrocarbons	Unknown	65	74.10	7.50	87.10	9.40

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

Tank No.	Date Installed	Materials Stored	Seal Type (refer to Table 2-LR below)	Roof Type (refer to Table 2-LR below)	Capacity		Diameter (M)	Vapor Space (M)	Color (from Table VI-C)		Paint Condition (from Table VI-C)	Annual Throughput (gal/yr)	Turn- overs (per year)
					(bbl)	(M^3)			Roof	Shell			
TK-1000	TBD	Produced Water	N/A	FX	400	64	3.66	6.10	MG	MG	Average	3,459,993	205.95
T-007	2023	Produced Water	N/A	FX	400	64	3.66	6.10	MG	MG	Average	3,459,993	205.95
T-008	2013	Stabilized Condensate	N/A	FX	300	48	3.70	4.60	MG	MG	Good	2,912,700	231.17
T-009	<8/23/2011	Stabilized Condensate	N/A	FX	300	48	3.70	4.60	MG	MG	Good	2,912,700	231.17
T-011	<8/23/2011	Stabilized Condensate	N/A	FX	300	48	3.70	4.60	MG	MG	Good	2,912,700	231.17
T-012	<8/23/2011	Stabilized Condensate	N/A	FX	300	48	3.70	4.60	MG	MG	Good	2,912,700	231.17

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
	Mechanical Shoe Seal	Liquid-mounted resilient seal	Vapor-mounted resilient seal	Seal Type		
FX: Fixed Roof					**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	
					MG: Medium Gray	
					BL: Black	
					OT: Other (specify)	

Note: 1.00 bbl = 0.159 M^3 = 42.0 gal

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

Material Processed				Material Produced			
Description	Chemical Composition	Phase (Gas, Liquid, or Solid)	Quantity (specify units)	Description	Chemical Composition	Phase	Quantity (specify units)
Field Natural Gas	Metehane, low concentration VOC's	Gas	450 MMscf/day	Dry Gas	Methane, low concentration VOCs	G	450 MMscf/day
				Produced Water	Water with trace hydrocarbons	L	451 bbl/day
				Stabilized Condensate	Heavy hydrocarbons	L	190 bbl/day

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.

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
N/A - No CEM equipment at this facility.									

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 - No PEM equipment at this facility.								

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 CO2e emissions are less than 75,000 tons per year.

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									Total GHG Mass Basis ton/yr[4]	Total CO_2e ton/yr[5]
Unit No.	GWPs [1]	1	298	25	22,800	footnote 3										
1	mass GHG	18,685.34	0.035	0.35	-	-									18,685.73	
	CO_2e	18,685.34	10.49	8.80	-	-										18,704.64
2	mass GHG	18,685.34	0.035	0.35	-	-									18,685.73	
	CO_2e	18,685.34	10.49	8.80	-	-										18,704.64
5	mass GHG	20,596.87	0.039	0.39	-	-									20,597.29	
	CO_2e	20,596.87	11.57	9.70	-	-										20,618.14
6	mass GHG	8,771.60	0.017	0.17	-	-									8,771.78	
	CO_2e	8,771.60	4.93	4.13	-	-										8,780.66
7	mass GHG	8,771.60	0.017	0.17	-	-									8,771.78	
	CO_2e	8,771.60	4.93	4.13	-	-										8,780.66
8	mass GHG	8,771.60	0.017	0.17	-	-									8,771.78	
	CO_2e	8,771.60	4.93	4.13	-	-										8,780.66
9	mass GHG	8,771.60	0.017	0.17	-	-									8,771.78	
	CO_2e	8,771.60	4.93	4.13	-	-										8,780.66
10	mass GHG	8,771.60	0.017	0.17	-	-									8,771.78	
	CO_2e	8,771.60	4.93	4.13	-	-										8,780.66
11	mass GHG	8,771.60	0.017	0.17	-	-									8,771.78	
	CO_2e	8,771.60	4.93	4.13	-	-										8,780.66
12	mass GHG	14,141.32	0.027	0.27											14,141.62	
	CO_2e	14,141.32	7.94	6.66												14,155.93
13	mass GHG	14,141.32	0.027	0.27											14,141.62	
	CO_2e	14,141.32	7.94	6.66												14,155.93
14	mass GHG	14,141.32	0.027	0.27											14,141.62	
	CO_2e	14,141.32	7.94	6.66												14,155.93
15	mass GHG	14,141.32	0.027	0.27											14,141.62	
	CO_2e	14,141.32	7.94	6.66												14,155.93
3a	mass GHG	-	-	-	-	-									-	
	CO_2e	-	-	-	-	-										-
3b	mass GHG	1,537.07	2.90E-03	0.029	-	-									1,537.10	
	CO_2e	1,537.07	0.86	0.72	-	-										1,538.65
TK-1000	mass GHG	0.61	-	1.03	-	-									1.64	
	CO_2e	0.61	-	25.75	-	-										26.36
T-007	mass GHG	0.61	-	1.03	-	-									1.64	
	CO_2e	0.61	-	25.75	-	-										26.36

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									Total GHG Mass Basis ton/yr[4]	Total CO_2e ton/yr[5]
T-008	mass GHG	9.04E-11	-	8.19E-13	-	-									9.13E-11	-
T-009																
T-011	CO_2e	9.04E-11	-	2.05E-11	-	-									-	1.11E-10
T-012																
F-001	mass GHG	-	-	-	-	-									-	
	CO_2e	-	-	-	-	-										-
LOAD	mass GHG	-	-	-	-	-									-	
	CO_2e	-	-	-	-	-										-
ECD	mass GHG	52.98	9.98E-05	1.05	-	-									54.03	
	CO_2e	52.98	0.030	26.21	-	-										79.22
Flare (process)	mass GHG	5,146.41	0.011	8.71	-	-									5,155.13	
	CO_2e	5,146.41	2.74	217.66	-	-										5,366.81
Flare (SSM)	mass GHG	10,216.49	0.012	6.83	-	-									10,223.33	
	CO_2e	10,216.49	3.60	170.85	-	-										10,390.94
Vent (SSM)	mass GHG	0.59	-	77.78	-	-									78.37	
	CO_2e	0.59	-	1,944.47	-	-										1,945.06
MALF	mass GHG	-	-	-	-	-									-	
	CO_2e	-	-	-	-	-										-
Total	mass GHG	184,064.22	0.34	98.56	-	-									184,163.12	
	CO_2e	184,064.22	101.09	2,463.97	-	-										186,629.27

[1] **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.

[2] For **HFCs** or **PFCs** describe the specific HFC or PFC compound and use a separate column for each individual compound.

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

[4] Green house gas emissions on a **mass basis** is the ton per year green house gas emission before adjustment with its GWP.

[5] **CO_2e** 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

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, de-bottlenecking 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) for more detailed instructions on SSM emissions.

Enterprise Field Services, LLC (Enterprise) is submitting this application and accompanying material pursuant to 20.2.72.219.D(1)(a) NMAC to apply for a significant revision to the existing NSR minor source permit for the South Carlsbad Compressor Station (South Carlsbad). The facility is located approximately 2.8 miles northwest of Loving, NM in Eddy county and is currently operating under NSR Permit No. 0220-M12R1.

The purpose of this significant revision is to increase the facility wide gas throughput from 300 MMscfd to 450 MMscfd. In addition, Enterprise will also add one (1) Caterpillar G3608 compressor engine (Unit 11), four (4) Caterpillar G3612 compressor engines (Units 12 through 15), and one (1) slop oil storage tank (Unit TK-1000). Enterprise will also install one (1) Caterpillar G3516A4 emergency generator (Unit GEN-1) for backup power only and will operate less than 500 hr/yr. As a result, GEN-1 will be exempt under 20.2.72.202.B.(3) NMAC. The facility fuel gas will also be updated to a more recent analysis which will affect all combustion equipment. Compressor blowdowns from the existing engines as well as the new engines will be directed to the flare for combustion (Unit Flare (SSM)). These additions will also modify the facility wide fugitive emissions. The addition of these units will make the facility major for both Title V and PSD.

The facility is a natural gas compressor station. Gas enters the facility through a separator and is compressed by three gas turbine-driven compressors (Units 1, 2, & 5) and ten 4-stroke lean burn compressor engines (Units 6 - 15). The water-rich gas is routed through a dehydrator, Unit 3a, where water is removed. The water from the dehydrator regenerator, which contains some hydrocarbons, is routed through a condenser to recover salable hydrocarbons, which are routed to unit T-006. The non-condensable gas from the condenser is routed to a packaged burner system for use as burner fuel in the dehydrator reboiler. During periods when the reboiler is not operating or not calling for fuel, the non-condensable gas stream is routed to the enclosed combustion device (Unit ECD) and combusted with a 98% DRE. The gas stream from the flash tank is send to the fuels system and is not a source of emissions. After inlet compression, gas is sent directly to a chiller and cold separator, where liquids (primarily water) condense and are removed from the stream. The dry gas stream then goes to a pipeline for transport.

Liquids from the inlet separator are routed to a 3-phase separator, where water, hydrocarbon liquids, and gas are separated. The gas stream from the 3-phase separator is used as turbine fuel (along with makeup fuel if needed from the discharge residue gas stream and/or the gas stream from the condensate stabilizer). The water goes to tanks for storage. The hydrocarbon liquids from the 3-phase separator and from the cold separator go to the condensate stabilizer where the water and hydrocarbons are further separated. Liquid hydrocarbons and water are stored in separate tanks, and hydrocarbon gases are added to the turbine fuel stream.

In the event of an emergency, the gas streams from the 3-phase separator and from the condensate stabilizer may be routed to the flare. During non-routine conditions such as when gas must be released from portions of the facility for maintenance or in the event of an emergency, some VOCs will be directed to the flare. Gas from the 3-phase separator and stabilizer overheads will be directed to the flare in the event of a plant shutdown. Additionally, during an emergency shutdown, pressure vessels or the gas contents of the refrigeration system may be released to the flare; however, the quantity of gas in these vessels or systems is less than the assumed maximum gas volume from the 3-phase separator and stabilizer overheads. Additionally, during routine maintenance of the compressor engines, compressor blowdown vapors will be routed to the flare for combustion.

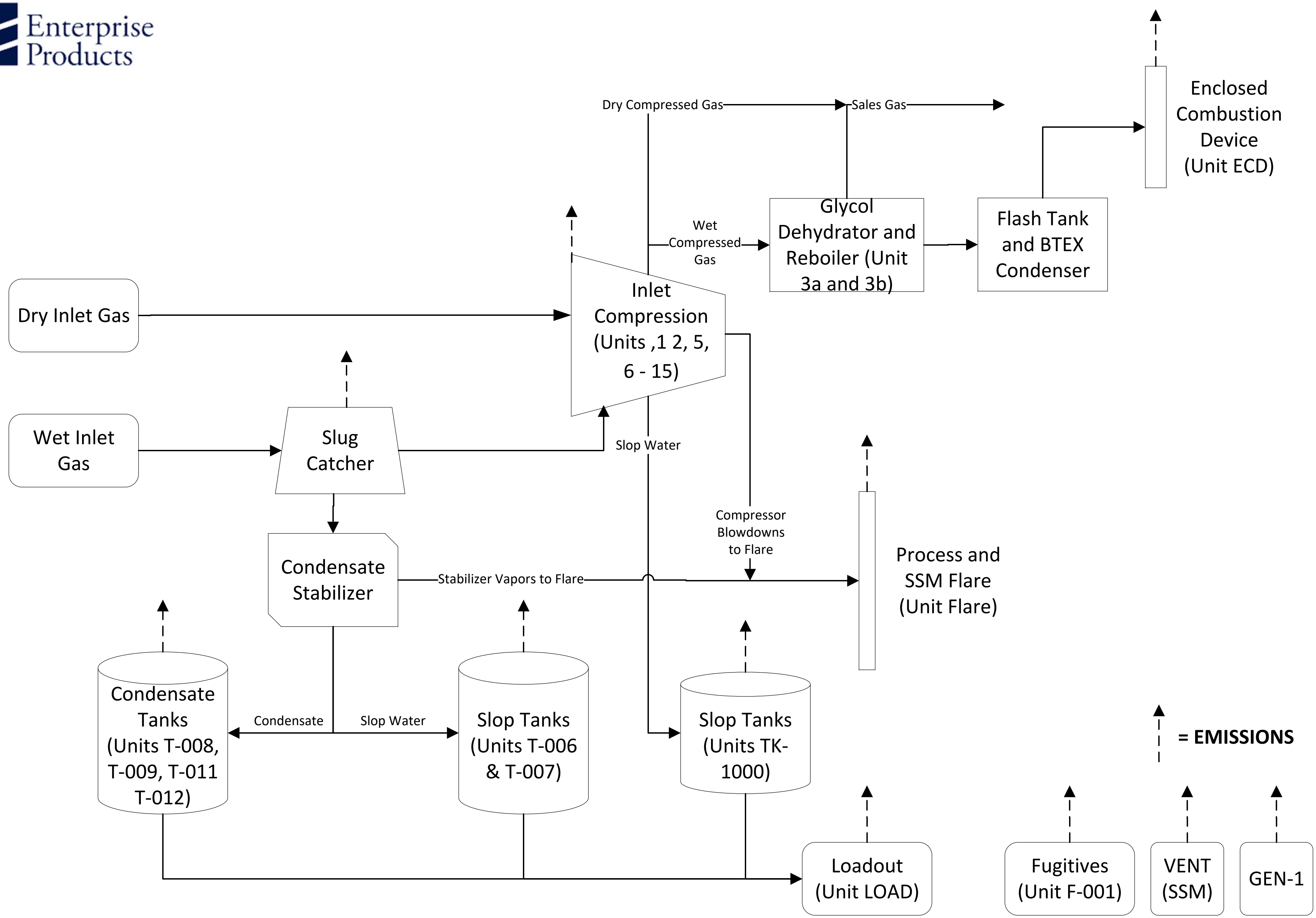
Section 4

Process Flow Sheet

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.

A process flow diagram has been included with this section.

Enterprise Products



Enterprise Field Services, LLC

PROCESS FLOW DIAGRAM

South Carlsbad Compressor Station

Section 5

Plot Plan Drawn to Scale

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.

A plot plan has been included with this section.

L:\Projects\677 (Enterprise Products)\677-1738 (Delaware CS Expansion at SCAR)\CAD\PIPING\SHEETS\30025-PIPL-0036.dwg

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OVERALL PLOT PLAN
SOUTH CARLSBAD COMPRESSOR STATION

Enterprise Products

NO.	REVISION	DRAWN	CHECKED	APPRVD	DATE
0	ISSUED FOR CONSTRUCTION	RS	AD	LS	07/06/23
1	ISSUED FOR CONSTRUCTION	RS	AD	MS	09/14/23
1A	ISSUED FOR REVIEW	HJW	PC	JWB	10/12/23

DRAWING SCALE	1"=30'-0"		
DRAWN BY	RS	03/21/23	
CHECKED BY	AD	04/18/23	
APPROVED BY	MS	04/18/23	
DOCUMENT CONTROL #	30025-PIPL-0036		

ENTERPRISE APPROVED	J. EMBLEN
DATE	
ENTERPRISE PROJECT #	A60532
DRAWING NUMBER	30025-PIPL-0036

Section 6

All Calculations

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) 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.

Solar Centaur T-4702 turbines (Units 1 & 2)

NO_X and CO emission rates were updated using historical stack test results obtained from 2010 to 2016 stack tests with a safety factor. VOC emission rates are reproduced here from previous applications. SO_2 emissions are based on a conservative fuel sulfur content estimated of 5 gr S/100 scf and 100% conversion of elemental sulfur to SO_2. Particulate emission rates ($PM_{2.5}$, PM_{10}, and PM) were updated based on Solar Turbines Inc, Product Information Letter 171, refer to Section 7. Total and individual HAP emissions are calculated using AP-42 Table 3.1-3 emission factors. Greenhouse gas emissions are estimated using emission factors from 40 CFR 98 Subpart C Tables C-1 and C-2.

Solar Centaur 40-4700S (Unit 5)

NO_X, CO, and VOC emission rates were calculated using manufacturer specifications. SO_2 emissions are based on a conservative fuel sulfur content estimated of 5 gr S/100 scf and 100% conversion of elemental sulfur to SO_2. Particulate ($PM_{2.5}$, PM_{10}, and PM) and HAP emissions were calculated using AP-42 Table 3.1-2a and 3.1-3 emission factors. Greenhouse gas emissions are estimated using emission factors from 40 CFR 98 Subpart C Tables C-1 and C-2.

Caterpillar Engines (Units 6, 7, 8, 9, 10, 11, 12 & 13)

NO_X, CO, and VOC emission rates were calculated using manufacturer specifications. SO_2 emissions are based on a conservative fuel sulfur content estimated of 5 gr S/100 scf and 100% conversion of elemental sulfur to SO_2. Particulate ($PM_{2.5}$, PM_{10}, and TSP) and HAP emissions were calculated using AP-42 Table 3.2-2. Greenhouse gas emissions are estimated using emission factors from 40 CFR 98 Subpart C Tables C-1 and C-2.

Glycol Dehydrator and Reboiler (Units 3a & 3b)

Glycol dehydrator emissions were calculated using GRI-GLYCalc and an extended gas analysis. VOC and HAP emissions from the regenerator are controlled with a BTEX condenser. Flash tank emissions are primarily controlled by the ECD or sent to the reboiler to be used as fuel. The BTEX condenser overheads are routed to the ECD where VOC and HAP emissions are combusted and controlled with a 98% efficiency.

Produced Water Slop Tank (Unit TK-1000 & T-007)

Working, breathing, and flash emissions from TK-1000 and T-007 are calculated in this application using a BR&E ProMax simulation.

Stabilized Condensate Storage Tanks (Units T-008, T-009, T-011, & T-012)

Working and breathing emissions from T-008, T-009, T-011, and T-012 are calculated in this application using a BR&E ProMax simulation.

Exempt Storage Tanks (Units T-001 through T-006)

Methanol storage tanks (T-002) and condensate slop oil tank (T-006) are exempt pursuant to 20.2.72.202.B.(5) NMAC. Emissions from T-002 were conservatively estimated based on three (3) anticipated turnovers per year. Emissions from T-006 was calculated with BR&E ProMax using condenser liquid streams from the GRI-GLYCalc process simulation and other relevant calculations. Emission calculations for both units are included in the application for reference. All other storage tanks at South Carlsbad Compressor Station are either exempt because they contain liquids with vapor pressure less than 10 mmHg (T-001, T-004, and T-005) or are not a source of regulated pollutants (T-003).

Condensate Loading Emissions (Unit LOAD & LOAD_SLOP)

ProMax (both LOAD and LOAD_SLOP) and GRI-HAPCalc (Unit LOAD only) were used to perform the loading emissions calculations. Specifically, a RVP11 ProMax simulation was used to determine the stream compositions.

SprialX Enclosed Combustion Device (Unit ECD)

Emission calculations account for the possible presence of H_2S in the fuel gas. Emissions of NO_x, CO, and PM are calculated using AP-42 Tables 1.4-1 & 2 emission factors. Pilot H_2S emissions are calculated based on the conservative estimate of 0.25 g H_2S/100 scf and a 98% combustion efficiency of the ECD. Pilot SO_2 emissions are based on a conservative fuel sulfur content estimate of 5 gr S/100 scf and 100% conversion of elemental sulfur to SO_2. SO_2 emissions were calculated based on a destruction rate efficiency (DRE) of 98%, based on the manufacturer specification sheet, and conversion to SO_2. Emissions of VOC, H_2S, and HAPs are calculated based on the GRI-GLYCalc report for the Controlled Regenerator Emissions after the BTEX condenser and the report for the Flash Gas Emissions with a 98% DRE. For the H_2S, it was assumed 98% was combusted and 100% of the combusted H_2S was converted to SO_2.

Unpaved Haul Road Emissions (Unit HAUL)

These emissions were calculated using Equation 2 of AP-42 Section 13.2.2. Haul road emissions at this facility are exempt pursuant to 20.2.72.202.B(5) NMAC. Emission calculations are included in the application for reference.

Flare (Unit Flare)

Emission calculations were updated to account for the possible presence of H_2S. An H_2S composition of 0.5 mol % was assumed. Emissions of NO_x and CO are calculated using the larger of the AP-42 Table 13.5-1 and TNRCC RG-109 emission factors. Pilot H_2S emissions are calculated based on the conservative estimate of 0.25 g H_2S/100 scf and a 98% combustion efficiency of the flare. Pilot SO_2 emissions are based on a conservative fuel sulfur content estimated of 5 gr S/100 scf and 100% conversion of elemental sulfur to SO_2. SO_2 emissions were calculated assuming 98% combustion efficiency and conversion to SO_2. Emissions of VOCs and HAPs are estimated based on the gas analysis and an assumed 98% combustion efficiency.

During non-routine conditions such as when gas must be released from portions of the facility for maintenance or in the event of an emergency, some VOCs will be directed to the flare. Gas streams 14 and 33 will be directed to the flare in the event of a plant shutdown. Additionally, during an emergency shutdown, pressure vessels or the gas contents of the refrigeration system may be released to the flare; however, the quantity of gas in these vessels or systems is less than the assumed maximum gas volume from streams 14 and 33. Additionally, compressor blowdown vapors will be sent to the flare.

Flare parameters are calculated using a temperature of 1000˚ C and a 20 m/sec velocity (per NMAQB guidelines), and an effective diameter calculated in accordance with the Modeling Guidelines.

Greenhouse gas emissions were estimated using 40 CFR 98 Subpart W calculation methodology.

Turbine Blowdowns (Unit VENT (SSM)) and Compressor Blowdowns (Unit Flare (SSM))

An updated facility fuel gas analysis was used to determine the emissions associated with this unit. From time to time, the pressurized gas in a portion of the facility's system must be vented in order to relieve the pressure. At South Carlsbad Compressor Station, this is primarily done in order to perform maintenance on the compressors (Units 6 through 15) and compressor turbines (Units 1, 2, and 5). This pressure relief is termed "blow down". Blow down at this facility is and will continue to be directed to various vents, including but not limited to pressure relief valves and blowdown vent stacks, aggregated in this application as unit VENT (SSM). Compressor blowdowns will be combusted at the facility flare as unit Flare (SSM)

During routine startup, shutdown, or blow down events, gas from the turbines is diverted to unit VENT. A table of the inlet gas composition (based on the combined gas analysis) and the anticipated number of blow down events per year (conservatively estimated) is included in this section. Venting volume and frequency were estimated based on operating history and engineering knowledge.

Maximum hourly venting emissions were calculated assuming 1 hour per event for a worst-case scenario. Annual venting emissions were calculated using the total volume of gas vented annually based on the estimate of predicted annual events.

Fugitive Emissions (Unit F-001)

Fugitive emission calculations were completed using emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates, 1995. Subcomponent counts for each subcomponent are based on estimated average component counts for each piece of equipment.

Maximum Uncontrolled Emissions																
Equipment	**NO_x**		**CO**		**VOC**		**SO_x**		**PM**		**PM_{10}**		**$PM_{2.5}$**		**H_2S**	
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**
1	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03
2	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03
5	4.43	19.40	5.89	25.78	1.40	6.15	0.56	2.43	0.27	1.16	0.27	1.16	0.27	1.16	2.78E-04	1.22E-03
6	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
7	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
8	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
9	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
10	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
11	1.65	7.24	13.78	60.35	1.49	6.52	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
12	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04
13	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04
14	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04
15	2.71	11.88	26.24	114.95	6.17	27.03	0.38	1.67	0.28	1.21	0.28	1.21	0.28	0.28	1.91E-04	8.35E-04
3a	-	-	-	-	73.65	322.57	-	-	-	-	-	-	-	-	0.041	0.18
3b	0.29	1.29	0.25	1.08	0.016	0.071	0.041	0.18	0.022	0.098	0.022	0.098	0.022	0.098	1.04E-03	4.54E-03
TK-1000	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-
T-007	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-
T-008 T-009 T-011 T-012	-	-	-	-	*	18.85	-	-	-	-	-	-	-	-	-	-
F-001	-	-	-	-	*	58.61	-	-	-	-	-	-	-	-	-	-
LOAD	-	-	-	-	*	9.82	-	-	-	-	-	-	-	-	-	-
ECD	0.010	0.044	8.52E-03	0.037	-	-	6.59E-05	2.89E-04	-	-	-	-	-	-	3.50E-05	1.53E-04
Flare (Process)	15.78	2.81	42.32	15.26	61.88	22.28	0.11	0.46	-	-	-	-	-	-	0.056	0.020
Flare (SSM)	22.46	4.59	60.21	12.30	61.64	8.06	0.16	0.047	-	-	-	-	-	-	1.70E-03	5.11E-04
VENT (SSM)	-	-	-	-	*	29.43	-	-	-	-	-	-	-	-	*	2.13E-03
MALF[1]	38.24	6.00	102.53	10.00	123.52	10.00	0.26	10.00	-	-	-	-	-	-	0.058	2.00
Total	**155.98**	**306.75**	**413.64**	**908.86**	**357.25**	**641.15**	**5.07**	**30.42**	**3.51**	**15.37**	**3.51**	**15.37**	**3.51**	**11.65**	**0.16**	**2.22**

"*" Denotes an hourly emission rate is not appropriate

"-" Indicates emissions of this pollutant are not expected

[1] Flare malfunction hourly emission rates reflect worst case emissions modeled for this unit. These emissions are the maximum allowed for the flare and are not additive with the Process and SSM emissions requested under Unit Flare.

Controlled Emissions																
Equipment	**NO_x**		**CO**		**VOC**		**SO_x**		**PM**		**PM_{10}**		**$PM_{2.5}$**		**H_2S**	
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**
1	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03
2	27.00	90.82	7.40	11.25	0.77	3.37	0.50	2.21	0.55	2.40	0.55	2.40	0.55	2.40	2.52E-04	1.10E-03
5	4.43	19.40	5.89	25.78	1.40	6.15	0.56	2.43	0.27	1.16	0.27	1.16	0.27	1.16	2.78E-04	1.22E-03
6	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
7	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
8	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
9	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
10	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
11	1.65	7.24	3.31	14.48	3.86	16.90	0.24	1.04	0.17	0.75	0.17	0.75	0.17	0.75	1.18E-04	5.18E-04
12	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04
13	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04
14	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04
15	2.73	11.95	5.46	23.90	6.37	27.88	0.38	1.67	0.28	1.21	0.28	1.21	0.28	1.21	1.91E-04	8.35E-04
3a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b	0.29	1.29	0.25	1.08	0.016	0.071	0.041	0.18	0.022	0.098	0.022	0.098	0.022	0.098	1.04E-03	4.54E-03
TK-1000	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-
T-007	-	-	-	-	*	0.67	-	-	-	-	-	-	-	-	-	-
T-008 **T-009** **T-011** **T-012**	-	-	-	-	*	18.85	-	-	-	-	-	-	-	-	-	-
F-001	-	-	-	-	*	58.61	-	-	-	-	-	-	-	-	-	-
LOAD	-	-	-	-	*	9.82	-	-	-	-	-	-	-	-	-	-
ECD	0.15	0.65	0.12	0.54	0.86	3.79	0.067	0.29	0.01	0.046	0.01	0.046	0.01	0.046	7.61E-04	3.33E-03
Flare (Process)	15.78	2.81	42.32	15.26	61.88	22.28	0.11	0.46	-	-	-	-	-	-	0.056	0.020
Flare (SSM)	22.46	4.59	60.21	12.30	61.64	8.06	0.16	0.047	-	-	-	-	-	-	1.70E-03	5.11E-04
VENT (SSM)	-	-	-	-	*	29.43	-	-	-	-	-	-	-	-	*	2.13E-03
MALF[1]	38.24	6.00	102.53	10.00	123.52	10.00	0.26	10.00	-	-	-	-	-	-	0.058	2.00
Total	**156.18**	**307.63**	**267.77**	**269.96**	**299.47**	**388.07**	**5.14**	**30.72**	**3.52**	**15.42**	**3.52**	**15.42**	**3.52**	**15.42**	**0.12**	**2.04**

"*" Denotes an hourly emission rate is not appropriate

"-" Indicates emissions of this pollutant are not expected

[1] Flare malfunction hourly emission rates reflect worst case emissions modeled for this unit. These emissions are the maximum allowed for the flare and are not additive with the Process and SSM emissions requested under Unit Flare.

Controlled HAP and Greenhouse Gas Emissions																	
Equipment	**Total HAPs**		**Formaldehyde**		**Acetaldehyde**		**n-Hexane**		**Benzene**		**Toluene**		**Xylenes**		**Ethylbenzene**		**CO2e**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**tpy**
1	0.035	0.15	0.026	0.11	1.46E-03	6.39E-03	-	-	4.38E-04	1.92E-03	4.74E-03	0.021	2.33E-03	0.010	-	-	18,704.64
2	0.035	0.15	0.026	0.11	1.46E-03	6.39E-03	-	-	4.38E-04	1.92E-03	4.74E-03	0.021	2.33E-03	0.010	-	-	18,704.64
5	0.038	0.17	0.029	0.13	1.61E-03	7.04E-03	-	-	4.82E-04	2.11E-03	5.23E-03	0.023	2.57E-03	0.011	-	-	20,618.14
6	0.29	1.26	0.13	0.56	0.14	0.63	0.019	0.083	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	-	-	8,780.66
7	0.29	1.26	0.13	0.56	0.14	0.63	0.019	0.083	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	-	-	8,780.66
8	0.29	1.26	0.13	0.56	0.14	0.63	0.019	0.083	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	-	-	8,780.66
9	0.29	1.26	0.13	0.56	0.14	0.63	0.019	0.083	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	-	-	8,780.66
10	0.29	1.26	0.13	0.56	0.14	0.63	0.019	0.083	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	-	-	8,780.66
11	0.29	1.26	0.13	0.56	0.14	0.63	0.019	0.083	7.53E-03	0.033	6.98E-03	0.031	3.15E-03	0.014	-	-	8,780.66
12	0.47	2.05	0.209	0.92	0.23	1.01	0.031	0.13	0.012	0.053	0.011	0.048	5.08E-03	0.022	-	-	14,155.93
13	0.47	2.05	0.209	0.92	0.23	1.01	0.031	0.13	0.012	0.053	0.011	0.048	5.08E-03	0.022	-	-	14,155.93
14	0.47	2.05	0.209	0.92	0.23	1.01	0.031	0.13	0.012	0.053	0.011	0.048	5.08E-03	0.022	-	-	14,155.93
15	0.47	2.05	0.209	0.92	0.23	1.01	0.031	0.13	0.012	0.053	0.011	0.048	5.08E-03	0.022	-	-	14,155.93
3a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b	0.022	0.095	1.26E-03	5.50E-03	1.10E-03	4.80E-03	2.10E-03	9.20E-03	1.12E-03	4.90E-03	1.53E-03	6.70E-03	1.99E-03	8.70E-03	3.17E-03	0.014	1,538.65
TK-1000	*	0.097	-	-	-	-	*	7.66E-04	*	0.058	*	0.017	*	1.95E-03	*	5.44E-04	-
T-007	*	0.097	-	-	-	-	*	7.66E-04	*	0.058	*	0.017	*	1.95E-03	*	5.44E-04	-
T-008 **T-009** **T-011** **T-012**	*	0.79	-	-	-	-	*	0.67	*	0.086	*	0.031	*	2.72E-03	*	1.44E-03	-
F-001	*	5.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LOAD	*	0.45	-	-	-	-	*	0.39	*	0.043	*	7.00E-04	*	1.20E-03	*	1.30E-03	-
ECD	0.16	0.70	-	-	-	-	0.018	0.079	0.084	0.37	0.052	0.23	0.052	0.23	-	-	79.22
Flare (Process)	0.79	0.28	-	-	-	-	0.56	0.20	0.075	0.027	0.087	0.031	0.058	0.021	7.50E-03	2.70E-03	5,366.81
Flare (SSM)	0.38	0.11	-	-	-	-	0.38	0.11	-	-	-	-	-	-	-	-	10,390.94
VENT (SSM)	*	0.47	-	-	-	-	*	0.35	*	0.078	*	0.023	*	-	-	-	1,945.06
MALF	-	0.16	-	-	-	-	-	0.12	-	0.026	-	7.61E-03	-	-	-	-	-
Total	**5.06**	**24.72**	**1.68**	**7.35**	**1.79**	**7.83**	**1.20**	**2.97**	**0.26**	**1.17**	**0.24**	**0.80**	**0.16**	**0.47**	**0.011**	**0.020**	**186,655.78**

Unit: 1, 2
Description: Solar Centaur T-4702 NG turbines

Fuel consumption	35.3	Mscf/hr	As permitted
Fuel heat value	1034	Btu/scf	LHV of fuel gas
Heat rate	36.5	MMbtu/hr	Fuel consumption * fuel heat value / 1000
Annual fuel usage	309.0	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	VOC	SO_2 [1]	PM [2]	H_2S [1]		
				0.015		lb/MMBtu	Solar Turbines Inc Product Information Letter 171 Particulates Emission Rate
15.8	1.5					lbs/hr	Unit 1: 2010 Stack Test Report Maximum Recordable Rate
-	-					lbs/hr	Unit 2: 2010 Stack Test Report Maximum Recordable Rate
15.2	0.8					lbs/hr	Unit 1: 2011 Stack Test Report Maximum Recordable Rate
15.4	1.0					lbs/hr	Unit 2: 2011 Stack Test Report Maximum Recordable Rate
16.4	1.2					lbs/hr	Unit 1: 2012 Stack Test Report Maximum Recordable Rate
15.2	1.0					lbs/hr	Unit 2: 2012 Stack Test Report Maximum Recordable Rate
17.57	2.14					lbs/hr	Unit 1: 2014 Stack Test Report Maximum Recordable Rate
18.85	1.87					lbs/hr	Unit 2: 2014 Stack Test Report Maximum Recordable Rate
15.63	1.87					lbs/hr	Unit 1: 2015 Stack Test Report Maximum Recordable Rate
16.62	1.27					lbs/hr	Unit 2: 2015 Stack Test Report Maximum Recordable Rate
7.85	0.90					lbs/hr	Unit 1: 2016 Stack Test Report Maximum Recordable Rate
9.75	1.21					lbs/hr	Unit 2: 2016 Stack Test Report Maximum Recordable Rate
18.9	2.1					lbs/hr	Maximum Recordable Rate
10%	20%						Safety Factor
20.7	**2.6**					lbs/hr	Emission Rate with Safety Factor
27.0	7.4	0.77				lb/hr	As permitted
27.0	**7.4**	**0.77**	**0.50**	**0.55**	**2.5E-04**	lb/hr	Hourly emission rate
90.8	**11.2**	**3.4**	**2.2**	**2.4**	**1.1E-03**	tpy	Annual emission rate (8760 hrs/yr)

Total HAP [3]	HCHO [3]	Acetaldehyde [3]	Benzene [3]	Toluene [3]	Xylenes [3]		
	7.10E-04	4.00E-05	1.20E-05	1.30E-04	6.40E-05	lb/MMbtu	AP-42 Table 3.1-3
0.035	**0.026**	**1.46E-03**	**4.38E-04**	**4.74E-03**	**2.33E-03**	lb/hr	Hourly emission rate
0.15	**0.11**	**6.39E-03**	**1.92E-03**	**0.021**	**0.010**	tpy	Annual emission rate (8760 hrs/yr)

[1] SO_2 emissions based on fuel sulfur content of 5 gr S/100 scf, or 0.00714 lb S/Mscf

lb/hr SO_2 = 5gr S/100scf * Fuel consumption (Mscf/hr) * 1lb/7000gr * 1000scf/Mscf * 64 lb SO_2/32 lb S

H_2S emissions based on 0.25 g/100 scf H_2S in fuel

lb/hr H_2S = 0.25 gr H_2S/100 scf * Fuel consumption (Mscf/hr) * 1000scf/Mscf * 1 lb/7000 gr * (1 - Comb. Eff [98%])

[2] Assumed TSP = PM_{10} = $PM_{2.5}$

[3] HAP emissions calculated using emission factors from AP-42 Table 3.1-3.

GHG Calculations

CO_2 [4]	N_2O [4]	CH_4 [4]	CO_2e [4]		
53.06	0.0001	0.001		kg/MMBtu	40 CFR 98 Subpart C Tables C-1 and C-2
1	298	25		GWP	40 CFR 98 Table A-1
18685.3	0.035	0.35		tpy	
18685.34	**10.5**	**8.8**	**18704.6**	tpy CO_2e	

[4] N_2O, CH_4, and CO_2 tpy Emission Rate= EF* Fuel Usage * Fuel Heat Value * 2.20462 lb/1 kg * 1 ton/2000 lb

CO_2e tpy Emission Rate = CO_2 Emission Rate + N_2O Emission Rate*GWP Factor +CH_4 Emission Rate*GWP Factor

Unit: 5
Description: Solar Centaur 40-4700 NG turbines

Fuel consumption	38.9	Mscf/hr	
Fuel heat value	1034	Btu/scf	LHV of fuel gas
Heat rate	40.2	MMBtu/hr	Fuel consumption * fuel heat value / 1000
Annual fuel usage	340.6	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	VOC	SO_2 [1]	PM[2]	H_2S[1]		
				0.0066	-	lb/MMBtu	AP-42 Table 3.1-2a
0.100	0.122	0.035			-	lb/MMBtu	Hourly Emission Factors
0.100	0.122	0.035			-	lb/MMBtu	Annual emission rate (8760 hrs/yr)
4.03	4.90	1.40	0.56	0.27		lb/hr	
17.64	21.48	6.15	2.43	1.16	-	tpy	
10%	20%						Safety Factor
4.43	**5.89**	**1.40**	**0.56**	**0.27**	**2.78E-04**	**lb/hr**	Emission Rate with Safety Factor
19.40	**25.78**	**6.15**	**2.43**	**1.16**	**1.22E-03**	**tpy**	

Total HAP[3]	HCHO[3]	Acetaldehyde[3]	Benzene[3]	Toluene[3]	Xylenes[3]		
	7.10E-04	4.00E-05	1.20E-05	1.30E-04	6.40E-05	lb/MMBtu	AP-42 Table 3.1-3
0.038	**0.029**	**0.002**	**4.82E-04**	**0.0052**	**0.0026**	lb/hr	Hourly emission rate
0.17	**0.13**	**0.0070**	**0.0021**	**0.023**	**0.011**	tpy	Annual emission rate (8760 hrs/yr)

[1] SO_2 emissions based on fuel sulfur content of 5 gr S/100 scf, or 0.00714 lb S/Mscf

lb/hr SO_2 = 5gr S/100scf * Fuel consumption (Mscf/hr) * 1lb/7000gr * 1000scf/Mscf * 64 lb SO_2/32 lb S

H_2S emissions based on 0.25 g/100 scf H_2S in fuel

lb/hr H_2S = 0.25 gr H_2S/100 scf * Fuel consumption (Mscf/hr) * 1000scf/Mscf * 1 lb/7000 gr * (1 - Comb. Eff [98%])

[2] Assumed TSP = PM_{10} = $PM_{2.5}$

[3] HAP emissions calculated using emission factors from AP-42 Table 3.1-3.

GHG Calculations

CO_2[4]	N_2O[4]	CH_4[4]	CO_2e[4]		
53.06	0.0001	0.001		kg/MMBtu	40 CFR 98 Subpart C Tables C-1 and C-2
1	298	25		GWP	40 CFR 98 Table A-1
20596.9	0.039	0.39		tpy	
20596.866	**11.6**	**9.7**	**20618.1**	tpy CO_2e	

[4] N_2O, CH_4, and CO_2 tpy Emission Rate= EF* Fuel Usage * Fuel Heat Value * 2.20462 lb/1 kg * 1 ton/2000 lb

CO_2e tpy Emission Rate = CO_2 Emission Rate + N_2O Emission Rate*GWP Factor +CH_4 Emission Rate*GWP Factor

Unit(s): 6-11
Description: Six (6) CAT G3608 4-Stroke Lean Burn Compressor Engines

Horsepower	2,500	bhp	
Fuel Consumption Rate	6,848	Btu/hp-hr	
Fuel consumption	16.6	Mscf/hr	
Fuel heat value	1034	Btu/scf	LHV of fuel gas
Annual fuel usage	145.0	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	VOC	SO_2 [1]	PM[3]	H_2S [2]		
				0.0100	-	lb/MMBtu	AP-42 Table 3.2-2
0.300	2.5	0.270	-	-	-	g/bhp-hr	Vendor Emission Factors
1.65	**13.78**	**1.49**	**0.24**	**0.17**	**1.18E-4**	**lb/hr**	Hourly emission rate
7.24	**60.35**	**6.52**	**1.04**	**0.75**	**5.18E-4**	**tpy**	Annual emission rate (8760 hrs/yr)

Total HAP[4]	n-Hexane[4]	HCHO[4]	Acetaldehyde[4]	Benzene[4]	Toluene[4]	Xylenes[4]		
	1.11E-03		8.36E-03	4.40E-04	4.08E-04	1.84E-04	lb/MMBtu	AP-42 Table 3.2-2
-		0.16	-	-	-	-	g/bhp-hr	Vendor Emission Factors
1.04	**0.019**	0.88	**0.14**	**7.53E-03**	**6.98E-03**	**3.15E-3**	lb/hr	Hourly emission rate
4.57	**0.083**	**3.86**	**0.63**	**0.033**	**0.031**	**0.014**	tpy	Annual emission rate (8760 hrs/yr)

Controlled Emissions

NO_x	CO	VOC	SO_2 [1]	PM[3]	H_2S [2]		
				0.0100	-	lb/MMBtu	AP-42 Table 3.2-2
0.300	0.6	0.700	-	-	-	g/bhp-hr	Vendor Emission Factors
1.65	**3.31**	**3.86**	**0.24**	**0.17**	**1.18E-4**	**lb/hr**	Hourly emission rate
7.24	**14.48**	**16.90**	**1.04**	**0.75**	**5.18E-4**	**tpy**	Annual emission rate (8760 hrs/yr)

Total HAP[4]	n-Hexane[4]	HCHO[4]	Acetaldehyde[4]	Benzene[4]	Toluene[4]	Xylenes[4]		
	1.11E-03		8.36E-03	4.40E-04	4.08E-04	1.84E-04	lb/MMBtu	AP-42 Table 3.2-2
-		0.023	-	-	-	-	g/bhp-hr	Vendor Emission Factors
0.29	**0.019**	**0.13**	**0.14**	**7.53E-03**	**6.98E-03**	**3.15E-3**	lb/hr	Hourly emission rate
1.26	**0.083**	**0.56**	**0.63**	**0.033**	**0.031**	**0.014**	tpy	Annual emission rate (8760 hrs/yr)

[1] SO_2 emissions based on fuel sulfur content of 5 gr S/100 scf, or 0.00714 lb S/Mscf

lb/hr SO_2 = 5gr S/100scf * Fuel consumption (Mscf/hr) * 1lb/7000gr * 1000scf/Mscf * 64 lb SO_2/32 lb S

[2] H_2S emissions based on 0.25 g/100 scf H_2S in fuel

lb/hr H_2S = 0.25 gr H_2S/100 scf * Fuel consumption (Mscf/hr) * 1000scf/Mscf * 1 lb/7000 gr * (1 - Comb. Eff [98%])

[3] Assumed TSP = PM_{10} = $PM_{2.5}$

[4] HAP emissions calculated using emission factors from AP-42 Table 3.1-3.

GHG Calculations

CO_2 [4]	N_2O [4]	CH_4 [4]	CO_2e [4]		
53.06	0.0001	0.001		kg/MMBtu	40 CFR 98 Subpart C Tables C-1 and C-2
1	298	25		GWP	40 CFR 98 Table A-1
8,771.60	0.017	0.17	8,771.78	tpy	
8,771.60	**4.93**	**4.13**	**8,780.66**	tpy CO_2e	

[4] N_2O, CH_4, and CO_2 tpy Emission Rate= EF* Fuel Usage * Fuel Heat Value * 2.20462 lb/1 kg * 1 ton/2000 lb

CO_2e tpy Emission Rate = CO_2 Emission Rate + N_2O Emission Rate*GWP Factor +CH_4 Emission Rate*GWP Factor

Unit(s): 12-15
Description: Four (4) CAT G3612 4-Stroke Lean Burn Compressor Engines

Horespower	4,125	bhp	
Fuel Consumption Rate	6,691	Btu/hp-hr	
Fuel consumption	26.7	Mscf/hr	
Fuel heat value	1034	Btu/scf	LHV of fuel gas
Annual fuel usage	233.8	MMscf/yr	8760 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	VOC	SO_2 [1]	PM[3]	H_2S[2]		
				0.0100	-	lb/MMBtu	AP-42 Table 3.2-2
0.40	3.87	0.91	-	-	-	g/bkW-hr	Vendor Emission Factors
0.30	2.89	0.68	-	-	-	g/bhp-hr	Vendor Emission Factors
0.298	2.885863	0.679			-	lb/MMBtu	Annual emission rate (8760 hrs/yr)
2.71	26.24	6.17	--	0.28		lb/hr	
11.88	114.95	27.03	--	1.21	-	tpy	
			0%				Safety Factor
2.71	**26.24**	**6.17**	**0.38**	**0.28**	**1.91E-4**	**lb/hr**	Hourly emission rate
11.88	**114.95**	**27.03**	**1.67**	**1.21**	**8.35E-4**	**tpy**	Annual emission rate (8760 hrs/yr)

Total HAP[4]	n-Hexane[4]	HCHO[4]	Acetaldehyde[4]	Benzene[4]	Toluene[4]	Xylenes[4]		
	1.11E-03		8.36E-03	4.40E-04	4.08E-04	1.84E-04	lb/MMBtu	AP-42 Table 3.2-2
-		0.17	-	-	-	-	g/bkW-hr	Vendor Emission Factors
-		0.13	-	-	-	-	g/bhp-hr	Vendor Emission Factors
1.41	**0.03**	1.15	**0.23**	**0.012**	**0.011**	**0.0051**	lb/hr	Hourly emission rate
6.18	**0.13**	**5.05**	**1.01**	**0.053**	**0.049**	**0.022**	tpy	Annual emission rate (8760 hrs/yr)

Controlled Emissions

NO_x	CO	VOC	SO_2 [1]	PM[3]	H_2S[2]		
				0.0100	-	lb/MMBtu	AP-42 Table 3.2-2
0.3	0.6	0.7	-	-	-	g/bhp-hr	Vendor Emission Factors
2.73	**5.46**	**6.37**	**0.38**	**0.28**	**1.91E-4**	**lb/hr**	Hourly emission rate
11.95	**23.90**	**27.88**	**1.67**	**1.21**	**8.35E-4**	**tpy**	Annual emission rate (8760 hrs/yr)

Total HAP[4]	n-Hexane[4]	HCHO[4]	Acetaldehyde[4]	Benzene[4]	Toluene[4]	Xylenes[4]		
	1.11E-03		8.36E-03	4.40E-04	4.00E-04	1.84E-04	lb/MMBtu	AP-42 Table 3.2-2
-		0.023	-	-	-	-	g/bhp-hr	Vendor Emission Factors
0.47	**0.031**	0.21	**0.23**	**0.012**	**0.011**	**5.08E-03**	lb/hr	Hourly emission rate
2.05	**0.13**	**0.92**	**1.01**	**0.053**	**0.048**	**0.022**	tpy	Annual emission rate (8760 hrs/yr)

[1] SO_2 emissions based on fuel sulfur content of 5 gr S/100 scf, or 0.00714 lb S/Mscf

lb/hr SO_2 = 5gr S/100scf * Fuel consumption (Mscf/hr) * 1lb/7000gr * 1000scf/Mscf * 64 lb SO_2/32 lb S

[2] H_2S emissions based on 0.25 g/100 scf H_2S in fuel

lb/hr H_2S = 0.25 gr H_2S/100 scf * Fuel consumption (Mscf/hr) * 1000scf/Mscf * 1 lb/7000 gr * (1 - Comb. Eff [98%])

[3] Assumed TSP = PM_{10} = $PM_{2.5}$

[4] HAP emissions calculated using emission factors from AP-42 Table 3.1-3.

GHG Calculations

CO_2[4]	N_2O[4]	CH_4[4]	CO_2e[4]		
53.06	0.0001	0.001		kg/MMBtu	40 CFR 98 Subpart C Tables C-1 and C-2
1	298	25		GWP	40 CFR 98 Table A-1
14,141.32	0.03	0.27	14,141.62	tpy	
14,141.32	**7.94**	**6.66**	**14,155.93**	tpy CO_2e	

[4] N_2O, CH_4, and CO_2 tpy Emission Rate= EF* Fuel Usage * Fuel Heat Value * 2.20462 lb/1 kg * 1 ton/2000 lb
CO_2e tpy Emission Rate = CO_2 Emission Rate + N_2O Emission Rate*GWP Factor +CH_4 Emission Rate*GWP Factor

Unit(s):	GEN-1	**(Exempt under 20.2.72.202.B.(3) NMAC)**	
Description:	One (1) CAT G3516A4 4-Stroke Lean Burn Generator Engines		
Operating Hours:	500	hr/yr	
Horespower	1,462	bhp	
Fuel Consumption Rate	7,786	Btu/hp-hr	
Fuel consumption	11.0	Mscf/hr	
Fuel heat value	1034	Btu/scf	Nominal LHV of fuel gas
Annual fuel usage	5.5	MMscf/yr	500 hrs/yr operation

Uncontrolled Emissions

NO_x	CO	VOC	SO_2 [1]	PM[3]	H_2S[2]		
				0.0100	-	lb/MMBtu	AP-42 Table 3.2-2
2.7	2.58	0.31	-	-	-	g/bhp-hr	Vendor Emission Factors
2.680	2.58	0.310			-	lb/MMBtu	Annual emission rate (500 hrs/yr)
8.64	8.32	1.00	--	0.11		lb/hr	
2.16	2.08	0.25	--	0.03	-	tpy	
			0%				Safety Factor
8.64	**8.32**	**1.00**	**0.16**	**0.11**	**7.86E-5**	**lb/hr**	Hourly emission rate
2.16	**2.08**	**0.25**	**0.69**	**0.03**	**3.44E-4**	**tpy**	Annual emission rate (500 hrs/yr)

Total HAP[4]	n-Hexane[4]	HCHO[4]	Acetaldehyde[4]	Benzene[4]	Toluene[4]	Xylenes[4]		
	1.11E-03		8.36E-03	4.40E-04	4.08E-04	1.84E-04	lb/MMBtu	AP-42 Table 3.2-2
-		0.42	-	-	-	-	g/bhp-hr	Vendor Emission Factors
1.46	**0.013**	**1.35**	**0.10**	**5.01E-03**	**4.64E-03**	**2.09E-03**	lb/hr	Hourly emission rate
0.37	**3.16E-3**	**0.34**	**0.024**	**1.25E-03**	**1.16E-03**	**5.24E-04**	tpy	Annual emission rate (8760 hrs/yr)

Controlled Emissions

NO_x	CO	VOC	SO_2 [1]	PM[3]	H_2S[2]		
				0.0100	-	lb/MMBtu	AP-42 Table 3.2-2
2.7	2.58	0.3	-	-	-	g/bhp-hr	Vendor Emission Factors
2.700	2.58	0.310			-	lb/MMBtu	Annual emission rate (8760 hrs/yr)
8.70	**8.32**	**1.00**	**0.16**	**0.11**	**7.86E-05**	**lb/hr**	Hourly emission rate
2.18	**2.08**	**0.25**	**0.69**	**0.03**	**3.44E-04**	**tpy**	Annual emission rate (8760 hrs/yr)

Total HAP[4]	n-Hexane[4]	HCHO[4]	Acetaldehyde[4]	Benzene[4]	Toluene[4]	Xylenes[4]		
	1.11E-03		8.36E-03	4.40E-04	4.08E-04	1.84E-04	lb/MMBtu	AP-42 Table 3.2-2
-		0.42	-	-	-	-	g/bhp-hr	Vendor Emission Factors
1.46	**0.013**	**1.35**	**0.095**	**5.01E-03**	**4.64E-03**	**2.09E-03**	lb/hr	Hourly emission rate
0.37	**3.16E-3**	**0.34**	**0.024**	**1.25E-03**	**1.16E-03**	**5.24E-04**	tpy	Annual emission rate (8760 hrs/yr)

[1] SO_2 emissions based on fuel sulfur content of 5 gr S/100 scf, or 0.00714 lb S/Mscf

lb/hr SO_2 = 5gr S/100scf * Fuel consumption (Mscf/hr) * 1lb/7000gr * 1000scf/Mscf * 64 lb SO_2/32 lb S

[2] H_2S emissions based on 0.25 g/100 scf H_2S in fuel

lb/hr H_2S = 0.25 gr H_2S/100 scf * Fuel consumption (Mscf/hr) * 1000scf/Mscf * 1 lb/7000 gr * (1 - Comb. Eff [98%])

[3] Assumed TSP = PM_{10} = $PM_{2.5}$

[4] HAP emissions calculated using emission factors from AP-42 Table 3.1-3.

GHG Calculations

CO_2[4]	N_2O[4]	CH_4[4]	CO_2e[4]		
53.06	0.0001	0.001		kg/MMBtu	40 CFR 98 Subpart C Tables C-1 and C-2
1	298	25		GWP	40 CFR 98 Table A-1
332.89	6.27E-04	0.006	332.90	tpy	
332.89	**0.19**	**0.16**	**333.24**	tpy CO_2e	

[4] N_2O, CH_4, and CO_2 tpy Emission Rate= EF* Fuel Usage * Fuel Heat Value * 2.20462 lb/1 kg * 1 ton/2000 lb

CO_2e tpy Emission Rate = CO_2 Emission Rate + N_2O Emission Rate*GWP Factor +CH_4 Emission Rate*GWP Factor

Unit: 3a
Description: Gas Tech dehydrator with condenser & BTEX buster
3a Glycol Dehydrator(Still Vent and FlashTank)

Control Equipment: ECD (Unit ECD) to control dehydrator regenerator. ECD and reboiler (Unit 3b) to control flash tank emissions
Manufacturer: Gas Tech

Uncontrolled Emissions - Glycol Dehydrator Venting to Atmosphere

	NO_x	CO	VOC	SO_2	H_2S	PM		
Regenerator-unit 3a	-	-	56.35	-	0.037	-	lb/hr	GRI-GLYCalc (uncontrolled regenerator emissions)
Flash tank-unit 3a	-	-	17.30	-	3.60E-03	-	lb/hr	GRI-GLYCalc (flash tank off gas)
Total	**-**	**-**	**73.65**	**-**	**0.041**	**-**	**lb/hr**	
	-	**-**	**322.57**	**-**	**0.18**	**-**	**tpy**	

n-Hexane	Benzene	Toluene	Xylenes	Total HAPs		
1.14	7.30	8.14	2.53	19.1	lb/hr	GRI-GLYCalc (Regenerator - 3a)
0.21	0.038	0.027	0.0030	0.28	lb/hr	GRI-GLYCalc (Flash tank-3a "off gas")
1.4	**7.3**	**8.2**	**2.5**	**19.4**	**lb/hr**	
5.9	**32.1**	**35.8**	**11.1**	**84.9**	**tpy**	

Controlled Emissions - Glycol Dehydrator

	NO_x	CO	VOC	SO_2[1]	H_2S[1]	PM		
Regenerator-unit 3a	BTEX still vent emissions are sent to the ECD for combustion. Emissions are represented at ECD.						lb/hr	GRI-GLYCalc (uncontrolled regenerator emissions)
Flash tank-unit 3a	Flash tank vapors are sent to the ECD for combustion, or to the Reboiler (Unit 3b) for fuel. Emissions are represented at those units.						lb/hr	GRI-GLYCalc (flash tank off gas)
Total	**-**	**-**	**-**	**-**	**-**	**-**	**lb/hr**	
	-	**-**	**-**	**-**	**-**	**-**	**tpy**	

	n-Hexane	Benzene	Toluene	Xylenes	Total HAPs		
Regenerator-unit 3a	BTEX still vent emissions are sent to the ECD for combustion. Emissions are represented at ECD.					lb/hr	GRI-GLYCalc (Regenerator - 3a)
Flash tank-unit 3a	Flash tank vapors are sent to the ECD for combustion, or to the Reboiler (Unit 3b) for fuel. Emissions are represented at those units.					lb/hr	GRI-GLYCalc (Flash tank-3a "off gas")
Total	**-**	**-**	**-**	**-**	**-**	**lb/hr**	
	-	**-**	**-**	**-**	**-**	**tpy**	

Unit: 3b
Description: Gas Tech dehydrator reboiler
3b 3 MMBtu/hr Glycol Dehydrator Reboiler

Control Equipment: Controls flash tank vapors from dehy (Unit 3a), along with the ECD (Unit ECD)
Manufacturer: Gas Tech

Reboiler Emissions

Reboiler Fuel Usage

Fuel Consumption	3.0	MMBtu/hr	Input heat rate
Throughput	200	MMscf/d	Throughput
Fuel heat value	1034	Btu/scf	Nominal LHV of fuel gas
Hourly fuel usage	2.90	Mscf/hr	Fuel usage
Annual fuel usage	25.42	MMscf/yr	Annual usage
Operating hours	8760	hr/yr	

Flash Tank Usage

	759	scf/hr	GRI-GLYCalc - flash tank off gas stream (Sent to Fuel Inlet)
Flow to Reboiler	100%		Percentage sent to the reboiler (as fuel)
	0.76	Mscf/hr	Total fuel routed to Reboiler (flash tank off gas not combusted by ECD)

	NO_x	CO	VOC	SO_2[1]	H_2S[1]	PM		
Reboiler-unit 3b	100	84	5.5			7.6	lb/MMscf	Unit emission rates from AP-42 Table 1.4-1 & 2 (Assuming average NG
	101.4	85.2	5.6			7.7	lb/MMscf	Adjusted emission factor: EF X (Fuel Heat Value/1,020 Btu/scf)
				0.041	1.04E-03		lb/hr	
Total	**0.29**	**0.25**	**0.016**	**0.041**	**1.04E-03**	**0.022**	**lb/hr**	lb/MMscf * (Mscf/hr / 1000 Mscf/1 MMscf)
	1.29	**1.08**	**0.07**	**0.18**	**4.54E-03**	**0.10**	**tpy**	

	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	HCHO	Acetaldehyde	Total HAPs		
	0.0092	0.0049	0.0067	0.0139	0.0087	0.0055	0.0048	0.0946	tpy	GRI-HAPCalc (Reboiler-3b)
Total	**2.10E-03**	**1.12E-03**	**1.53E-03**	**3.17E-03**	**1.99E-03**	**1.26E-03**	**1.10E-03**	**0.022**	**lb/hr**	
	9.20E-03	**4.90E-03**	**6.70E-03**	**0.014**	**8.70E-03**	**5.50E-03**	**4.80E-03**	**0.095**	**tpy**	

GHG Calculations

CO_2[3]	N_2O[3]	CH_4[3]	CO_2e[3]		
53.06	0.0001	0.001		kg/MMBtu	40 CFR 98 Subpart C Tables C-1 and C-2
1	298	25		GWP	40 CFR 98 Table A-1
1537.07	*0.0029*	*0.029*		tpy	
		19.8			GRI-GLYCalc (flash tank off gas)
		-			GRI-GLYCalc (flash tank off gas, Routed to Fuel)
1537.1	**0.86**	**0.72**	**1538.7**	tpy CO_2e	

[3] N_2O, CH_4, and CO_2 tpy Emission Rate= EF* Fuel Usage * Fuel Heat Value * 2.20462 lb/1 kg * 1 ton/2000 lb
CO_2e tpy Emission Rate = CO_2 Emission Rate + N_2O Emission Rate*GWP Factor +CH_4 Emission Rate*GWP Factor

Exhaust Parameters

Heat Rate:	3000	MBtu/hr	
Exhaust temp (Tstk):	800	°F	
Site Elevation:	3060	ft MSL	
Ambient pressure (Pstk):	26.73	in. Hg	Calculated based on elevation
F factor:	10610	wscf/MMBtu	40 CFR 60 Appx A Method 19
Exhaust flow	530.5	scfm	Calculated from F factor and heat rate
Exhaust flow:	1438.6	acfm	scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R
Stack diameter:	1.33	ft	Engineering estimate
Stack height:	35	ft	Engineering estimate
Exhaust velocity:	17.3	ft/sec	Exhaust flow ÷ stack area

Site Data

Site Elevation	3060	ft MSL	
Standard Pressure	29.92	in Hg	
Pressure at Elevation	26.75	in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard Temperature	528	R	

Slop Water Tank Emissions

Unit: TK-1000
Description: Slop Tank from Compression

Tank Throughput

226	bbl/day	bbl/yr / 365 day/yr
82,381	bbl/yr	Maximum Throughput
3,459,993	gal/yr	bbl/yr * 42 gal/bbl

Promax Emissions Report
Annual Emissions

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Flashing Losses (ton/yr)	Total Losses (ton/yr)[1]
Hydrogen Sulfide	--	--	--	--
Nitrogen	4.50E-6	1.44E-6	0.01	0.01
Carbon Dioxide	0.02	0.01	0.58	0.61
Methane	1.16E-3	3.72E-4	1.03	1.03
Ethane	7.96E-4	2.55E-4	0.62	0.62
Propane	6.92E-5	2.22E-5	0.31	0.31
i-Butane	1.66E-6	5.32E-7	0.03	0.03
n-Butane	4.30E-6	1.38E-6	0.09	0.09
2,2-Dimethylpropane	2.39E-9	7.66E-10	1.50E-4	1.50E-4
i-Pentane	1.64E-7	5.25E-8	0.01	0.01
n-Pentane	2.06E-8	6.59E-9	0.01	0.01
2,2-Dimethylbutane	9.32E-11	2.99E-11	4.09E-5	4.09E-5
Cyclopentane	--	--	--	--
2,3-Dimethylbutane	2.41E-9	7.74E-10	5.66E-4	5.66E-4
2-Methylpentane	2.12E-9	6.80E-10	1.01E-3	1.01E-3
3-Methylpentane	5.41E-9	1.73E-9	1.20E-3	1.20E-3
n-Hexane	5.71E-10	1.83E-10	7.66E-4	7.66E-4
Methylcyclopentane	5.26E-9	1.69E-9	9.57E-4	9.57E-4
Benzene	1.84E-5	5.91E-6	0.06	0.06
Cyclohexane	1.33E-8	4.27E-9	1.49E-3	1.49E-3
2-Methylhexane	3.12E-11	9.99E-12	7.40E-5	7.40E-5
3-Methylhexane	--	--	--	--
2,2,4-Trimethylpentane	2.97E-11	9.52E-12	1.12E-4	1.12E-4
n-Heptane	2.48E-11	7.95E-12	1.56E-4	1.56E-4
Methylcyclohexane	6.88E-10	2.20E-10	3.85E-4	3.85E-4
Toluene	1.16E-6	3.71E-7	0.02	0.02
n-Octane	7.42E-14	2.38E-14	3.98E-6	3.98E-6
Ethylbenzene	1.09E-8	3.50E-9	5.44E-4	5.44E-4
m-Xylene	1.15E-9	3.70E-10	1.00E-4	1.00E-4
p-Xylene	--	--	--	--
o-Xylene	3.80E-8	1.22E-8	1.85E-3	1.85E-3
n-Nonane	2.71E-15	8.67E-16	5.59E-7	5.59E-7
n-Decane	6.01E-18	1.93E-18	1.51E-8	1.51E-8
n-Undecane	--	--	--	--
Saftey Factor	**25%**	**25%**	**25%**	**--**
Total VOC	**1.19E-4**	**3.81E-5**	**0.67**	**0.67**
Total HAP	**2.46E-5**	**7.87E-6**	**0.10**	**0.10**

Venting VOC Emissions

Unit: T-006
Description: Slop Water Tank from 3-Phase Separator and Dehy

Tank Throughput

33	bbl/day	bbl/yr / 365 day/yr
12,000	bbl/yr	Maximum Throughput
504,000	gal/yr	bbl/yr * 42 gal/bbl

Promax Emissions Report
Annual Emissions

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Losses (ton/yr)[1]
Hydrogen Sulfide	3.28692E-05	1.89576E-05	5.18268E-05
Nitrogen	1.10618E-05	6.38002E-06	1.74418E-05
Carbon Dioxide	0.002045151	0.001179563	0.003224714
Methane	0.000521325	0.00030068	0.000822004
Ethane	0.00410824	0.002369471	0.006477712
Propane	0.009757611	0.005627806	0.015385417
i-Butane	0.001901042	0.001096446	0.002997489
n-Butane	0.00583467	0.003365208	0.009199879
2,2-Dimethylpropane	0	0	0
i-Pentane	0.001544366	0.00089073	0.002435096
n-Pentane	0.001627716	0.000938803	0.002566519
2,2-Dimethylbutane	0	0	0
Cyclopentane	0	0	0
2,3-Dimethylbutane	0	0	0
2-Methylpentane	0	0	0
3-Methylpentane	0	0	0
n-Hexane	0.000416481	0.00024021	0.00065669
Methylcyclopentane	0	0	0
Benzene	0.002117181	0.001221107	0.003338287
Cyclohexane	0.000822733	0.00047452	0.001297252
2-Methylhexane	0	0	0
3-Methylhexane	0	0	0
2,2,4-Trimethylpentane	0	0	0
n-Heptane	0.000369694	0.000213225	0.000582919
Methylcyclohexane	0.000511008	0.000294729	0.000805737
Toluene	0.00118465	0.00068326	0.00186791
n-Octane	0.000519775	0.000299786	0.000819561
Ethylbenzene	6.81112E-08	3.92839E-08	1.07395E-07
m-Xylene	0.000140878	8.12527E-05	0.00022213
p-Xylene	0	0	0
o-Xylene	0	0	0
n-Nonane	0	0	0
n-Decane	0	0	0
n-Undecane	0	0	0
Saftey Factor	**100%**	**100%**	**100%**
Total VOC	**0.0535**	**0.0309**	**0.0843**
Total HAP	**7.72E-03**	**4.45E-03**	**1.22E-02**

[1] Emissions are assumed to be 1% condensate.

Venting VOC Emissions

Unit: T-007
Description: Slop Water Tank from 3-Phase Separator and Dehy

Tank Throughput

226	bbl/day	bbl/yr / 365 day/yr
82,381	bbl/yr	Maximum Throughput
3,459,993	gal/yr	bbl/yr * 42 gal/bbl

Promax Emissions Report
Annual Emissions

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Flashing Losses (ton/yr)	Total Losses (ton/yr)[1]
Hydrogen Sulfide	--	--	--	--
Nitrogen	4.50E-6	1.44E-6	0.01	0.01
Carbon Dioxide	0.02	0.01	0.58	0.61
Methane	1.16E-3	3.72E-4	1.03	1.03
Ethane	7.96E-4	2.55E-4	0.62	0.62
Propane	6.92E-5	2.22E-5	0.31	0.31
i-Butane	1.66E-6	5.32E-7	0.03	0.03
n-Butane	4.30E-6	1.38E-6	0.09	0.09
2,2-Dimethylpropane	2.39E-9	7.66E-10	1.50E-4	1.50E-4
i-Pentane	1.64E-7	5.25E-8	0.01	0.01
n-Pentane	2.06E-8	6.59E-9	0.01	0.01
2,2-Dimethylbutane	9.32E-11	2.99E-11	4.09E-5	4.09E-5
Cyclopentane	--	--	--	--
2,3-Dimethylbutane	2.41E-9	7.74E-10	5.66E-4	5.66E-4
2-Methylpentane	2.12E-9	6.80E-10	1.01E-3	1.01E-3
3-Methylpentane	5.41E-9	1.73E-9	1.20E-3	1.20E-3
n-Hexane	5.71E-10	1.83E-10	7.66E-4	7.66E-4
Methylcyclopentane	5.26E-9	1.69E-9	9.57E-4	9.57E-4
Benzene	1.84E-5	5.91E-6	0.06	0.06
Cyclohexane	1.33E-8	4.27E-9	1.49E-3	1.49E-3
2-Methylhexane	3.12E-11	9.99E-12	7.40E-5	7.40E-5
3-Methylhexane	--	--	--	--
2,2,4-Trimethylpentane	2.97E-11	9.52E-12	1.12E-4	1.12E-4
n-Heptane	2.48E-11	7.95E-12	1.56E-4	1.56E-4
Methylcyclohexane	6.88E-10	2.20E-10	3.85E-4	3.85E-4
Toluene	1.16E-6	3.71E-7	0.02	0.02
n-Octane	7.42E-14	2.38E-14	3.98E-6	3.98E-6
Ethylbenzene	1.09E-8	3.50E-9	5.44E-4	5.44E-4
m-Xylene	1.15E-9	3.70E-10	1.00E-4	1.00E-4
p-Xylene	--	--	--	--
o-Xylene	3.80E-8	1.22E-8	1.85E-3	1.85E-3
n-Nonane	2.71E-15	8.67E-16	5.59E-7	5.59E-7
n-Decane	6.01E-18	1.93E-18	1.51E-8	1.51E-8
n-Undecane	--	--	--	--
Saftey Factor	**25%**	**25%**	**25%**	**--**
Total VOC	**1.19E-4**	**3.81E-5**	**0.67**	**0.67**
Total HAP	**2.46E-5**	**7.87E-6**	**0.10**	**0.10**

Venting VOC Emissions

Unit: T-008. 009, T-011, T-012
Description: Stabilized condensate tanks
# of tanks 4
Tank Throughput*
190 bbl/day

Tanks 4.09d Emissions Report
Annual Emissions

	Uncontrolled Emissions per Tank			**Uncontrolled Tank Battery**
Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Losses (ton/yr)	Total Losses (ton/yr)
Hydrogen Sulfide	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon Dioxide	1.16E-11	1.10E-11	2.26E-11	9.04E-11
Methane	1.05E-13	1.00E-13	2.05E-13	8.19E-13
Ethane	7.64E-08	7.28E-08	1.49E-07	5.97E-07
Propane	4.13E-04	3.93E-04	8.06E-04	3.22E-03
i-Butane	2.98E-02	2.84E-02	5.83E-02	2.33E-01
n-Butane	7.27E-01	6.93E-01	1.42E+00	5.68E+00
2,2-Dimethylpropane	1.45E-02	1.39E-02	2.84E-02	1.14E-01
i-Pentane	6.38E-01	6.08E-01	1.25E+00	4.99E+00
n-Pentane	5.78E-01	5.51E-01	1.13E+00	4.51E+00
2,2-Dimethylbutane	5.63E-03	5.37E-03	1.10E-02	4.40E-02
Cyclopentane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylbutane	3.99E-02	3.80E-02	7.80E-02	3.12E-01
2-Methylpentane	9.24E-02	8.80E-02	1.80E-01	7.22E-01
3-Methylpentane	4.87E-02	4.65E-02	9.52E-02	3.81E-01
n-Hexane	8.57E-02	8.17E-02	1.67E-01	6.70E-01
Methylcyclopentane	3.96E-02	3.77E-02	7.73E-02	3.09E-01
Benzene	1.10E-02	1.05E-02	2.15E-02	8.58E-02
Cyclohexane	2.72E-02	2.59E-02	5.32E-02	2.13E-01
2-Methylhexane	7.08E-03	6.75E-03	1.38E-02	5.53E-02
3-Methylhexane	7.97E-03	7.59E-03	1.56E-02	6.22E-02
2,2,4-Trimethylpentane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Heptane	3.02E-02	2.88E-02	5.89E-02	2.36E-01
Methylcyclohexane	1.65E-02	1.58E-02	3.23E-02	1.29E-01
Toluene	3.94E-03	3.76E-03	7.70E-03	3.08E-02
n-Octane	7.97E-03	7.60E-03	1.56E-02	6.23E-02
Ethylbenzene	1.84E-04	1.76E-04	3.60E-04	1.44E-03
m-Xylene	1.71E-04	1.63E-04	3.33E-04	1.33E-03
p-Xylene	1.78E-04	1.70E-04	3.48E-04	1.39E-03
o-Xylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Nonane	7.42E-04	7.07E-04	1.45E-03	5.80E-03
n-Decane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Undecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL VOC	**2.41**	**2.30**	**4.71**	**18.85**
TOTAL HAPs	**0.101**	**0.096**	**0.20**	**0.79**

* Facility throughout will be 190 bbl/day. Each tank has the potential to route entire facility throughput through a give tank however actual throughput will likely be much lower.

Venting SSM Emissions

Unit: VENT (SSM)
Description: Emission rates from venting during startup, shutdown, and blowdown operation

Volume Vented Calculations

	Venting Unit	Volume (Mscf)	Events/yr	Gas Stream	Volume Vented (Mscf/yr)	
	1	13.27	120	Inlet	1591.84	
	2	8	120	Inlet	901.21	
	5	18.68	120	Inlet	2241.11	
Totals			**360**		**4734.15**	
Total (hrs)			360			Assumes 1 hour per event

Source: 4/8/2022 Inlet Sample Analysis

Component	MW	Wet vol/mol%	Dry vol/mol%	MW * dry vol %	Mass Fraction (dry)	Spec. Volume ft^3/lb	Spec. Volume VOC ft^3/lb
Water	18.02	0.000%				21.06	
Nitrogen	28.01	1.23%	1.23%	0.345	1.63%	13.55	
CO_2	44.01	0.21%	0.21%	0.094	0.45%	8.62	
H_2S	34.08	0.001%	0.001%	0.034%	0.0016%	11.14	
Methane	16.04	77.6%	77.63%	12.455	58.88%	23.65	
Ethane	30.07	11.8%	11.78%	3.541	16.74%	12.62	
Propane	44.10	5.6%	5.65%	2.491	11.78%	8.61	4.545
i-Butane	58.12	0.75%	0.75%	0.433	2.05%	6.53	0.599
n-Butane	58.12	1.7%	1.72%	0.997	4.71%	6.53	1.380
2,2 Dimethylpropane	72.15	0.012%	0.01%	0.009	0.04%	5.30	0.010
i-Pentane	72.15	0.35%	0.35%	0.253	1.20%	5.26	0.282
n-Pentane	72.15	0.36%	0.36%	0.258	1.22%	5.26	0.287
2,2 Dimethylbutane	86.18	0.0050%	0.01%	0.004	0.02%	5.26	0.005
Cyclopentane	70.14	0.00%	0.00%	0.000	0.00%	5.41	0.000
2,3 Dimethylbutane	86.18	0.026%	0.03%	0.022	0.11%	4.40	0.021
2 Methylpentane	86.18	0.061%	0.06%	0.053	0.25%	4.40	0.049
3 Methylpentane	86.18	0.031%	0.03%	0.027	0.13%	4.40	0.025
n-Hexane	86.18	0.07%	0.07%	0.056	0.26%	4.40	0.052
Methylcyclopentane	84.16	0.031%	0.03%	0.026	0.12%	4.51	0.025
Cyclohexane	84.16	0.034%	0.03%	0.029	0.14%	3.79	0.023
2-Methylhexane	100.20	0.004%	0.00%	0.004	0.02%	3.79	0.003
3-Methylhexane	100.20	0.005%	0.01%	0.005	0.02%	3.79	0.004
n-Heptanes	100.20	0.018%	0.02%	0.018	0.09%	3.79	0.014
Other Heptanes	100.20	0.00%	0.00%	0.000	0.00%	3.79	0.000
Methylcyclohexane	98.19	0.013%	0.01%	0.013	0.06%	3.87	0.010
2,2,4-Trimethylpentane	114.23	0.00%	0.00%	0.003	0.02%	3.32	0.002
Benzene	78.11	0.016%	0.02%	0.012	0.06%	4.86	0.013
Toluene	92.14	0.004%	0.00%	0.004	0.02%	4.12	0.003
Ethylbenzene	106.17	0.00000%	0.00%	0.000	0.00%	3.57	0.000
Xylenes	106.17	0.0000%	0.00%	0.000	0.00%	3.57	0.000
C8+ heavies	114.23	0.0000%	0.00%	0.000	0.00%	3.32	0.000
Total		100.0%	100.0%	21.15	100%		7.355
Dry total		100.0%		*(mixture mol. wt)*			
NMEHC (VOC)		9.15%					22.30%
Mixture heating value		1241	BTU/scf				

Note: Composition is based on a Fesco Gas Analysis from April 8, 2022

Venting SSM Emissions

Unit: VENT (SSM)
Description: Emission rates from venting during startup, shutdown, and blowdown operation

Emission Calculations

Inlet Gas 1.0 Mcf/hr Engineering estimate

VOC	H_2S		
9.15%	0.0010%	mol%	VOC content from gas analysis; H2S content based on maximum possible (
7.4	11.136	ft^3/lb	Specific volume from gas analysis, calculated above
12.4	0.00090	lb/hr	vol. gas * mole fraction / specific volume
12.4	0.00090	lb/Mcf	lb/hr / Mcf/hr

Total Blowdown Emissions
These calculations estimate the total emission rate per blowdown event, based on duration and volume of gas

Vent

4734.15	Mcf/yr total vented
0%	Safety Factor
4734.15	with SF
13.27	Max Mcf/event
0%	Safety Factor
13.27	with SF

	VOC	H_2S		
Inlet Gas	12.4	0.00090	lb/Mcf vented	
	164.9	0.012	lb/Max event	Max Mcf/event * lb/Mcf
	164.9	0.012	lb/hr	lb/Max event / 1 hr/event Hourly emission rate shown for infor
	29.4	**0.00**	tpy vented	(Mcf/yr * lb/Mcf) / 2000 lb/ton

HAP	VOC content	Specific Volume	lb/Mcf[1]	tpy[2]
n-Hexane	0.07%	4.40	0.15	0.35
2,2,4-TMP	0%	3.32	9.03E-03	0.02
Benzene	0.016%	4.86	0.033	0.08
Toluene	0.004%	4.12	9.711E-03	0.02
Ethylbenzene	0.00000%	3.57	-	-
Xylenes	0.0000%	3.57	-	-
Total HAPs				**0.47**

[1] (Vol. gas * mole fraction / specific volume) / Mcf/hr
[2] (Mcf/yr * lb/Mcf) / 2000 lb/ton

GHG Calculations

CO_2	CH_4	CO_2e		
0.6	77.8		tpy	Mscf/yr * 1000scf/yr * density * 1.1023tons/MT * 1MT/1000k(
1	25		GWP	40 CFR 98 Table A-1
0.59	**1,944.47**	**1,945.1**	tpy CO_2e	

Compressor Blowdowns (SSM) Emissions

Unit: Flare (SSM)
Description: Compressor Blowdown Emissions sent to Flare (SSM)

Volume Vented Calculations

	Venting Unit	Volume (Mscf/event)	Events/yr	Gas Stream	Volume Vented (Mscf/yr)	
	6	9.48	60	Inlet	568.80	Assumed equivalent to new compressor blowdowns
	7	9.48	60	Inlet	568.80	Assumed equivalent to new compressor blowdowns
	8	9.48	60	Inlet	568.80	Assumed equivalent to new compressor blowdowns
	9	9.48	60	Inlet	568.80	Assumed equivalent to new compressor blowdowns
	10	9.48	60	Inlet	568.80	Assumed equivalent to new compressor blowdowns
	11	9.48	60	Inlet	568.80	Assumed equivalent to new compressor blowdowns
	12	9.48	60	Inlet	568.80	5 events/month/unit
	13	9.48	60	Inlet	568.80	5 events/month/unit
	14	9.48	60	Inlet	568.80	5 events/month/unit
	15	9.48	60	Inlet	568.80	5 events/month/unit
Totals			**600**		**5688.00**	
Total (hrs)		*94.80*	600			Assumes 1 hour per event

Source: 4/8/2022 Inlet Sample Analysis

Component	MW	Wet vol/mol%	Dry vol/mol%	MW * dry vol %	Mass Fraction (dry)	Spec. Volume ft^3/lb	Spec. Volume VOC ft^3/lb
Water	18.02	0.000%				21.06	
Nitrogen	28.01	1.231%	1.23%	0.345	1.63%	13.547	
CO_2	44.01	0.214%	0.21%	0.094	0.45%	8.623	
H_2S*	34.08	0.001%	0.00%	0.03%	0.00%	11.136	
Methane	16.04	77.628%	77.63%	12.455	58.88%	23.65	
Ethane	30.07	11.775%	11.78%	3.541	16.74%	12.62	
Propane	44.10	5.649%	5.65%	2.491	11.78%	8.606	4.545
i-Butane	58.12	0.745%	0.75%	0.433	2.05%	6.529	0.599
n-Butane	58.12	1.715%	1.72%	0.997	4.71%	6.529	1.380
2,2 Dimethylpropane	72.15	0.012%	0.01%	0.009	0.04%	5.302	0.010
i-Pentane	72.15	0.351%	0.35%	0.253	1.20%	5.26	0.282
n-Pentane	72.15	0.357%	0.36%	0.258	1.22%	5.26	0.287
2,2 Dimethylbutane	86.18	0.005%	0.01%	0.004	0.02%	5.26	0.005
Cyclopentane	70.14	0.000%	0.00%	0.000	0.00%	5.411	0.000
2,3 Dimethylbutane	86.18	0.026%	0.03%	0.022	0.11%	4.404	0.021
2 Methylpentane	86.18	0.061%	0.06%	0.053	0.25%	4.404	0.049
3 Methylpentane	86.18	0.031%	0.03%	0.027	0.13%	4.404	0.025
n-Hexane	86.18	0.065%	0.07%	0.056	0.26%	4.404	0.052
Methylcyclopentane	84.16	0.031%	0.03%	0.026	0.12%	4.509	0.025
Cyclohexane	84.16	0.034%	0.03%	0.029	0.14%	3.787	0.023
2-Methylhexane	100.20	0.004%	0.00%	0.004	0.02%	3.787	0.003
3-Methylhexane	100.20	0.005%	0.01%	0.005	0.02%	3.787	0.004
n-Heptanes	100.20	0.018%	0.02%	0.018	0.09%	3.787	0.014
Other Heptanes	100.20	0.000%	0.00%	0.000	0.00%	3.787	0.000
Methylcyclohexane	98.19	0.013%	0.01%	0.013	0.06%	3.865	0.010
2,2,4-Trimethylpentane	114.23	0.003%	0.00%	0.003	0.02%	3.322	0.002
Benzene	78.11	0.016%	0.02%	0.012	0.06%	4.858	0.013
Toluene	92.14	0.004%	0.00%	0.004	0.02%	4.119	0.003
Ethylbenzene	106.17	0.000%	0.00%	0.000	0.00%	3.574	0.000
Xylenes	106.17	0.000%	0.00%	0.000	0.00%	3.574	0.000
C8+ heavies	114.23	0.000%	0.00%	0.000	0.00%	3.322	0.000
Total		100.0%	100.0%	21.15	100%		7.355
Dry total		100.0%		*(mixture mol. wt)*			
NMEHC (VOC)		9.15%					22.30%
Mixture heating value		1292	BTU/scf				

Note: Composition is based on a Fesco Gas Analysis from April 8, 2022

Compressor Blowdowns (SSM) Emissions

Unit: Flare (SSM)
Description: Compressor Blowdown Emissions sent to Flare (SSM)

Emission Calculations

Inlet Gas 9.5 Mcf/hr-compressor Based on calculated compressor blowdowns

VOC	**H_2S**		
9.15%	0.0010%	mol%	VOC content from gas analysis; H2S content based on maximum possible estimated inlet concentration
7.4	11.136	ft^3/lb	Specific volume from gas analysis, calculated above
117.9	**8.51E-03**	lb/hr[1]	vol. gas * mole fraction / specific volume

HAP	**VOC content**	**Specific Volume**	**lb/hr[1]**
n-Hexane	0.07%	4.40	1.40
2,2,4-TMP	0%	3.32	0.09
Benzene	0.016%	4.86	0.31
Toluene	0.004%	4.12	0.09
Ethylbenzene	0.00000%	3.57	-
Xylenes	0.0000%	3.57	-
Total HAPs			**1.89**

[1] lb/hr-comp = Vol. gas (Mcf/hr-comp) * (1000 cf/Mcf) * mole fraction / specific volume (ft^3/lb)

Total Uncontrolled Blowdown Emissions

These calculations estimate the total uncontrolled emission rate per blowdown event, based on duration and volume of gas. Compressor blowdowns are routed to the flare for combustion.

10		Worst Case Simultaneous Blowdowns
600	events/year	Annual number of blowdowns for all compressors
1	hr/event	Assumed duration per event
600	hr/yr	Annual Total Blowdown Hours

VOC	H_2S	HAP	
117.9	0.00851	1.89	lb/hr-comp
1178.77	**0.085**	**18.89**	lb/hr (worst case) = lb/hr-comp * # comp.
353.63	**0.026**	**5.67**	tpy (worst case) = lb/hr * annual total blowdown hours (hr/yr)

Unit: Flare (Process)
Description: Combustion of vapors from condensate stabilizer - alternative operating scenario

Pilot Emissions

MW of fuel gas	16.04	lb/lb-mol	Estimated, nominal for natural gas
Pilot fuel flow	100	scf/hr	Engineering estimate
Fuel heating value	1034	Btu/scf	Estimated, nominal for LHV natural gas
Heat rate	0.10	MMBtu/hr	Btu/scf * scf/hr / 1,000,000
Annual fuel usage	0.88	MMscf/yr	scf/hr * 8760 hrs/yr / 1,000,000

Pilot Emission Calculations

NOx	CO	VOC[1]	H_2S[2]	SO_2[3]	HAPs[1]		
0.068	0.37					lb/MMBtu	AP-42 Tables 13.5-1 & 13.5-2 (02/18)
0.138	0.2755					lb/MMBtu	TNRCC RG-109 High Btu ("Other")
			3.57E-05			lb H_2S/hr	Sweet natural gas fuel, 0.25 gr H_2S/100scf
				0.0014		lb SO_2/hr	Sweet natural gas fuel, 5 gr S/100scf
			7.1E-07	6.6E-05		lb/hr	98% combustion H_2S; 100% H_2S -> SO_2
0.0143	**0.038**	**-**	**7.1E-07**	**0.0015**	**-**	lb/hr	
0.0156	**0.042**	**-**	**7.8E-07**	**0.0016**	**-**	tpy	lb/hr * (2190 hr/yr operation)/ 2000 lb/ton
0.062	0.168	-	3.1E-06	0.0065	-	tpy	lb/hr * (8760 hr/yr operation)/ 2000 lb/ton

[1] Fuel is purchased natural gas, comprised mainly of methane. VOC and HAP emissions from pilot only are assumed to be negligible.
[2] H_2S emissions based on 0.25 g/100 scf H_2S in fuel, 98% combustion.
0.25 gr H_2S/100 scf * fuel scf/hr * 1 lb/7000 gr = lb/hr H_2S (prior to combustion and conversion to SO_2)
[3] SO_2 emissions based on sulfur content of 5 g/100 scf S in fuel and 100% combustion of H_2S to SO_2.
5 gr S/100 scf * fuel scf/hr * 1 lb/7000 gr * 64 lb SO_2/32 lb S = lb/hr SO_2

Source: Armstron Gas Lab Analysis No. 211306

Component	MW	vol/mol % Gas Analysis	Dry vol/mol%	MW * dry vol %	Spec. Volume (scf/lb)	Flow (scf/hr)	Loading (lb/hr)	Annual Flow (scf/yr)	Annual Loading (lb/yr)
Water	18.02	0.000%							
Nitrogen	28.01	0.412%	0.414%	0.116	13.547	259	19.102	186,314.1	13,753.2
CO2	44.01	1.020%	1.025%	0.451	8.623	641	74.298	461,284.7	53,494.7
H2S	34.08	0.050%	0.050%	0.017	11.136	31	2.821	22,616.4	2,030.9
Methane	16.04	45.293%	45.527%	7.304	23.65	28455	1203.152	20,487,273.4	866,269.5
Ethane	30.07	15.926%	16.008%	4.814	12.62	10005	792.795	7,203,649.3	570,812.2
Propane	44.10	22.771%	22.889%	10.093	8.606	14305	1662.258	10,299,883.7	1,196,825.9
i-Butane	58.12	4.100%	4.121%	2.395	6.529	2576	394.501	1,854,502.0	284,040.7
n-Butane	58.12	7.034%	7.071%	4.110	6.529	4419	676.846	3,181,769.7	487,328.8
i-Pentane	72.15	1.333%	1.340%	0.967	5.26	838	159.256	603,134.9	114,664.4
n-Pentane	72.15	1.120%	1.126%	0.812	5.26	703	133.745	506,517.5	96,296.1
Cyclopentane	70.14	0.000%	0.000%	0.000	5.411	0	0.000	0.0	0.0
n-Hexane	86.18	0.196%	0.197%	0.170	4.404	123	**28.006**	88,804.9	**20,164.6**
Cyclohexane	84.16	0.000%	0.000%	0.000	4.509	0	0.000	0.0	0.0
Other Hexanes	84.16	0.000%	0.000%	0.000	4.509	0	0.000	0.0	0.0
Heptanes	100.20	0.059%	0.059%	0.059	3.787	37	9.794	26,705.8	7,052.0
Methylcyclohexane	98.19	0.000%	0.000%	0.000	3.865	0	0.000	0.0	0.0
2,2,4-Trimethylpentane	114.23	0.000%	0.000%	0.000	3.322	0	**0.000**	0.0	**0.0**
Benzene	78.11	0.029%	0.029%	0.023	4.858	18	**3.772**	13,192.0	**2,715.5**
Toluene	92.14	0.028%	0.029%	0.026	4.119	18	**4.340**	12,870.3	**3,124.6**
Ethylbenzene	106.17	0.002%	0.002%	0.002	3.574	1	**0.375**	965.3	**270.1**
Xylenes	106.17	0.016%	0.016%	0.017	3.574	10	**2.876**	7,400.4	**2,070.6**
C8+ heavies	114.23	0.095%	0.096%	0.109	3.322	60	18.026	43,115.4	12,978.8
Total		99.5%	100.0%	20.83		62500	5186.0	45,000,000.0	2,227,532.2
Dry total		99.5%							

*Note: * Although the RVP 11 gas simulation did not account and H_2S it was determined that a 0.05% wet/mol % will be used to overcome gas composition fluctuations.*

Uncontrolled VOC Emissions	**36.98%**	**3,093.8**	**lb/hr**	**2,227,532.2**	**lb/yr**
Uncontrolled HAP Emissions		**39.4**	**lb/hr**	**28,345.4**	**lb/yr**

Gas to Flare	62,500	scf/hr	maximum expected flow of 1.5MMscf/day; assumed 24 hour operation
	45,000,000	scf/yr	maximum expected annual flow
	1,828.35	Btu/scf	
	114.27	MMbtu/hr	
	82,275.84	Mmbtu/yr	
	20.83	MW	
Pilot Gas to Flare	100.00	scf/hr	
	16.04	MW	
Totals all streams	62,600.00	scf/hr	
	20.82	MW	volume-weighted average

	NOx	CO	VOC	H_2S	SO_2	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	HAPs		
	0.0680	0.3700										lb/MMBtu	AP-42 Table 13.5-1
	0.138	0.2755										lb/MMBtu	TNRCC RG-109 High Btu ("Other")
					0.10							lb/hr	98% combustion H_2S; 100% H_2S -> SO_2
Gas to Flare Stack	**15.8**	**42.3**										**lb/hr**	lb/MMBtu * MMBtu/hr
			61.9	**0.056**	**0.10**	**0.56**	**0.075**	**0.087**	**0.008**	**0.058**	**0.79**	**lb/hr**	98% destruction of calculated content
Gas to Flare Stack - annual emissions	**2.8**	**15.2**		**-**	**-**							**tpy**	lb/MMBtu * MMBtu/yr/2000
			22.3	**0.020**	**0.46**	**0.20**	**0.027**	**0.031**	**0.003**	**0.021**	**0.28**	**tpy**	98% destruction of calculated content

Flare Emission Totals (Pilot + Inlet Gases)

NOx	CO	VOC	H_2S	SO_2	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	HAPs	
15.8	**42.3**	**61.9**	**5.6E-02**	**1.1E-01**	**0.56**	**0.075**	**0.087**	**0.0075**	**0.058**	**0.79**	**lb/hr**
2.8	**15.3**	**22.3**	**2.0E-02**	**4.6E-01**	**0.20**	**0.027**	**0.031**	**0.0027**	**0.021**	**0.28**	**tpy**

Stack Parameters

1000	°C	Exhaust temperature	Per NMAQB guidelines
20	m/sec	Exhaust velocity	Per NMAQB guidelines
65	ft	Flare height	Engineering design

Pilot only

7,238	cal/sec	Heat release (q)	MMBtu/hr * 10^6 * 252 cal/Btu ÷ 3600 sec/hr
5,847		q_n	$q_n = q(1\text{-}0.048(MW)^{1/2})$
0.08	m	Effective stack diameter (D)	$D = (10^{-6} q_n)^{1/2}$

Pilot and Normal Operation

114.4	MMBtu/hr	Total heat input	Sum of fuel and flare gas heating values
20.82	g/mol	Total mean MW	Volume weighted average of gas MWs
8,006,278	cal/sec	Heat release (q)	MMBtu/hr * 10^6 * 252 cal/Btu ÷ 3600 sec/hr
6,252,653		q_n	$q_n = q(1\text{-}0.048(MW)^{1/2})$
2.501	m	Effective stack diameter (D)	$D = (10^{-6} q_n)^{1/2}$
8.20	ft	Effective stack diameter (D)	

Flare GHG Emissions

§98.233(n) Flare stack GHG emissions.

flared Amine vent gas & Assist Gas

Step 1. Calculate contribution of un-combusted CH_4 emissions

$E_{a,CH4}$ (un-combusted) = V_a * (1- η)* X_{CH4} *(Equation W-39B)*

where:

$E_{a,CH4}$ = contribution of annual un-combusted CH_4 emissions from regenerator in cubic feet under actual conditions.

V_a = volume of gas sent to combustion unit during the year (cf)

η = Fraction of gas combusted by a burning flare (or regenerator), default value from Subpart W = 0.98

For gas sent to an unlit flare, η is zero.

	Client Analysis	Pilot NG Composition
X_{CH4} = Mole fraction of CH_4 in gas to the flare =	0.452929	0.9500

Step 2. Calculate contribution of un-combusted CO_2 emissions

$E_{a,CO2}$ = V_a * X_{CO2} *(Equation W-20)*

where:

$E_{a,CO2}$ = contribution of annual un-combusted CO_2 emissions from regenerator in cubic feet under actual conditions.

	Client Analysis	Pilot NG Composition
V_a = volume of gas sent to combustion unit during the year (cf)		
X_{CO2} = Mole fraction of CO_2 in gas to the flare =	0.010198	0.005

Step 3. Calculate contribution of combusted CO_2 emissions

$E_{a,CO2}$ (combusted) = Σ (η * V_a * Y_j * R_j) *(Equation W-21)*

where:

η = Fraction of gas combusted by a burning flare (or regenerator) = 0.98

For gas sent to an unlit flare, η is zero.

V_a = volume of gas sent to combustion unit during the year (cf)

Y_j = mole fraction of gas hydrocarbon constituents j:	Client Analysis	Pilot NG Composition
Constituent j, Methane =	0.452929	0.9500
Constituent j, Ethane =	0.159257	0.0320
Constituent j, Propane =	0.227708	0.0020
Constituent j, Butane =	0.111341	0.00060
Constituent j, Pentanes Plus =	0.028800006	0.015

R_j = number of carbon atoms in the gas hydrocarbon constituent j:	
Constituent j, Methane =	1
Constituent j, Ethane =	2
Constituent j, Propane =	3
Constituent j, Butane =	4
Constituent j, Pentanes Plus =	5

Step 4. Calculate GHG volumetric emissions at standard conditions (scf).

$$E_{s,n} = \frac{E_{a,n} * (459.67 + T_s) * P_a}{(459.67 + T_a) * P_s}$$ *(Equation W-33)*

where:

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

$E_{a,n}$ = GHG i volumetric emissions at actual conditions (cf)

T_s = Temperature at standard conditions (F) = 60 F

T_a = Temperature at actual conditions (F) = 76 F (Based on Annual Avg Max Temperature for Hobbs, NM from Western Regional Climate Center)

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

P_a = Absolute pressure at actual conditions (psia) = 14.7 psia (Assumption)

Constant = 459.67 (temperature conversion from F to R)

Step 5. Calculate annual CH_4 and CO_2 mass emissions (ton).

$Mass_{s,i}$ = $E_{s,i}$ * ρ_i * 0.0011023 *(Equation W-36)*

where:

$Mass_{s,i}$ = GHG i (CO_2, CH_4, or N_2O) mass emissions at standard conditions in tons (tpy)

$E_{s,i}$ = GHG i (CO_2, CH_4, or N_2O) volumetric emissions at standard conditions (cf)

ρ_i = Density of GHG i. Use:

CH_4: 0.0192 kg/ft^3 (at 60F and 14.7 psia)

CO_2: 0.0526 kg/ft^3 (at 60F and 14.7 psia)

Step 6. Calculate annual N_2O emissions from portable or stationary fuel combustion sources under actual conditions (cf) using Equation W-40

$Mass_{N2O}$ = 0.0011023 * Fuel * HHV * EF *(Equation W-40)*

where:

$Mass_{N2O}$ = annual N_2O emissions from combustion of a particular type of fuel (tons).

Fuel = mass or volume of the fuel combusted

HHV = high heat value of the fuel

Pilot Gas = 1.034E-03 MMBtu/scf

Inlet Gas = 1.828E-03 MMBtu/scf

EF = 1.00E-04 kg N_2O/MMBtu

10^{-3} = conversion factor from kg to metric tons.

Step 7. Calculate total annual emission from flare by summing Equations W-40, W-19, W-20, and W-21

Gas Sent to Flare	Gas Sent to Flare (cf/yr)	CH_4 Un-Combusted, $E_{a,CH4}$ (cf)	CO_2 Un-Combusted, $E_{a,CO2}$ (cf)	CO_2 Combusted, $E_{a,CO2}$ (cf)	CH_4 Un-Combusted, $E_{a,CH4}$ (scf)	CO_2 Un-Combusted, $E_{a,CO2}$ (scf)	CO_2 Combusted, $E_{a,CO2}$ (scf)	CH_4 Un-Combusted, $E_{a,CH4}$ (tpy)	CO_2 Un-Combusted, $E_{a,CO2}$ (tpy)	CO_2 Combusted, $E_{a,CO2}$ (tpy)	N_2O Mass Emissions (tpy)	CO2e (tpy)
Inlet Gas	45,000,000	407,636.1	458,910.0	90,137,358.4	395,239.0	444,953.6	87,396,087.5	8.4	25.8	5,067.3	0.0091	5,304.9
Pilot Gas	876,000	16,644.0	4,380.0	943,812.9	16,137.8	4,246.8	915,109.5	0.34	0.25	53.1	0.0001	61.9
							Total	**8.7**	**26.0**	**5,120.4**	**0.0092**	**5,366.8**

	CO_2	CH_4	N_2O
GWP	1	25	298

Flare SSM Emissions

Unit: Flare (SSM)
Description: Flare controlling blowdown and emergency emissions from the facility

Flaring Excess Gas When Plant is Down

Stream 11	26274.78	scf/hr		85320	scf/hr
	2163.24	Btu/scf	**Compressor**	1241.00	Btu/scf
	56.84	MMbtu/hr	**Blowdowns**	105.88	MMbtu/hr
	37.87	lb/lbmol		21.16	lb/lbmol

Totals all streams	111594.78	scf/hr	
	25.10	MW	volume-weighted average

	NOx	**CO**	**VOC**	**H_2S**	**SO_2**	**HAPs**	**PM**	**Units**	
	0.068	0.37						lb/MMBtu	AP-42 Tables 13.5-1 & 13.5-2
	0.138	0.2755						lb/MMBtu	TNRCC RG-109 High Btu ("Other")
				-				% H2S	Max est. concentration from inlet
Stream 11	7.84	21.03	-	-	-	-	-	lb/hr	lb/MMBtu * MMBtu/hr
	-	-	38.07	-	-	3.98E-03	-	lb/hr	98% destruction of calculated content
	7.84	21.03	38.07	-	-	3.98E-03	-	lb/hr	Total for Stream 11
	0.20	0.55	0.99	-	-	1.04E-04	-	tpy	Assumes 52 events of 1 hr duration for upset conditions
Compressor Blowdowns	14.61	39.18	-	-	-	-	-	lb/hr	lb/MMBtu * MMBtu/hr
	-	-	23.58	1.70E-03	-	0.38	-	lb/hr	98% destruction of calculated content
	-	-	-	-	0.16	-	-	lb/hr	Estimated 100% conversion of combusted H_2S to SO_2
	14.61	39.18	23.58	1.70E-03	0.16	0.38	-	lb/hr	Total for compressor blowdowns
	4.38	11.75	7.07	5.11E-04	0.047	0.11	-	tpy	60 events of 1 hr duration per compressor (600 hr/yr)
	0%	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**%**	**Safety Factor**
	22.46	**60.21**	**61.64**	**1.70E-03**	**0.157**	**0.38**	-	**lb/hr**	
	4.59	**12.30**	**8.06**	**5.11E-04**	**0.047**	**0.11**	-	**tpy**	**Total; Upset Flared gas**

Flare SSM GHG Emissions

§98.233(n) Flare stack GHG emissions.

flared Amine vent gas & Assist Gas

Step 1. Calculate contribution of un-combusted CH_4 emissions

$E_{a,CH4}$ (un-combusted) = $V_a * (1- \eta)* X_{CH4}$ *(Equation W-39B)*

where:

$E_{a,CH4}$ = contribution of annual un-combusted CH_4 emissions from regenerator in cubic feet under actual conditions.

V_a = volume of gas sent to combustion unit during the year (cf)

η = Fraction of gas combusted by a burning flare (or regenerator), default value from Subpart W = 0.98

	Stream 11	Compressor Blowdowns
For gas sent to an unlit flare, η is zero.		
X_{CH4} = Mole fraction of CH_4 in gas to the flare =	0.27	0.7763

Step 2. Calculate contribution of un-combusted CO_2 emissions

$E_{a,CO2} = V_a * X_{CO2}$ *(Equation W-20)*

where:

$E_{a,CO2}$ = contribution of annual un-combusted CO_2 emissions from regenerator in cubic feet under actual conditions.

	Stream 11	Compressor Blowdowns
V_a = volume of gas sent to combustion unit during the year (cf)		
X_{CO2} = Mole fraction of CO_2 in gas to the flare =	0.464	0.002

Step 3. Calculate contribution of combusted CO_2 emissions

$E_{a,CO2}$ (combusted) = $\Sigma (\eta * V_a * Y_j * R_j)$ *(Equation W-21)*

where:

η = Fraction of gas combusted by a burning flare (or regenerator) = 0.98

For gas sent to an unlit flare, η is zero.

V_a = volume of gas sent to combustion unit during the year (cf)

	Stream 11	Compressor Blowdowns
Y_j = mole fraction of gas hydrocarbon constituents j:		
Constituent j, Methane =	0.2719	0.78
Constituent j, Ethane =	0.1906	0.12
Constituent j, Propane =	0.2786	0.06
Constituent j, Butane =	0.1556	0.017
Constituent j, Pentanes Plus =	0.03498	0.010
R_j = number of carbon atoms in the gas hydrocarbon constituent j:		
Constituent j, Methane =	1	
Constituent j, Ethane =	2	
Constituent j, Propane =	3	
Constituent j, Butane =	4	
Constituent j, Pentanes Plus =	5	

Step 4. Calculate GHG volumetric emissions at standard conditions (scf).

$$E_{s,n} = \frac{E_{a,n} * (459.67 + T_s) * P_a}{(459.67 + T_a) * P_s}$$ *(Equation W-33)*

where:

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

$E_{a,n}$ = GHG i volumetric emissions at actual conditions (cf)

T_s = Temperature at standard conditions (F) = 60 F

T_a = Temperature at actual conditions (F) = 76 F   (Based on Annual Avg Max Temperature for Hobbs, NM from Western Regional Climate Center)

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

P_a = Absolute pressure at actual conditions (psia) = 14.7 psia   (Assumption)

Constant = 459.67   (temperature conversion from F to R)

Step 5. Calculate annual CH_4 and CO_2 mass emissions (ton).

$Mass_{s,i} = E_{s,i} * \rho_i * 0.0011023$ *(Equation W-36)*

where:

$Mass_{s,i}$ = GHG i (CO_2, CH_4, or N_2O) mass emissions at standard conditions in tons (tpy)

$E_{s,i}$ = GHG i (CO_2, CH_4, or N_2O) volumetric emissions at standard conditions (cf)

ρ_i = Density of GHG i. Use:

CH_4: 0.0192 kg/ft^3 (at 60F and 14.7 psia)

CO_2: 0.0526 kg/ft^3 (at 60F and 14.7 psia)

Step 6. Calculate annual N_2O emissions from portable or stationary fuel combustion sources under actual conditions (cf) using Equation W-40 .

$Mass_{N2O}$ = 0.0011023 * Fuel * HHV * EF   *(Equation W-40)*

where:

$Mass_{N2O}$ = annual N_2O emissions from combustion of a particular type of fuel (tons).

Fuel = mass or volume of the fuel combusted

HHV = high heat value of the fuel

Stream 11 = 2.163E-03 MMBtu/scf

EF = 1.00E-04 kg N_2O/MMBtu

10^{-3} = conversion factor from kg to metric tons.

Step 7. Calculate total annual emission from flare by summing Equations W-40, W-19, W-20, and W-21.

Gas Sent to Flare	Gas Sent to Flare (cf/yr)	CH_4 Un-Combusted, $E_{a,CH4}$ (cf)	CO_2 Un-Combusted, $E_{a,CO2}$ (cf)	CO_2 Combusted, $E_{a,CO2}$ (cf)	CH_4 Un-Combusted, $E_{a,CH4}$ (scf)	CO_2 Un-Combusted, $E_{a,CO2}$ (scf)	CO_2 Combusted, $E_{a,CO2}$ (scf)	CH_4 Un-Combusted, $E_{a,CH4}$ (tpy)	CO_2 Un-Combusted, $E_{a,CO2}$ (tpy)	CO_2 Combusted, $E_{a,CO2}$ (tpy)	N_2O Mass Emissions (tpy)	CO2e (tpy)
Stream 11	45,000,000	244,718	20,898,382.25	100,814,700.26	237,275.48	20,262,817.52	97,748,708.48	5.02	1,174.86	5,667.57	0.011	6,971.17
Compressor Blowdowns	5,688,000	88,310	2,641,555.52	57,376,305.00	85,623.93	2,561,220.13	55,631,368.21	1.81	148.50	3,225.56	0.001	3,419.77
							Total	**6.83**	**1,323.36**	**8,893.13**	**0.012**	**10,390.94**

	CO_2	CH_4	N_2O
GWP	1	25	298

Emission unit: F-001

Facility-wide Fugitive Emissions Per Piece of Equipment							
Subcomponent		Emission Factor[1] (lb/hr/comp)	Control Efficiency	VOC Content[2] (wt%)	H_2S Content[2] (wt%)	HAP Content[2] (wt%)	Subcomponent Counts[3,6]
Valves	Gas	9.92E-03	0%	22.33%	0.001%	0.36%	1424
	Light Oil	5.51E-03	0%	100.00%	0%	12.51%	1219
	Heavy Oil	1.85E-05	0%	0%	0%	0.00%	0
Flanges	Gas	8.60E-04	0%	22.33%	0.001%	0.36%	1405
	Light Oil	2.43E-04	0%	100.00%	0%	12.51%	885
	Heavy Oil	8.60E-07	0%	0%	0%	0.00%	0
Connectors	Gas	4.41E-04	0%	22.33%	0.001%	0.36%	3757
	Light Oil	4.63E-04	0%	100.00%	0%	12.51%	3237
	Heavy Oil	1.65E-05	0%	0%	0%	0.00%	0
Pumps	Light Oil	2.87E-02	0%	100.00%	0%	12.51%	17
	Heavy Oil	2.87E-02	0%	0%	0%	0.00%	0
Other	Gas	1.94E-02	0%	22.33%	0.001%	0.36%	139
	Light Oil	1.65E-02	0%	100.00%	0%	12.51%	4
	Heavy Oil	7.06E-05	0%	0%	0%	0.00%	0

Safety Factor[6]	10%
Hourly VOC Emission Rate (lb/hr)[4]	13.38
Annual VOC Emission Rate (tpy)[5]	58.61
Hourly H_2S Emission Rate (lb/hr)[4]	1.97E-04
Annual H_2S Emission Rate (tpy)[5]	8.62E-04
Hourly HAP Emission Rate (lb/hr)[4]	1.19
Annual HAP Emission Rate (tpy)[5]	5.23

[1] Emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates, 1995.
[2] Weight percent of gas and liquid components are referenced from flash gas and liquid streams from a ProMax simulation for this facility.
[3] Subcomponent counts for each subcomponent are based on estimated average component counts for each piece of equipment.
[4] Hourly Emissions [lb/hr] = Emissions Factor [lb/hr/component] * Weight Content of Chemical Component [%] * Subcomponent Count.
[5] Annual Emissions [ton/yr] = Hourly Emissions [lb/hr] * 8760 [hr/yr] * 1/2000 [ton/lb].
[6] The safety factor of 25% is added to accommodate the addition of the CAT G3608 engines.

Loading Emissions

Unit: LOAD
Description: Emissions from Truck Loading of Condensate

Emission Calculations

69,350	Throughput (bbl/yr)	Expected condensate throughput
2,912,700	Throughput (gal/yr)	bbl/d * 42 gal/bbl * 365 d/yr
9.82	tpy VOC	GRI-HAPCalc 3.01

Total HAPs	n-Hexane	Benzene	Toluene	e-Benzene	Xylenes		
0.4	0.39	0.04	0.00	0.001	0.0012	tpy	GRI-HAPCalc3.01

ECD

Unit:	ECD
Description:	BTEX Combustor
DRE:	98%

Pilot Emissions

MW of fuel gas	16.04	lb/lb-mol	Estimated, nominal for natural gas
Pilot fuel flow	100	scf/hr	Engineering estimate
Fuel heating value	1034	Btu/scf	Estimated, nominal for LHV natural gas
Heat rate	0.10	MMBtu/hr	Btu/scf * scf/hr / 1,000,000
Annual fuel usage	0.88	MMscf/yr	scf/hr * 8760 hrs/yr / 1,000,000

Flash Tank & Still Vent Emissions

Still Vent Flow	362	scf/hr	GRI-GLYcalc Controlled Regenerator Stream
Still Vent Heating Value	2356.59	Btu/scf	Estimated using weighted heat values of components
Flash Tank Flow	759	scf/hr	GRI-GLYcalc Flash Tank Off Gas Stream
Percentage Sent to ECD	50%		Percentage sent to ECD for combustion. Remaining vapors are sent to reboiler as fuel.
Flash Tank Flow to ECD	380	scf/hr	
Flash Tank Heating Value	1447.76	Btu/scf	Estimated using weighted heat values of components
Total Flow	742	scf/hr	BTEX Still Vent + Flash Tank Vapors sent to ECD
Total Heating Value	1891.45	Btu/scf	Weighted average of BTEX Still Vent and Flash Tank streams
Total Heating Rate	1.40	MMBtu/hr	Btu/scf * scf/hr / 1,000,000
Annual fuel usage	6.50	MMscf/yr	scf/hr * 8760 hrs/yr / 1,000,000

Emission Rates

	NO_x	CO	VOC[1]	H_2S[2]	SO_2[3]	PM	HAPs[1]		
Emission Factors	100	84				7.6		lb/MMscf	AP-42 Tables 1.4-1 & 2
	101.37	85.15				7.70		lb/MMscf	Adjusted emission factor (Pilot): EF X (Fuel Heat Value/1,020 Btu/scf)
	185.44	155.77				14.09		lb/MMscf	Adjusted emission factor (Still Vent & Flash Tank Vapors): EF X (Fuel Heat Value/1,020 Btu/scf)
			34.59	0.035			7.82	lb/hr	Still Vent: GRI-GLYCalc Controlled Regenerator Emisisons Stream
			8.65	1.80E-03			0.14	lb/hr	Flash Tank: GRI-GLYcalc Flash Tank Off Gas Stream
				3.57E-05				lb H_2S/hr	Pilot Gas: Sweet natural gas fuel, 0.25 gr H_2S/100scf
					0.0014			lb SO_2/hr	Pilot Gas: Sweet natural gas fuel, 5 gr S/100scf
Pilot	0.010	8.52E-03	-	3.50E-05	6.588E-05	-	-	lb/hr	95% combustion H_2S; 100% H_2S -> SO_2
	0.044	0.037	-	1.53E-04	2.89E-04	-	-	tpy	
Glycol Regenerator Still Vent & Flash Tank	0.138	0.116	0.86	7.26E-04	0.067	1.05E-02	0.16	lb/hr	95% combustion H_2S; 100% H_2S -> SO_2
	0.60	0.51	3.79	3.18E-03	0.29	0.046	0.70	tpy	
Total (Pilot + Gases)	**0.15**	**0.124**	**0.86**	**7.61E-04**	**0.067**	**1.05E-02**	**0.16**	lb/hr	
	0.65	**0.54**	**3.79**	**3.33E-03**	**0.29**	**0.046**	**0.70**	tpy	lb/hr * (8760 hr/yr operation)/ 2000 lb/ton

n-Hexane	Benzene	Toluene	Xylenes	Total HAPs		
0.80	4.16	2.59	0.28	7.82	lb/hr	Still Vent: GRI-GLYCalc Controlled Regenerator Emisisons Stream
0.11	0.04	0.03	3.00E-03	0.17	lb/hr	Flash Tank: GRI-GLYcalc Flash Tank Off Gas Stream
0.018	**0.08**	**0.05**	**0.006**	**0.16**	lb/hr	
0.08	**0.37**	**0.23**	**0.02**	**0.70**	tpy	

[1] Pilot fuel is purchased natural gas, comprised mainly of methane. VOC and HAP emissions from pilot only are assumed to be negligible.

[2] H_2S emissions based on 0.25 g/100 scf H_2S in fuel, 95% combustion.

0.25 gr H_2S/100 scf * fuel scf/hr * 1 lb/7000 gr = lb/hr H_2S (prior to combustion and conversion to SO_2)

[3] SO_2 emissions based on sulfur content of 5 g/100 scf S in fuel and 100% combustion of H_2S to SO_2.

5 gr S/100 scf * fuel scf/hr * 1 lb/7000 gr * 64 lb SO_2/32 lb S = lb/hr SO_2

GHG Calculations

CO_2[4]	N_2O[4]	CH_4[4]	CO_2e[4]		
53.06	0.0001	0.001		kg/MMBtu	40 CFR 98 Subpart C Tables C-1 and C-2
1	298	25		GWP	40 CFR 98 Table A-1
53.0	0.0001	0.001		tpy	
		9.04		tpy	Still Vent: GRI-GLYCalc Controlled Regenerator Emisisons Stream
		43.34		tpy	Flash Tank: GRI-GLYcalc Flash Tank Off Gas Stream
-	-	*1.05*		tpy	Controlled emissions with 98% Combustion Control
53.0	**0.03**	**26.21**	**79.2**	tpy CO_2e	

[4] N_2O, CH_4, and CO_2 tpy Emission Rate= EF* Fuel Usage * Fuel Heat Value * 2.20462 lb/1 kg * 1 ton/2000 lb

CO_2e tpy Emission Rate = CO_2 Emission Rate + N_2O Emission Rate*GWP Factor +CH_4 Emission Rate*GWP Factor

Exhaust Parameters

Heat Rate:	1505.91	MBtu/hr	Design Specification
Exhaust temp (Tstk):	650	°F	Eng Estimate
Site Elevation:	3060	ft MSL	
Ambient pressure (Pstk):	26.73	in. Hg	Calculated based on elevation
F factor:	10610	wscf/MMBtu	40 CFR 60 Appx A Method 19
Exhaust flow	266.3	scfm	Calculated from F factor and heat rate
Exhaust flow:	636.2	acfm	scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R
Stack diameter:	4.5	ft	Spec Sheet
Stack height:	11.99	ft	Spec Sheet
Exhaust velocity:	0.67	ft/sec	Exhaust flow ÷ stack area

Site Data

Site Elevation	3060	ft MSL	
Standard Pressure	29.92	in Hg	
Pressure at Elevation	26.75	in Hg	Hess, Introduction to Theoretical Meteorology, eqn. 6.8
Standard Temperature	528	R	

Slop Water Loading Emissions

Unit: LOAD_SLOP
Description: Emissions from Truck Loading of Slop Water

Emission Calculations

Loading from T-006

12,000	Throughput (bbl/yr)	Expected condensate throughput
504,000	Throughput (gal/yr)	bbl/d * 42 gal/bbl * 365 d/yr
10.3	tpy VOC	GRI-HAPCalc 3.01
1%	Based on 1% Crude Oil[1]	
0.10	**tpy VOC**	

Total HAPs	n-Hexane	Benzene	Toluene	e-Benzene	Xylenes		
0.5	0.41	0.05	0.02	0.0007	0.0012	tpy	GRI-HAPCalc3.01
1%	1%	1%	1%	1%	1%	%	Based on 1% Crude Oil[1]
4.71E-03	**4.08E-03**	**4.56E-04**	**1.51E-04**	**7.00E-06**	**1.20E-05**	tpy	

[1] Assume slop water contains 1% hydrocarbons per TCEQ guidance.

Loading from T-007

4.81E-5	Calculated VOC Emissions (tpy)	Calculated using ProMax
25%	Safety Factor	
6.01E-5	**tpy VOC**	

Total HAPs	n-Hexane	Benzene	Toluene	e-Benzene	Xylenes		
9.94E-06	2.89E-10	9.33E-06	5.86E-07	5.52E-09	1.98E-08	tpy	Calculated using ProMax
25%	25%	25%	25%	25%	25%	%	Safety Factor
1.24E-05	**3.61E-10**	**1.17E-05**	**7.32E-07**	**6.90E-09**	**2.48E-08**	tpy	

Loading from TK-1000 (Identical to T-007)

4.81E-5	Calculated VOC Emissions (tpy)	Calculated using ProMax
25%	Safety Factor	
6.01E-5	**tpy VOC**	

Total HAPs	n-Hexane	Benzene	Toluene	e-Benzene	Xylenes		
9.94E-06	2.89E-10	9.33E-06	5.86E-07	5.52E-09	1.98E-08	tpy	Calculated using ProMax
25%	25%	25%	25%	25%	25%	%	Safety Factor
1.24E-05	**3.61E-10**	**1.17E-05**	**7.32E-07**	**6.90E-09**	**2.48E-08**	tpy	

Total Emissions

0.10 **tpy VOC**

Total HAPs	n-Hexane	Benzene	Toluene	e-Benzene	Xylenes	
4.73E-03	**4.08E-03**	**4.79E-04**	**1.52E-04**	**7.01E-06**	**1.20E-05**	**tpy**

Haul Road Emissions

Input Data

Empty vehicle weight[1]	16	tons	
Load weight[2]	21.2	tons	
Loaded vehicle[3]	37.2	tons	
Mean vehicle weight[4]	26.6	tons	
Vehicle frequency	1.2	vehicles/day	Throughput (gal/yr) * (1 yr/365 days) * (1 truck/7,560 gal)
Vehicle frequency	1.2	trips/hour	Maximum
Round-trip distance	0.40	mile/trip	
Operating hours	8760	hours/yr	
Surface silt content[5]	1.8	%	
Annual wet days[6]	60	days/yr	
Vehicle miles traveled[7]	0.5	mile/hr	

Emission Factors and Constants

Parameter	PM_{30}	PM_{10}	$PM_{2.5}$
k, lb/VMT[8]	4.9	1.5	0.15
a, lb/VMT[8]	0.70	0.90	0.90
b, lb/VMT[8]	0.45	0.45	0.45
Hourly EF, lb/VMT[9]	3.47	0.73	0.07
Annual EF, lb/VMT[10]	2.90	0.61	0.06

Uncontrolled Emissions

PM_{30}	PM_{10}	$PM_{2.5}$	
1.7	0.36	0.036	lb/hr[11]
0.26	0.055	0.0055	ton/yr[12]

Footnotes

[1] Empty vehicle weight includes driver and occupants and full fuel load.
[2] Cargo, transported materials, etc. (lb/gal RVP11 *7560 gal truck/ 2000lb/ton)
[3] Loaded vehicle weight = Empty + Load Size
[4] Mean Vehicle weight = (Loaded Weight + Empty Weight) / 2
[5] AP-42 Table 13.2.2-1, Taconite mining and processing mean silt content
A 60% reduction in silt is used based on the use of gravel roads at this facility.
[6] AP-42 Figure 13.2.2-1
[7] VMT/hr = Vehicle Miles Traveled per hour = Trips per hour * Miles per trip
[8] Table 13.2.2-2, Industrial Roads
[9] AP-42 13.2.2, Equation 1a
[10] AP-42 13.2.2, Equation 2
[11] lb/hr = Hourly EF (lb/VMT) * VMT (mile/hr)
[12] ton/yr = Annual EF (lb/VMT) * Truck/day * Mile/truck * 365day/yr * 1ton/2000lb

Facility Malfucntion Emissions

Unit: MALF
Description: Facility-wide malfunction emissions

Emission Calculations

Requested NO_X MALF:	6	tons/yr
Requested CO MALF:	10	tons/yr
Requested VOC MALF:	10	tons/yr
Requested SO_X MALF:	10	tons/yr
Requested H_2S MALF:	2	tons/yr
Requested HAP MALF:	0.16	tons/yr
Requested Hexane MALF:	0.12	tons/yr
Request Benzene MALF:	0.026	tons/yr
Requested Toluene MALF:	0.0076	tons/yr
Inlet gas VOC content:	22.33	Mass %
Inlet gas CO_2 content:	0.45	Mass %
Inlet gas CH_4 content:	58.87	Mass %
Inlet gas HAPs content:	0.357	Mass %
Inlet gas Hexane:	0.27	Mass %
Inlet gas Benzene:	0.059	Mass %
Inlet gas Toluene:	0.017	Mass %

Unit(s):	PIGGING			
Description:	Pig Receiver and Launcher Emissions			
Exemption:	20.2.72.202.B(5) NMAC			
Inlet Receiver Volume	140.00	scf/event		Estimate based on similar Facility Design
Safety Factor	100%			
Inlet Receiver Volume	280.00	scf/event		Calculated
Annual Events:	24	# of events/yr		Estimate based on similar Facility Design
Duration of Event	0.5	hr/event		Estimate
Number of Receivers:	1			Estimate based on similar Facility Design

Pigging Emissions based on Inlet Analysis

Composition	MW[2]	Wet vol/mol%[1]	Dry vol/mol%	MW*Mol%	Spec. Volume (scf/lb)[2]	Mass Flow (lb/hr)[3]	Mass Flow (lb/yr)[4]	Mass Flow (ton/yr)[5]
Water	18.015	0.000%			21.06			
Nitrogen	28.013	1.23%	1.231%	0.34	13.55	5.09E-03	6.11E-02	3.05E-05
CO2	44.010	0.21%	0.214%	0.09	8.62	1.39E-03	1.67E-02	8.34E-06
H2S*	34.082	0.001%	0.001%	0.00	11.14	5.03E-06	6.03E-05	3.02E-08
Methane	16.043	77.6%	77.633%	12.45	23.65	1.84E-01	2.21E+00	1.10E-03
Ethane	30.070	11.8%	11.776%	3.54	12.62	5.23E-02	6.27E-01	3.14E-04
Propane	44.097	5.6%	5.649%	2.49	8.61	3.68E-02	4.41E-01	2.21E-04
i-Butane	58.123	0.75%	0.745%	0.43	6.53	6.39E-03	7.67E-02	3.83E-05
n-Butane	58.123	1.7%	1.715%	1.00	6.53	1.47E-02	1.77E-01	8.83E-05
2,2 Dimethylpropane	72.150	0.012%	0.012%	0.01	5.30	1.27E-04	1.52E-03	7.60E-07
i-Pentane	72.150	0.35%	0.351%	0.25	5.26	3.74E-03	4.48E-02	2.24E-05
n-Pentane	72.150	0.36%	0.357%	0.26	5.26	3.80E-03	4.56E-02	2.28E-05
2,2 Dimethylbutane	86.180	0.0050%	0.005%	0.004	5.26	5.32E-05	6.39E-04	3.19E-07
Cyclopentane	70.140	0.00%	0.000%	0.000	5.41	0.00E+00	0.00E+00	0.00E+00
2,3 Dimethylbutane	86.180	0.026%	0.026%	0.022	4.40	3.31E-04	3.97E-03	1.98E-06
2 Methylpentane	86.180	0.061%	0.061%	0.053	4.40	7.76E-04	9.31E-03	4.65E-06
3 Methylpentane	86.180	0.031%	0.031%	0.027	4.40	3.94E-04	4.73E-03	2.37E-06
n-Hexane	86.180	0.07%	0.065%	0.056	4.40	8.27E-04	9.92E-03	4.96E-06
Methylcyclopentane	84.160	0.031%	0.031%	0.026	4.51	3.85E-04	4.62E-03	2.31E-06
Cyclohexane	84.160	0.034%	0.034%	0.029	3.79	5.03E-04	6.03E-03	3.02E-06
2-Methylhexane	100.200	0.004%	0.004%	0.004	3.79	5.92E-05	7.10E-04	3.55E-07
3-Methylhexane	100.200	0.005%	0.005%	0.005	3.79	7.39E-05	8.87E-04	4.44E-07
n-Heptanes	100.200	0.018%	0.018%	0.018	3.79	2.66E-04	3.19E-03	1.60E-06
Other Heptanes	100.200	0.00%	0.000%	0.000	3.79	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	98.190	0.013%	0.013%	0.013	3.87	1.88E-04	2.26E-03	1.13E-06
2,2,4-Trimethylpentane	114.230	0.00%	0.003%	0.003	3.32	5.06E-05	6.07E-04	3.03E-07
Benzene	78.110	0.016%	0.016%	0.012	4.86	1.84E-04	2.21E-03	1.11E-06
Toluene	92.140	0.004%	0.004%	0.004	4.12	5.44E-05	6.53E-04	3.26E-07
Ethylbenzene	106.170	0.00000%	0.000%	0.000	3.57	0.00E+00	0.00E+00	0.00E+00
Xylenes	106.170	0.0000%	0.000%	0.000	3.57	0.00E+00	0.00E+00	0.00E+00
C8+ heavies	114.230	0.0000%	0.000%	0.000	3.32	0.00E+00	0.00E+00	0.00E+00
Total		100.0%	100.0%	21.15				
Dry Total		100.0%				**0.31**	**3.75**	**0.0019**
VOC Total		**0.21**		**8.26**		**0.12**	**1.46**	**7.32E-04**

Notes

[1] Inlet
[2] From "Physical Properties of Hydrocarbons"
[3] Flow (lb/hr) = Volume (scf/event) / Duration (hr/event) / Sp. Vol. (scf/lb) * Mol%
[4] Flow (tons/yr) = Volume (scf/yr) / Sp. Vol. (scf/lb) * Mol%
[5] Flow (tons/yr) = Flow (lb/yr) / 2000 lb/ton

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_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO_2e 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_2e 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_2e 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 CO2e 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 CO2e 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_2 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)

Section 7

Information Used to Determine Emissions

<u>Information Used to Determine Emissions</u> shall include the following:

- ☒ If manufacturer data are used, include specifications for emissions units <u>and</u> 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.

This section contains the following references or actual documentation to support the emissions in the required forms and the calculations in Section 6:

Subsection 1 – Documentation used to support calculations in this permit revision.

- Current version of AP-42 located online at: EPA AP-42 Compilation Air Emissions Factors
- Specific sections used in this application:
  - Section 3.1 – Stationary Gas Turbines (Table 3.1-3)
  - Section 3.2 – Natural Gas-fired Reciprocating Engines (Table 3.2-2)
  - Section 13.5 – Industrial Flares (Table 13.5-1)
- Compressor manufacturer and catalyst specifications (for Units 11, 12, 13, 14, and 15)
- Generator manufacturer specification sheet (for Unit GEN-1)
- TCEQ TNRCC RG-109 Flare guidance documentation
- ProMax Output for slop working, breathing, flashing, and loading emissions (for Unit TK-1000)
- FESCO, Ltd. inlet gas analysis (April 8, 2022) (for units VENT (SSM), FLARE (SSM), and F-001)
- FESCO, Ltd. Fuel gas analysis (April 8, 2022) (for units 1, 2, 5 – 15, 3b, Flare (Process), Flare (SSM), ECD)

Subsection 2 – Documentation used to support calculations from previous permit application.

- Current version of AP-42 located online at: EPA AP-42 Compilation Air Emissions Factors
- Specific sections used in this application:
  - Section 1.4 – Natural Gas External Combustion Sources-Natural Gas (Table 1.4-1, 1.4-2)
  - Section 3.1 – Stationary Natural Gas Turbines (Table 3.1-2a)
  - Section 3.2 – Natural Gas-fired Reciprocating Engines (Table 3.2-2)
  - Section 13.2.2 – Introduction to Fugitive Dust sources – Unpaved Roads
- Compressor manufacturer and catalyst specifications (for Units 6, 7, 8 , 9, & 10)
- GRI-GLYCalc v4.0 aggregate calculations report (for Unit 3a)
- Stream 11 properties used for Unit Flare (SSM)
- HAPCalc® 3.01 run results loading
- ProMax Output for slop and condensate working and breathing, and slop loading emissions (for Units T-006, T-007, T-008, T-009, T-011, and T-012)
- SpiralX manufacturer specification sheet (for Unit ECD)
- Turbine Stack Test Data – Reports (for Units 1 and 2)
- Turbine manufacturer specifications (for Unit 5)

Section 7

Subsection 1 – Information Used to Determine Emissions from Amended Portion of the Application

For clarity, this Subsection 1 contains pertinent information used for the calculations associated with the current project modifications (i.e. Units 11 - 15, TK-1000, GEN-1, F-001, VENT(SSM), Flare (SSM)). For all supplemental information used to calculate emissions for the existing permit, please refer to Section 7 Subsection 2.

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES (Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Acenaphthylene[k]	5.53 E-06	C
Acetaldehyde[k,l]	8.36 E-03	A
Acrolein[k,l]	5.14 E-03	A
Benzene[k]	4.40 E-04	A
Benzo(b)fluoranthene[k]	1.66 E-07	D
Benzo(e)pyrene[k]	4.15 E-07	D
Benzo(g,h,i)perylene[k]	4.14 E-07	D
Biphenyl[k]	2.12 E-04	D
Butane	5.41 E-04	D
Butyr/Isobutyraldehyde	1.01 E-04	C
Carbon Tetrachloride[k]	<3.67 E-05	E
Chlorobenzene[k]	<3.04 E-05	E
Chloroethane	1.87 E-06	D
Chloroform[k]	<2.85 E-05	E
Chrysene[k]	6.93 E-07	C
Cyclopentane	2.27 E-04	C
Ethane	1.05 E-01	C
Ethylbenzene[k]	3.97 E-05	B
Ethylene Dibromide[k]	<4.43 E-05	E
Fluoranthene[k]	1.11 E-06	C
Fluorene[k]	5.67 E-06	C
Formaldehyde[k,l]	5.28 E-02	A
Methanol[k]	2.50 E-03	B
Methylcyclohexane	1.23 E-03	C
Methylene Chloride[k]	2.00 E-05	C
n-Hexane[k]	1.11 E-03	C
n-Nonane	1.10 E-04	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES
(Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
n-Octane	3.51 E-04	C
n-Pentane	2.60 E-03	C
Naphthalene[k]	7.44 E-05	C
PAH[k]	2.69 E-05	D
Phenanthrene[k]	1.04 E-05	D
Phenol[k]	2.40 E-05	D
Propane	4.19 E-02	C
Pyrene[k]	1.36 E-06	C
Styrene[k]	<2.36 E-05	E
Tetrachloroethane[k]	2.48 E-06	D
Toluene[k]	4.08 E-04	B
Vinyl Chloride[k]	1.49 E-05	C
Xylene[k]	1.84 E-04	B

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

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

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

[c] Emission tests with unreported load conditions were not included in the data set.

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10^6 scf, and

h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

[e] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content in natural gas of 2,000 gr/10^6scf.

[f] Emission factor for TOC is based on measured emission levels from 22 source tests.

[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.31 lb/MMBtu vs. 1.25 lb/MMBtu, respectively.

[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.

[i] Considered ≤ 1 μm in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).

[j] PM Condensable = PM Condensable Inorganic + PM-Condensable Organic

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

[l] For lean burn engines, aldehyde emissions quantification using CARB 430 may reflect interference with the sampling compounds due to the nitrogen concentration in the stack. The presented emission factor is based on FTIR measurements. Emissions data based on CARB 430 are available in the background report.

Since flares do not lend themselves to conventional emission testing techniques, only a few attempts have been made to characterize flare emissions. Recent EPA tests using propylene as flare gas indicated that efficiencies of 98 percent can be achieved when burning an offgas with at least 11,200 kJ/m^3 (300 Btu/ft^3). The tests conducted on steam-assisted flares at velocities as low as 39.6 meters per minute (m/min) (130 ft/min) to 1140 m/min (3750 ft/min), and on air-assisted flares at velocities of 180 m/min (617 ft/min) to 3960 m/min (13,087 ft/min) indicated that variations in incoming gas flow rates have no effect on the combustion efficiency. Flare gases with less than 16,770 kJ/m^3 (450 Btu/ft^3) do not smoke.

Table 13.5-1 presents flare emission factors, and Table 13.5-2 presents emission composition data obtained from the EPA tests.[1] Crude propylene was used as flare gas during the tests. Methane was a major fraction of hydrocarbons in the flare emissions, and acetylene was the dominant intermediate hydrocarbon species. Many other reports on flares indicate that acetylene is always formed as a stable intermediate product. The acetylene formed in the combustion reactions may react further with hydrocarbon radicals to form polyacetylenes followed by polycyclic hydrocarbons.[2]

In flaring waste gases containing no nitrogen compounds, NO is formed either by the fixation of atmospheric nitrogen (N) with oxygen (O) or by the reaction between the hydrocarbon radicals present in the combustion products and atmospheric nitrogen, by way of the intermediate stages, HCN, CN, and OCN.[2] Sulfur compounds contained in a flare gas stream are converted to SO_2 when burned. The amount of SO_2 emitted depends directly on the quantity of sulfur in the flared gases.

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

EMISSION FACTOR RATING: B

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

[a] Reference 1. Based on tests using crude propylene containing 80% propylene and 20% propane.
[b] Measured as methane equivalent.
[c] Soot in concentration values: nonsmoking flares, 0 micrograms per liter (µg/L); lightly smoking flares, 40 µg/L; average smoking flares, 177 µg/L; and heavily smoking flares, 274 µg/L.

G3608

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Enterprise

CATERPILLAR®

GAS COMPRESSION APPLICATION

ENGINE SPEED (rpm):	1000
COMPRESSION RATIO:	7.6
AFTERCOOLER TYPE:	SCAC
AFTERCOOLER - STAGE 2 INLET (°F):	130
AFTERCOOLER - STAGE 1 INLET (°F):	174
JACKET WATER OUTLET (°F):	190
ASPIRATION:	TA
COOLING SYSTEM:	JW+1AC, OC+2AC
CONTROL SYSTEM:	ADEM4
EXHAUST MANIFOLD:	DRY
COMBUSTION:	LOW EMISSION
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3
SET POINT TIMING:	18

RATING STRATEGY:	STANDARD
RATING LEVEL:	CONTINUOUS
FUEL SYSTEM:	GAV
	WITH AIR FUEL RATIO CONTROL

SITE CONDITIONS:

FUEL:	Nat Gas
FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
FUEL METHANE NUMBER:	95.2
FUEL LHV (Btu/scf):	912
ALTITUDE(ft):	3000
INLET AIR TEMPERATURE(°F):	110
STANDARD RATED POWER:	2500 bhp@1000rpm

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	2500	2500	1875	1250
INLET AIR TEMPERATURE			°F	110	110	110	110
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(3)	Btu/bhp-hr	6848	6848	7075	7573
FUEL CONSUMPTION (HHV)		(3)	Btu/bhp-hr	7598	7598	7849	8403
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(4)(5)	ft3/min	6636	6636	5029	3419
AIR FLOW	(WET)	(4)(5)	lb/hr	27720	27720	21007	14282
FUEL FLOW (60°F, 14.7 psia)			scfm	313	313	242	173
INLET MANIFOLD PRESSURE		(6)	in Hg(abs)	104.4	104.4	78.9	55.1
EXHAUST TEMPERATURE - ENGINE OUTLET		(7)	°F	833	833	876	941
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(5)(8)	ft3/min	16069	16069	12600	9005
EXHAUST GAS MASS FLOW	(WET)	(5)(8)	lb/hr	28528	28528	21633	14728
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(9)(10)	g/bhp-hr	0.30	0.30	0.30	0.30
CO		(9)(10)	g/bhp-hr	2.50	2.50	2.49	2.50
THC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	4.41	4.41	4.68	4.75
NMHC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	0.41	0.41	0.43	0.44
NMNEHC (VOCs) (mol. wt. of 15.84)		(9)(10)(11)	g/bhp-hr	0.27	0.27	0.29	0.30
HCHO (Formaldehyde)		(9)(10)	g/bhp-hr	0.16	0.16	0.17	0.20
CO2		(9)(10)	g/bhp-hr	425	425	441	470
EXHAUST OXYGEN		(9)(12)	% DRY	11.3	11.3	11.1	10.7
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(13)	Btu/min	27700	27700	23042	18866
HEAT REJ. TO ATMOSPHERE		(13)	Btu/min	11186	11186	11118	10432
HEAT REJ. TO LUBE OIL (OC)		(13)	Btu/min	12553	12553	11937	10885
HEAT REJ. TO A/C - STAGE 1 (1AC)		(13)(14)	Btu/min	27175	27175	13666	3763
HEAT REJ. TO A/C - STAGE 2 (2AC)		(13)(14)	Btu/min	9026	9026	5673	2840

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(14)(15)	Btu/min	59003
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(14)(15)	Btu/min	24540
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Refer to product O&M manual for details on additional lower load capability. No overload permitted at rating shown.

For notes information consult page three.

PREPARED BY: ,
Data generated by GERP Web Version 2.2.0.17
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September 26, 2016

Emission Control Application Data Sheet

Maxim Silencers
6545 N. ELDRIDGE PKWY
HOUSTON TX. 77041
Phone: 713-682-6777
Fax: 713-682-3628

Customer: **COMPASS** Project: **OPP# 2207-270-EPD** Date: **11/11/2022**

Customer Contact Powertherm Contact: Order/Quote #: **0**

Engine Data:

Engine Model:	**CAT 3608A4**		Speed:	**1000**	RPM
Fuel & Operating Type:	**Natural Gas Lean Burn**		Engine Power:	**2500**	Hp
				1880	KW
Exhaust Flow Rate:	**16069**	**acfm**	Exhaust Temperature:	**833**	°F
	27301	**m^3/hr**		**445**	°C
	29528	**lbs/hr**			

Catalyst Data:

Number of Core layers:	**1**						
Model:	**MCCOF3-6-2420C3**				Inlet Size:	**20**	in
Grade:	**Critical**				Outlet Size:	**24**	in
Body Diameter:	**54**	in			Body Length:	**182**	in
Estimated weight:	**4180**	lbs			Estimated Back Pressure of the unit:	**6.01**	in of WC
	1897	Kg				**15.0**	mbar
Core Part Number:	**ERH-1536-1, 15 X 36 SIZE**		Qty	**3**	Speed through inlet:	**5279**	ft/min
Cell Density	300	cpsi			Back Pressure across Element(s) only	2.66	in of WC
						6.6	mbar

Emission:

Min. Temp. at Core Face: **752** °F **400** °C
Max. Temp. at Core Face: **917** °F **492** °C

Catalyst Type: **Oxidation**

O_2 in Exhaust vol %
H_2O in Exhaust vol %

	Pollutant					
	NOx	CO	NMNEHC/VOC	CH_2O/CHCO	ORGANIC PM10	
Engine Out / Pre Emission:	**0.3**	**2.5**	**0.27**	**0.16**	**0**	g/bhp-hr
	72.19	**601.62**	**64.97**	**38.50**	**0.00**	mg/Nm3
Post Emission:	**0.300**	**0.600**	**0.700**	**0.040**	**0.000**	g/bhp-hr
	72.19	**144.39**	**168.45**	**9.63**	**0.00**	mg/Nm3
	0.0	***76.0***	***-159.3***	***75.0***	***50.0***	% Reduction
	1.65	3.31	3.86	0.22		lb/hr
	7.24	14.48	16.90	0.97		tons/year operation **8760** hr/year
	34.7	69.3	80.9	4.6		ppmv
						ppmvd @ 15% O2

Acoustics:

Frequency Band (Hz):	31.5	63	125	250	500	1000	2000	4000	8000	
Raw Noise SPL (dB) at 3.28 ft.:	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	7 dBA
Estimated Attenuation (dB):	**24**	**35**	**37**	**31**	**28**	**24**	**25**	**29.5**	**30**	No Element
Plus:	**24**	**36**	**39**	**33**	**32**	**29**	**31**	**35.5**	**35**	One Element Layer
Silenced SPL (dB) at 3.28 ft.:	**-24**	**-36**	**-39**	**-33**	**-32**	**-29**	**-31**	**-35.5**	**-35**	-24.8 dBA

Warranty & Notes:

- **If Pre-Emission levels are not as noted above, contact Maxim Silencers for a re-quote.**
- To achieve Post Emissions levels detailed above, exhaust temperature and Pre-Emission data must be as specified.
- Maximum allowable exhaust temperature at core face is 1350°F.
- If applicable, the engine will require an air/fuel ratio controller to meet above emission levels. For Rich Burn engines λ must be 0.96 - 0.99.
- Catalyst cleaning/regeneration required, if initial backpressure increases by 2" of WC.
- Engine operation to be stable and reproducible.
- QAC is not designed to withstand a backfire, therefore measures should be taken prior to QAC unit to alleviate backfire pressure.
- Maximum lubrication oil consumption rate to be less than 0.0015 lb/bhp/hr.
- Lube oil sulfate ash contents should not exceed 0.5%.
- Phosphorus and/or Zinc should not exceed 5 ppmv in the exhaust stream.
- A high temperature alarm/shutdown to be maintained at downstream of catalyst at 1300°F.
- Fuel not to contain heavy or transition metals such as Pb, Ar, Zn, Cu, Sn, Fe, Ba, Ni, Cr etc.
- Chlorinated or Silicone containing compounds in the exhaust not to exceed 1 ppmv.
- Sulfur compounds in the exhaust gas stream not to exceed 25 ppmv.
- Performance guarantee is voided should the catalyst become masked or de-activated by any contaminant in the exhaust stream.
- Engine to be maintained and operated in accordance within manufacturer's recommended practice.
- Under no condition will Maxim Silencers assume any contingent liabilities.
- Operating manual is available online at www.maximsilencers.com or contact a Maxim sales representative.
- Nomenclature: QAC4-292-8, 4 is grade (Super Critical), 29 is catalyst block size, 2 is no. of catalyst(s) and 8 is flange diameter.
- Organic PM10 are estimate only and not a guarantee because of the variability in fuels and additives which change PM10.
- Maxim Silencers standard one year warranty applies.

Rev level: 86

G3612

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Josh Shaver - 677-1738 SCAR rA

GAS COMPRESSION APPLICATION

ENGINE SPEED (rpm):	1000
COMPRESSION RATIO:	7.6
AFTERCOOLER TYPE:	SCAC
AFTERCOOLER - STAGE 2 INLET (°F):	130
AFTERCOOLER - STAGE 1 INLET (°F):	174
JACKET WATER OUTLET (°F):	190
ASPIRATION:	TA
COOLING SYSTEM:	JW+1AC, OC+2AC
CONTROL SYSTEM:	ADEM4
EXHAUST MANIFOLD:	DRY
COMBUSTION:	LOW EMISSION
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3
SET POINT TIMING:	16

RATING STRATEGY:	STANDARD
RATING LEVEL:	CONTINUOUS
FUEL SYSTEM:	GAV
	WITH AIR FUEL RATIO CONTROL

SITE CONDITIONS:

FUEL:	Gas Analysis
FUEL PRESSURE RANGE(psia): (See note 1)	84.8-94.6
FUEL METHANE NUMBER:	43.3
FUEL LHV (Btu/scf):	1171
ALTITUDE(ft):	3063
INLET AIR TEMPERATURE(°F):	105
STANDARD RATED POWER:	4125 bhp@1000rpm

RATING		NOTES	LOAD	MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
				100%	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	4125	4125	3094	2063
INLET AIR TEMPERATURE			°F	105	105	105	105
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(3)	Btu/bhp-hr	6691	6691	6913	7342
FUEL CONSUMPTION (HHV)		(3)	Btu/bhp-hr	7370	7370	7615	8087
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(4)(5)	ft3/min	11164	11164	8455	5770
AIR FLOW	(WET)	(4)(5)	lb/hr	47048	47048	35630	24315
FUEL FLOW (60°F, 14.7 psia)			scfm	393	393	304	215
INLET MANIFOLD PRESSURE		(6)	in Hg(abs)	114.4	114.4	86.8	59.9
EXHAUST TEMPERATURE - ENGINE OUTLET		(7)	°F	766	766	817	884
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(5)(8)	ft3/min	25689	25689	20288	14597
EXHAUST GAS MASS FLOW	(WET)	(5)(8)	lb/hr	48374	48374	36658	25042
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(9)(10)	g/bkW-hr	0.40	0.40	0.40	0.40
CO		(9)(10)	g/bkW-hr	3.87	3.87	3.86	3.86
THC (mol. wt. of 15.84)		(9)(10)	g/bkW-hr	3.43	3.43	3.56	3.60
NMHC (mol. wt. of 15.84)		(9)(10)	g/bkW-hr	1.46	1.46	1.51	1.53
NMNEHC (VOCs) (mol. wt. of 15.84)		(9)(10)(11)	g/bkW-hr	0.91	0.91	0.94	0.95
HCHO (Formaldehyde)		(9)(10)	g/bkW-hr	0.17	0.17	0.17	0.19
CO2		(9)(10)	g/bkW-hr	628	628	651	693
EXHAUST OXYGEN		(9)(12)	% DRY	12.0	12.0	11.7	11.3
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(13)	Btu/min	45398	45398	39344	33323
HEAT REJ. TO ATMOSPHERE		(13)	Btu/min	16446	16446	16338	13820
HEAT REJ. TO LUBE OIL (OC)		(13)	Btu/min	19328	19328	18264	16034
HEAT REJ. TO A/C - STAGE 1 (1AC)		(13)(14)	Btu/min	57735	57735	29434	8824
HEAT REJ. TO A/C - STAGE 2 (2AC)		(13)(14)	Btu/min	10125	10125	6767	3924
COOLING SYSTEM SIZING CRITERIA							
TOTAL JACKET WATER CIRCUIT (JW+1AC)		(14)(15)	Btu/min	110560			
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)		(14)(15)	Btu/min	33825			

A cooling system safety factor of 0% has been added to the cooling system sizing criteria.

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Refer to product O&M manual for details on additional lower load capability. No overload permitted at rating shown.

For notes information consult page three.

G3516

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Josh Shaver - 677-1738 SCAR Genset

CATERPILLAR®

GENSET APPLICATION

ENGINE SPEED (rpm):	1800
COMPRESSION RATIO:	11
AFTERCOOLER TYPE:	SCAC
AFTERCOOLER WATER INLET (°F):	130
JACKET WATER OUTLET (°F):	210
ASPIRATION:	TA
COOLING SYSTEM:	JW+OC, AC
CONTROL SYSTEM:	ADEM4
EXHAUST MANIFOLD:	ASWC
COMBUSTION:	LOW EMISSION
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0
SET POINT TIMING:	18

RATING STRATEGY:	STANDARD
FUEL SYSTEM:	LPG IMPCO WITH AIR FUEL RATIO CONTROL

SITE CONDITIONS:

FUEL:	Nat Gas
FUEL PRESSURE RANGE(psig): (See note 1)	1.5-5.0
FUEL METHANE NUMBER:	84.7
FUEL LHV (Btu/scf):	905
ALTITUDE(ft):	3063
INLET AIR TEMPERATURE(°F):	105
STANDARD RATED POWER:	1462 bhp@1800rpm
POWER FACTOR:	1.0
VOLTAGE(V):	480

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**51%**
GENSET POWER	(WITHOUT FAN)	(2)(3)	ekW	1052	1015	762	521
GENSET POWER	(WITHOUT FAN)	(2)(3)	kVA	1052	1015	762	521
ENGINE POWER	(WITHOUT FAN)	(3)	bhp	1462	1411	1060	731
INLET AIR TEMPERATURE			°F	86	105	105	105
GENERATOR EFFICIENCY		(2)	%	96.5	96.5	96.3	95.6
GENSET EFFICIENCY	(ISO 3046/1)	(4)	%	32.1	32.0	31.0	29.3
THERMAL EFFICIENCY		(5)	%	51.8	52.1	54.2	57.9
TOTAL EFFICIENCY		(6)	%	83.9	84.1	85.2	87.2
ENGINE DATA							
GENSET FUEL CONSUMPTION	(ISO 3046/1)	(7)	Btu/ekW-hr	10614	10658	11007	11643
GENSET FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/ekW-hr	10820	10865	11220	11869
ENGINE FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/bhp-hr	7786	7818	8061	8461
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(8)(9)	ft3/min	3093	3087	2289	1481
AIR FLOW	(WET)	(8)(9)	lb/hr	13487	13008	9647	6241
FUEL FLOW (60°F, 14.7 psia)			scfm	210	203	157	114
INLET MANIFOLD PRESSURE		(10)	in Hg(abs)	63.5	61.4	47.2	32.5
EXHAUST TEMPERATURE - ENGINE OUTLET		(11)	°F	886	886	886	921
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(9)(12)	ft3/min	8306	8010	5959	3988
EXHAUST GAS MASS FLOW	(WET)	(9)(12)	lb/hr	14057	13561	10076	6551
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(13)(14)	g/bkW-hr	2.68	2.68	2.68	2.68
CO		(13)(14)	g/bkW-hr	2.58	2.56	2.43	2.21
THC (mol. wt. of 15.84)		(13)(14)	g/bkW-hr	3.13	3.14	3.19	3.30
NMHC (mol. wt. of 15.84)		(13)(14)	g/bkW-hr	0.47	0.47	0.48	0.50
NMNEHC (VOCs) (mol. wt. of 15.84)		(13)(14)(15)	g/bkW-hr	0.31	0.31	0.32	0.33
HCHO (Formaldehyde)		(13)(14)	g/bkW-hr	0.42	0.42	0.42	0.43
CO2		(13)(14)	g/bkW-hr	670	672	683	676
EXHAUST OXYGEN		(13)(16)	% DRY	7.4	7.3	6.9	6.0
HEAT REJECTION							
LHV INPUT		(17)	Btu/min	189683	183875	142413	103067
HEAT REJ. TO JACKET WATER (JW)		(18)	Btu/min	49466	48608	41267	33919
HEAT REJ. TO ATMOSPHERE	(INCLUDES GENERATOR)	(18)	Btu/min	9001	8774	7224	5918
HEAT REJ. TO LUBE OIL (OC)		(18)	Btu/min	7377	7249	6154	5059
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(18)	Btu/min	40524	39068	29117	20159
HEAT REJ. TO AFTERCOOLER (AC)		(18)(20)	Btu/min	10319	9677	5555	1545
PUMP POWER		(19)	Btu/min	971	971	971	971
COOLING SYSTEM SIZING CRITERIA							
TOTAL JACKET WATER CIRCUIT (JW+OC)		(21)	Btu/min	63265	62168		
TOTAL AFTERCOOLER CIRCUIT (AC)		(21)	Btu/min	13471	15226		
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(21)	Btu/min	44576	42974		
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.							
MINIMUM HEAT RECOVERY							
TOTAL JACKET WATER CIRCUIT (JW+OC)		(22)	Btu/min	50421	49547		
TOTAL AFTERCOOLER CIRCUIT (AC)		(22)	Btu/min	9803	9193		
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(22)	Btu/min	34102	31466		

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Refer to product O&M manual for details on additional lower load capability. No overload permitted at rating shown.

For notes information consult page three.
WARNINGS ISSUED FOR THIS RATING CONSULT PAGE 3

TNRCC

October 2000
RG-109 (Draft)

Air Permit Technical Guidance for Chemical Sources:

Flares and Vapor Oxidizers

printed on recycled paper

Air Permits Division

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

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_2 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

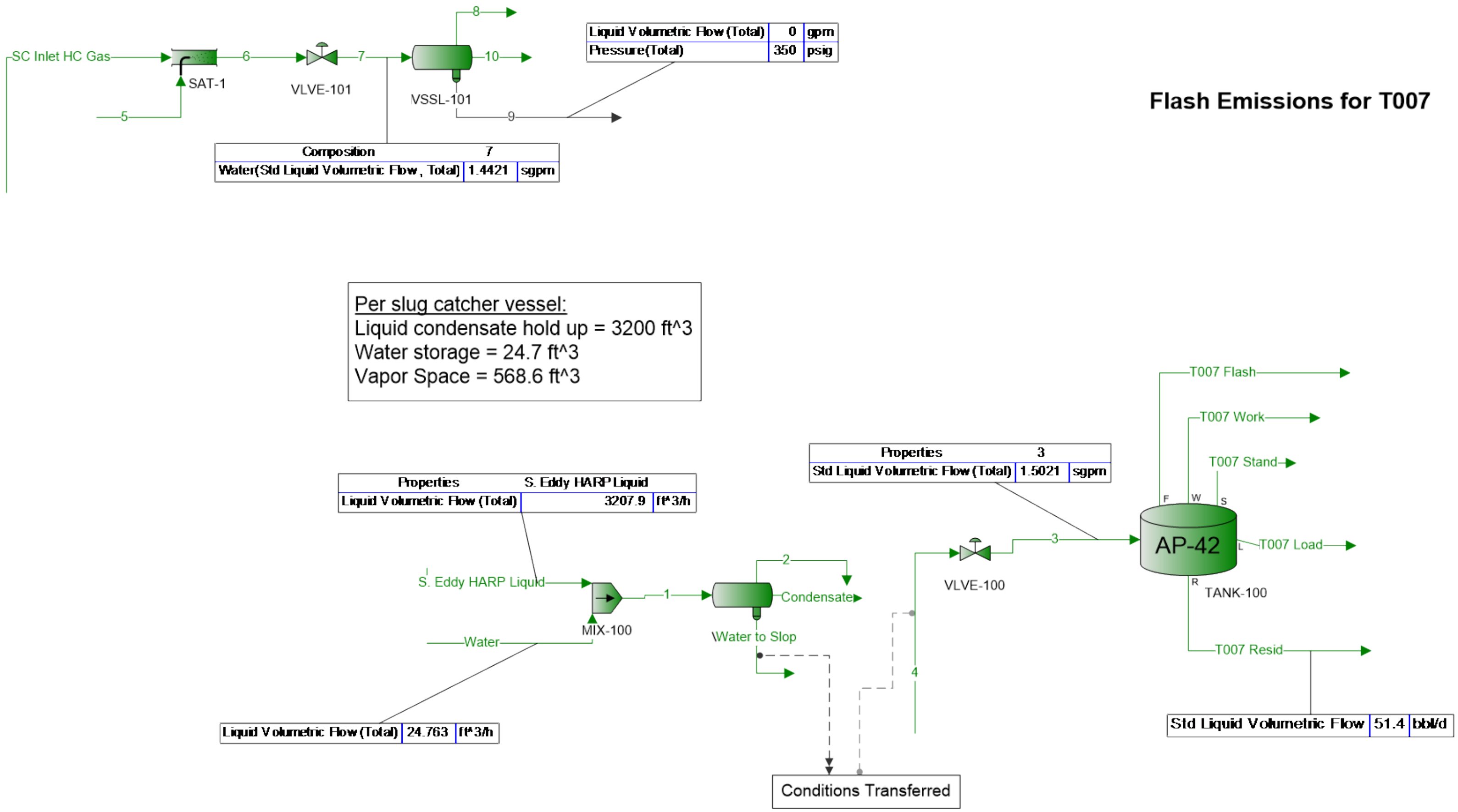
Claims for destruction efficiencies greater than those listed in Table 4 will be considered on a case-by-case basis. The applicant may make one of the three following demonstrations to justify the higher destruction efficiency: (1) general method, (2) 99.5 percent justification, or (3) flare stack sampling.

Table 4. Flare Factors

Waste Stream	Destruction/Removal Efficiency (DRE)		
VOC	98 percent (generic)		
	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_2S	98 percent		
NH_3	case by case		
CO	case by case		
Air Contaminants	**Emission Factors**		
thermal NO_x	steam-assist:	high Btu	0.0485 lb/MMBtu
		low Btu	0.068 lb/MMBtu
	other:	high Btu	0.138 lb/MMBtu
		low Btu	0.0641 lb/MMBtu
fuel NO_x	NO_x is 0.5 wt percent of inlet NH_3, other fuels case by case		
CO	steam-assist:	high Btu	0.3503 lb/MMBtu
		low Btu	0.3465 lb/MMBtu
	other:	high Btu	0.2755 lb/MMBtu
		low Btu	0.5496 lb/MMBtu
PM	none, required to be smokeless		
SO_2	100 percent S in fuel to SO_2		

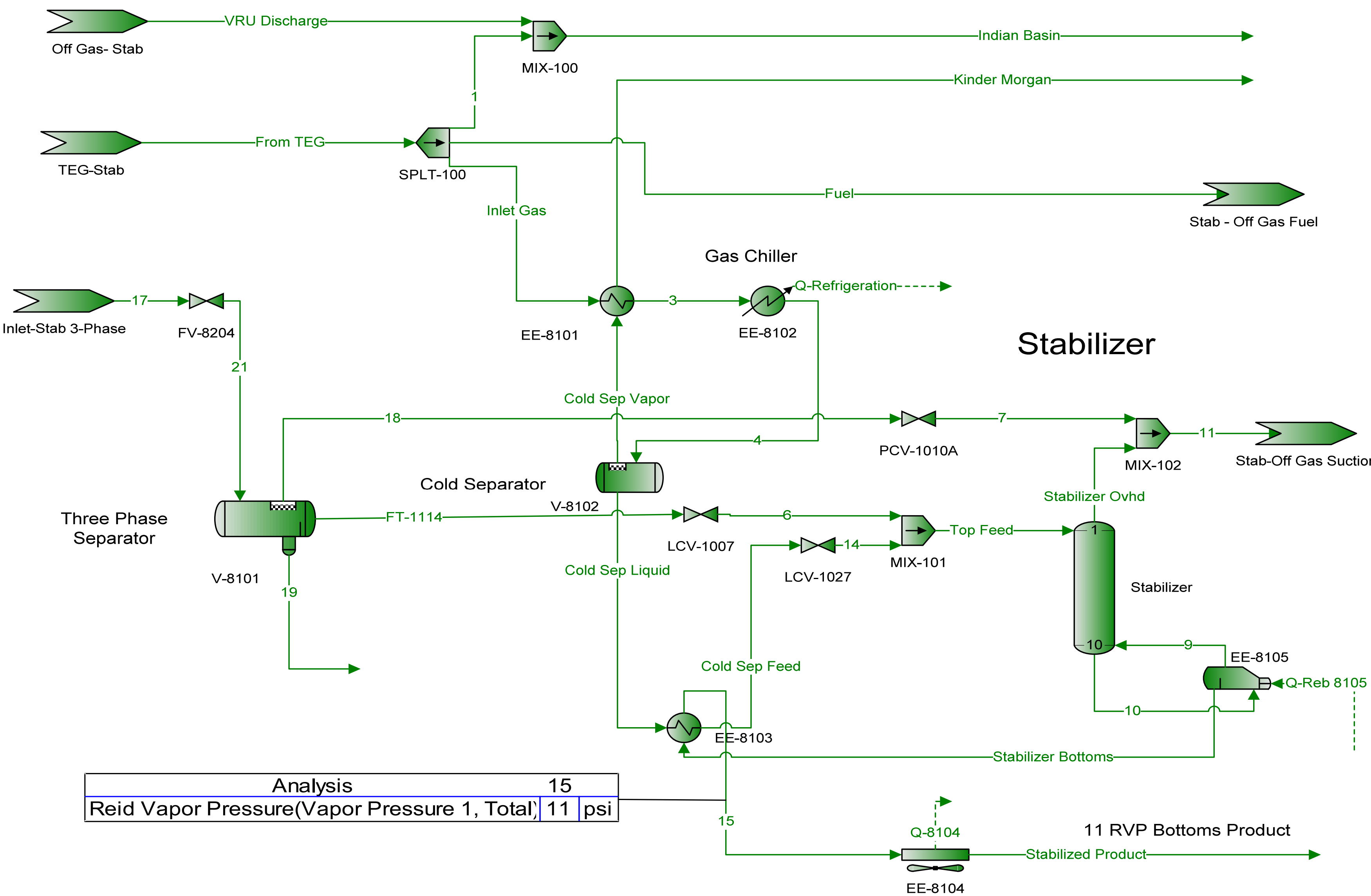
*The only exeption ot this is if inorganics might be emitted from the flare. In the case of landfills, the AP-42 PM factor may be used. In other cases, the emissions should be based on the composition of the waste stream routed to the flare.

Flash Emissions for T007



Process Streams		T007 Flash	T007 Load	T007 Resid	T007 Stand	T007 Work
Composition	Status:	Solved	Solved	Solved	Solved	Solved
Phase: Vapor	From Block:	TANK-100	TANK-100	TANK-100	TANK-100	TANK-100
	To Block:	--	--	--	--	--
Mass Flow		lb/h	lb/h		lb/h	lb/h
CO2		0.133378	0.00189041		0.00119717	0.00373511
N2		0.00253144	5.20004E-07		3.29312E-07	1.02744E-06
Methane		0.234813	0.000134200		8.49873E-05	0.000265156
Ethane		0.140636	9.19687E-05		5.82427E-05	0.000181714
Propane		0.0718049	8.00178E-06		5.06744E-06	1.58101E-05
i-Butane		0.00714517	1.91629E-07		1.21357E-07	3.78626E-07
n-Butane		0.0203610	4.96324E-07		3.14316E-07	9.80649E-07
2,2-Dimethylpropane		3.41758E-05	2.76260E-10		1.74953E-10	5.45842E-10
i-Pentane		0.00295933	1.89223E-08		1.19833E-08	3.73871E-08
n-Pentane		0.00122503	2.37697E-09		1.50531E-09	4.69648E-09
2,2-Dimethylbutane		9.32821E-06	1.07660E-11		6.81797E-12	2.12717E-11
Cyclopentane		0	0		0	0
2,3-Dimethylbutane		0.000129139	2.78977E-10		1.76673E-10	5.51210E-10
2-Methylpentane		0.000230393	2.45186E-10		1.55274E-10	4.84445E-10
3-Methylpentane		0.000273982	6.25413E-10		3.96067E-10	1.23571E-09
n-Hexane		0.000174999	6.59635E-11		4.17739E-11	1.30332E-10
Methylcyclopentane		0.000218516	6.08282E-10		3.85218E-10	1.20186E-09
Benzene		0.0132306	2.13091E-06		1.34948E-06	4.21031E-06
Cyclohexane		0.000339756	1.53830E-09		9.74191E-10	3.03942E-09
2-Methylhexane		1.68889E-05	3.60261E-12		2.28149E-12	7.11813E-12
3-Methylhexane		0	0		0	0
2,2,4-Trimethylpentane		2.55548E-05	3.43200E-12		2.17345E-12	6.78104E-12
n-Heptane		3.56897E-05	2.86606E-12		1.81504E-12	5.66283E-12
Methylcyclohexane		8.79239E-05	7.94464E-11		5.03125E-11	1.56972E-10
Toluene		0.00376847	1.33734E-07		8.46922E-08	2.64235E-07
n-Octane		9.08574E-07	8.57030E-15		5.42748E-15	1.69334E-14
Ethylbenzene		0.000124212	1.26097E-09		7.98555E-10	2.49145E-09
m-Xylene		2.28563E-05	1.33288E-10		8.44099E-11	2.63354E-10
o-Xylene		0.000421244	4.38913E-09		2.77959E-09	8.67215E-09
n-Nonane		1.27632E-07	3.12644E-16		1.97994E-16	6.17729E-16
n-Decane		3.44277E-09	6.94417E-19		4.39766E-19	1.37205E-18
Undecane		8.55938E-11	6.20916E-21		3.93219E-21	1.22682E-20
Dodecane		2.66972E-11	1.98251E-21		1.25550E-21	3.91709E-21
Water		0.0179314	3.95852E-05		2.50689E-05	7.82135E-05

Process Streams		T007 Flash	T007 Load	T007 Resid	T007 Stand	T007 Work
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved
Phase: Vapor	**From Block:**	TANK-100	TANK-100	TANK-100	TANK-100	TANK-100
	To Block:	--	--	--	--	--
Property	**Units**					
Temperature	°F	79.2053	79.2053		79.2053	79.2053
Pressure	psig	-1.81595	-1.81595		-1.81595	-1.81595
Mole Fraction Vapor	%	100	100		100	100
Mole Fraction Light Liquid	%	0	0		0	0
Mole Fraction Heavy Liquid	%	0	0		0	0
Phase Mole Fraction	%	100	13.4249		13.4249	13.4249
Molecular Weight	lb/lbmol	25.2452	38.1519		38.1519	38.1519
Mass Density	lb/ft^3	0.0564449	0.0853451		0.0853451	0.0853451
Molar Flow	lbmol/h	0.0258240	5.68167E-05		3.59814E-05	0.000112260
Mass Flow	lb/h	0.651930	0.00216766		0.00137276	0.00428293
Vapor Volumetric Flow	ft^3/h	11.5499	0.0253988		0.0160848	0.0501836
Liquid Volumetric Flow	gpm	1.43998	0.00316661		0.00200538	0.00625666
Std Vapor Volumetric Flow	MMSCFD	0.000235195	5.17465E-07		3.27704E-07	1.02242E-06
Std Liquid Volumetric Flow	sgpm	0.00315865	6.15482E-06		3.89778E-06	1.21609E-05
Compressibility		0.996134	0.995639		0.995639	0.995639
Specific Gravity		0.871650	1.31729		1.31729	1.31729
API Gravity						
Enthalpy	Btu/h	-1351.68	-7.88170		-4.99139	-15.5729
Mass Enthalpy	Btu/lb	-2073.34	-3636.03		-3636.03	-3636.03
Mass Cp	Btu/(lb*°F)	0.409161	0.237816		0.237816	0.237816
Ideal Gas CpCv Ratio		1.23906	1.28190		1.28190	1.28190
Dynamic Viscosity	cP	0.0111200	0.0143701		0.0143701	0.0143701
Kinematic Viscosity	cSt	12.2987	10.5114		10.5114	10.5114
Thermal Conductivity	Btu/(h*ft*°F)	0.0156055	0.0112447		0.0112447	0.0112447
Surface Tension	lbf/ft					
Net Ideal Gas Heating Value	Btu/ft^3	1052.52	230.930		230.930	230.930
Net Liquid Heating Value	Btu/lb	15713.4	2205.07		2205.07	2205.07
Gross Ideal Gas Heating Value	Btu/ft^3	1158.34	256.574		256.574	256.574
Gross Liquid Heating Value	Btu/lb	17304.5	2460.23		2460.23	2460.23



Analysis	15	
Reid Vapor Pressure(Vapor Pressure 1, Total)	11	psi

Process Streams		11
Composition	Status:	Solved
Phase: Total	From Block:	MIX-102
	To Block:	Stab-Off Gas Suction
Mole Fraction		%
Hydrogen Sulfide		0
Nitrogen		0.312230
Carbon Dioxide		0.464408
Methane		27.1909
Ethane		19.0598
Propane		27.8591
i-Butane		5.97467
n-Butane		15.5568
2,2-Dimethylpropane		0.0793060
i-Pentane		1.52584
n-Pentane		1.28386
2,2-Dimethylbutane		0.00868833
Cyclopentane		0
2,3-Dimethylbutane		0.0610432
2-Methylpentane		0.142975
3-Methylpentane		0.0752226
n-Hexane		0.130981
Methylcyclopentane		0.0700064
Benzene		0.0289122
Cyclohexane		0.0571682
2-Methylhexane		0.0100054
3-Methylhexane		0.0111842
2,2,4-Trimethylpentane		0
n-Heptane		0.0454781
Methylcyclohexane		0.0245459
Toluene		0.00791647
n-Octane		0.0120664
Ethylbenzene		0.000343834
m-Xylene		0.000321012
p-Xylene		0.000320591
o-Xylene		0
n-Nonane		0.00110478
n-Decane		0
n-Undecane		0

April 8, 2022

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

For: Enterprise Field Services, LLC
P. O. Box 1508
Carlsbad, New Mexico 88221

Sample: South Carlsbad Plant
Inlet to Plant
Spot Gas Sample @ 265 psig & 50 °F

Date Sampled: 03/22/22 Job Number: 221595.011

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	1.231	
Carbon Dioxide	0.214	
Methane	77.628	
Ethane	11.775	3.223
Propane	5.649	1.593
Isobutane	0.745	0.250
n-Butane	1.715	0.553
2-2 Dimethylpropane	0.012	0.005
Isopentane	0.351	0.131
n-Pentane	0.357	0.132
Hexanes	0.188	0.079
Heptanes Plus	0.135	0.052
Totals	100.000	6.019

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity ----------------------------	3.123	(Air=1)
Molecular Weight -------------------------	90.12	
Gross Heating Value ---------------------	4869	BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity ----------------------------	0.733	(Air=1)
Compressibility (Z) -----------------------	0.9963	
Molecular Weight -------------------------	21.16	
Gross Heating Value		
Dry Basis ---------------------------------	1292	BTU/CF
Saturated Basis ------------------------	1270	BTU/CF

*Hydrogen Sulfide tested on location by: Stain Tube Method (GPA 2377)
Results: 0.031 Gr/100 CF, 0.5 PPMV or <0.0001 Mol%

Base Conditions: 15.025 PSI & 60 Deg F

Sampled By: (24) Field
Analyst: RG
Processor: AS
Cylinder ID: ST-6013

Certified: FESCO, Ltd. - Alice, Texas

Conan Pierce 361-661-7015

FESCO, Ltd. Job Number: 221595.011

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	1.231		1.630
Carbon Dioxide	0.214		0.445
Methane	77.628		58.865
Ethane	11.775	3.223	16.735
Propane	5.649	1.593	11.774
Isobutane	0.745	0.250	2.047
n-Butane	1.715	0.553	4.711
2,2 Dimethylpropane	0.012	0.005	0.041
Isopentane	0.351	0.131	1.197
n-Pentane	0.357	0.132	1.217
2,2 Dimethylbutane	0.005	0.002	0.020
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.026	0.011	0.106
2 Methylpentane	0.061	0.026	0.248
3 Methylpentane	0.031	0.013	0.126
n-Hexane	0.065	0.027	0.265
Methylcyclopentane	0.031	0.011	0.123
Benzene	0.016	0.005	0.059
Cyclohexane	0.034	0.012	0.135
2-Methylhexane	0.004	0.002	0.019
3-Methylhexane	0.005	0.002	0.024
2,2,4 Trimethylpentane	0.003	0.002	0.016
Other C7's	0.012	0.005	0.056
n-Heptane	0.007	0.003	0.033
Methylcyclohexane	0.013	0.005	0.060
Toluene	0.004	0.001	0.017
Other C8's	0.005	0.002	0.026
n-Octane	0.001	0.001	0.005
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)	0.000	0.000	0.000
Totals	100.000	6.019	100.000

Computed Real Characteristics of Total Sample

Specific Gravity -------------------------------------	0.733	(Air=1)
Compressibility (Z) ---------------------------------	0.9963	
Molecular Weight ----------------------------------	21.16	

Gross Heating Value

Dry Basis ---	1292	BTU/CF
Saturated Basis --------------------------------	1270	BTU/CF

April 8, 2022

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

Sample: South Carlsbad Plant
Inlet to Plant
Spot Gas Sample @ 265 psig & 50 °F

Date Sampled: 03/22/22

Job Number: 221595.011

GLYCALC FORMAT

COMPONENT	**MOL%**	**GPM**	**Wt %**
Carbon Dioxide	0.214		0.445
Hydrogen Sulfide	< 0.001		< 0.001
Nitrogen	1.231		1.630
Methane	77.628		58.865
Ethane	11.775	3.223	16.735
Propane	5.649	1.593	11.774
Isobutane	0.745	0.250	2.047
n-Butane	1.727	0.558	4.752
Isopentane	0.351	0.131	1.197
n-Pentane	0.357	0.132	1.217
Cyclopentane	0.000	0.000	0.000
n-Hexane	0.065	0.027	0.265
Cyclohexane	0.034	0.012	0.135
Other C6's	0.123	0.052	0.500
Heptanes	0.059	0.024	0.255
Methylcyclohexane	0.013	0.005	0.060
2,2,4 Trimethylpentane	0.003	0.002	0.016
Benzene	0.016	0.005	0.059
Toluene	0.004	0.001	0.017
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.000	0.000	0.000
Octanes Plus	0.006	0.003	0.031
Totals	100.000	6.019	100.000

Real Characteristics Of Octanes Plus:

Specific Gravity -----------------------	3.843	(Air=1)
Molecular Weight -----------------------	110.89	
Gross Heating Value -----------------	5710	BTU/CF

Real Characteristics Of Total Sample:

Specific Gravity --------------------------	0.733	(Air=1)
Compressibility (Z) ----------------------	0.9963	
Molecular Weight ------------------------	21.16	
Gross Heating Value		
Dry Basis --------------------------------	1292	BTU/CF
Saturated Basis ------------------------	1270	BTU/CF

April 8, 2022

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

For: Enterprise Field Services, LLC
P. O. Box 1508
Carlsbad, New Mexico 88221

Sample: South Carlsbad Plant
Fuel Gas
Spot Gas Sample @ 785 psig & 83 °F

Date Sampled: 03/22/22 Job Number: 221595.001

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

COMPONENT	**MOL%**	**GPM**
Hydrogen Sulfide*	< 0.001	
Nitrogen	1.248	
Carbon Dioxide	0.022	
Methane	97.135	
Ethane	1.554	0.425
Propane	0.041	0.012
Isobutane	0.000	0.000
n-Butane	0.000	0.000
2-2 Dimethylpropane	0.000	0.000
Isopentane	0.000	0.000
n-Pentane	0.000	0.000
Hexanes	0.000	0.000
Heptanes Plus	0.000	0.000
Totals	100.000	0.436

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity ----------------------------	#DIV/0!	(Air=1)
Molecular Weight -------------------------	#DIV/0!	
Gross Heating Value ---------------------	#DIV/0!	BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity ----------------------------	0.568	(Air=1)
Compressibility (Z) -----------------------	0.9979	
Molecular Weight -------------------------	16.43	
Gross Heating Value		
Dry Basis ---------------------------------	1034	BTU/CF
Saturated Basis -------------------------	1017	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: 15.025 PSI & 60 Deg F

Sampled By: (24) Field
Analyst: RG
Processor: AS
Cylinder ID: ST-6001

Certified: FESCO, Ltd. - Alice, Texas

Conan Pierce 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	1.248		2.128
Carbon Dioxide	0.022		0.059
Methane	97.135		94.859
Ethane	1.554	0.425	2.844
Propane	0.041	0.012	0.110
Isobutane	0.000	0.000	0.000
n-Butane	0.000	0.000	0.000
2,2 Dimethylpropane	0.000	0.000	0.000
Isopentane	0.000	0.000	0.000
n-Pentane	0.000	0.000	0.000
2,2 Dimethylbutane	0.000	0.000	0.000
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.000	0.000	0.000
2 Methylpentane	0.000	0.000	0.000
3 Methylpentane	0.000	0.000	0.000
n-Hexane	0.000	0.000	0.000
Methylcyclopentane	0.000	0.000	0.000
Benzene	0.000	0.000	0.000
Cyclohexane	0.000	0.000	0.000
2-Methylhexane	0.000	0.000	0.000
3-Methylhexane	0.000	0.000	0.000
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.000	0.000	0.000
n-Heptane	0.000	0.000	0.000
Methylcyclohexane	0.000	0.000	0.000
Toluene	0.000	0.000	0.000
Other C8's	0.000	0.000	0.000
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)	0.000	0.000	0.000
Totals	100.000	0.436	100.000

Computed Real Characteristics of Total Sample

Specific Gravity ------------------------------------	0.568	(Air=1)
Compressibility (Z) --------------------------------	0.9979	
Molecular Weight ----------------------------------	16.43	
Gross Heating Value		
Dry Basis --	1034	BTU/CF
Saturated Basis --------------------------------	1017	BTU/CF

April 8, 2022

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

Sample: South Carlsbad Plant
Fuel Gas
Spot Gas Sample @ 785 psig & 83 °F

Date Sampled: 03/22/22

Job Number: 221595.001

GLYCALC FORMAT

COMPONENT	MOL%	GPM	Wt %
Carbon Dioxide	0.022		0.059
Hydrogen Sulfide	< 0.001		< 0.001
Nitrogen	1.248		2.128
Methane	97.135		94.859
Ethane	1.554	0.425	2.844
Propane	0.041	0.012	0.110
Isobutane	0.000	0.000	0.000
n-Butane	0.000	0.000	0.000
Isopentane	0.000	0.000	0.000
n-Pentane	0.000	0.000	0.000
Cyclopentane	0.000	0.000	0.000
n-Hexane	0.000	0.000	0.000
Cyclohexane	0.000	0.000	0.000
Other C6's	0.000	0.000	0.000
Heptanes	0.000	0.000	0.000
Methylcyclohexane	0.000	0.000	0.000
2,2,4 Trimethylpentane	0.000	0.000	0.000
Benzene	0.000	0.000	0.000
Toluene	0.000	0.000	0.000
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.000	0.000	0.000
Octanes Plus	0.000	0.000	0.000
Totals	100.000	0.436	100.000

Real Characteristics Of Octanes Plus:

Specific Gravity -----------------------	#DIV/0!	(Air=1)
Molecular Weight -----------------------	#DIV/0!	
Gross Heating Value -----------------	#DIV/0!	BTU/CF

Real Characteristics Of Total Sample:

Specific Gravity --------------------------	0.568	(Air=1)
Compressibility (Z) ----------------------	0.9979	
Molecular Weight ------------------------	16.43	
Gross Heating Value		
Dry Basis --------------------------------	1034	BTU/CF
Saturated Basis ------------------------	1017	BTU/CF

Inlet Stream for F-001 (Gas)

Component	**Mass Fraction (%)**
Hydrogen Sulfide	0.001
Nitrogen	1.630
Carbon Dioxide	0.445
Methane	58.865
Ethane	16.735
Propane	11.774
i-Butane	2.047
n-Butane	4.711
2,2-Dimethylpropane	0.041
i-Pentane	1.197
n-Pentane	1.217
2,2-Dimethylbutane	0.020
Cyclopentane	0.000
2,3-Dimethylbutane	0.106
2-Methylpentane	0.248
3-Methylpentane	0.126
n-Hexane	0.265
Methylcyclopentane	0.123
Benzene	0.059
Cyclohexane	0.135
2-Methylhexane	0.019
3-Methylhexane	0.024
2,2,4-Trimethylpentane	0.016
Other C7's	0.056
n-Heptane	0.033
Methylcyclohexane	0.060
Toluene	0.017
Other C8's	0.026
n-Octane	0.005
Ethylbenzene	0.000
M & P Xylenes	0.000
O-Xylenes	0.000
Other C9's	0.000
n-Nonane	0.000
Other C10's	0.000
n-Decane	0.000
Undecanes (11)	0.000
Total	**100.001**

Condensate Stream for F-001 (LL)

Component	**Mass Fraction (%)**
Hydrogen Sulfide	0
Nitrogen	0
Carbon Dioxide	1.56E-12
Methane	3.41E-14
Ethane	2.94E-08
Propane	0.000634161
i-Butane	0.128229103
n-Butane	5.031456961
2,2-Dimethylpropane	0.158545918
i-Pentane	14.05103734
n-Pentane	17.18954573
2,2-Dimethylbutane	0.266527577
Cyclopentane	0
2,3-Dimethylbutane	2.563416485
2-Methylpentane	6.596582328
3-Methylpentane	3.881328456
n-Hexane	8.492380503
Methylcyclopentane	4.295514381
Benzene	1.519673324
Cyclohexane	4.138898529
2-Methylhexane	1.565672441
3-Methylhexane	1.873134659
2,2,4-Trimethylpentane	0
n-Heptane	9.463728444
Methylcyclohexane	5.067089098
Toluene	1.749635538
n-Octane	8.41525751
Ethylbenzene	0.244897106
m-Xylene	0.256298415
p-Xylene	0.249932323
o-Xylene	0
n-Nonane	2.800062758
n-Decane	0
n-Undecane	0
C12	0
C13	0
C14	0
C15	0
C16	0
C17	0
C18	0
C19	0
C20	0
C21	0
C22	0
C23	0
C24	0
C25	0
C26	0
C27	0
C28	0
C29	0
C30	0
C36	0

VENT (SSM) Inlet Gas Analysis

Mole Fraction	%
Hydrogen Sulfide	0.001
Nitrogen	1.23100
Carbon Dioxide	0.21400
Methane	77.6280
Ethane	11.7750
Propane	5.64900
i-Butane	0.745000
n-Butane	1.71500
2,2-Dimethylpropane	0.01200000
i-Pentane	0.351000
n-Pentane	0.357000
2,2-Dimethylbutane	0.00500000
Cyclopentane	0
2,3-Dimethylbutane	0.0260000
2-Methylpentane	0.0610000
3-Methylpentane	0.0310000
n-Hexane	0.065000
Methylcyclopentane	0.0310000
Benzene	0.0160000
Cyclohexane	0.0340000
2-Methylhexane	0.0040000
3-Methylhexane	0.0050000
2,2,4-Trimethylpentane	0.003
n-Heptane	0.0180000
Methylcyclohexane	0.0130000
Toluene	0.0040000
n-Octane	0.0060000
Ethylbenzene	0.000000000
m-Xylene	0.000000000
p-Xylene	0.000000000
o-Xylene	0
n-Nonane	0.00000000
n-Decane	0
n-Undecane	0

Total VOC	9.15100
Total HAP	0.08800

Section 7

Subsection 2 – Information Used to Determine Emissions from Previous Applications

For clarity, this Subsection 2 contains pertinent information used to calculate emission for the existing permit (i.e. units other than Units 11 - 15, TK-1000, GEN-1, F-001, VENT(SSM), and Flare (SSM)). For pertinent information used for the calculations associated with current project modifications, please refer to Section 7 Subsection 1.

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

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

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

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

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

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $lb/10^6$ 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.

[b] Based on approximately 100% conversion of fuel carbon to CO_2. $CO_2[lb/10^6$ scf$]$ = (3.67) (CON) (C)(D), where CON = fractional conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.76), and D = density of fuel, $4.2x10^4$ $lb/10^6$ scf.

[c] All PM (total, condensible, 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_{10}, $PM_{2.5}$ or PM_1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible 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.

[d] Based on 100% conversion of fuel sulfur to SO_2.
Assumes sulfur content is natural gas of 2,000 grains/10^6 scf. The SO_2 emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO_2 emission factor by the ratio of the site-specific sulfur content (grains/10^6 scf) to 2,000 grains/10^6 scf.

Table 3.1-2a. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM STATIONARY GAS TURBINES

Emission Factors[a] - Uncontrolled				
Pollutant	Natural Gas-Fired Turbines[b]		Distillate Oil-Fired Turbines[d]	
	(lb/MMBtu)[c] (Fuel Input)	Emission Factor Rating	(lb/MMBtu)[e] (Fuel Input)	Emission Factor Rating
CO_2[f]	110	A	157	A
N_2O	0.003[g]	E	ND	NA
Lead	ND	NA	1.4 E-05	C
SO_2	0.94S[h]	B	1.01S[h]	B
Methane	8.6 E-03	C	ND	NA
VOC	2.1 E-03	D	4.1 E-04[j]	E
TOC[k]	1.1 E-02	B	4.0 E-03[l]	C
PM (condensible)	4.7 E-03[l]	C	7.2 E-03[l]	C
PM (filterable)	1.9 E-03[l]	C	4.3 E-03[l]	C
PM (total)	6.6 E-03[l]	C	1.2 E-02[l]	C

[a] Factors are derived from units operating at high loads ($\geq$80 percent load) only. For information on units operating at other loads, consult the background report for this chapter (Reference 16), available at "www.epa.gov/ttn/chief". ND = No Data, NA = Not Applicable.

[b] SCCs for natural gas-fired turbines include 2-01-002-01, 2-02-002-01 & 03, and 2-03-002-02 & 03.

[c] Emission factors based on an average natural gas heating value (HHV) of 1020 Btu/scf at 60°F. To convert from (lb/MMBtu) to (lb/10^6 scf), multiply by 1020. Similarly, these emission factors can be converted to other natural gas heating values.

[d] SCCs for distillate oil-fired turbines are 2-01-001-01, 2-02-001-01, 2-02-001-03, and 2-03-001-02.

[e] Emission factors based on an average distillate oil heating value of 139 MMBtu/10^3 gallons. To convert from (lb/MMBtu) to (lb/10^3 gallons), multiply by 139.

[f] Based on 99.5% conversion of fuel carbon to CO_2 for natural gas and 99% conversion of fuel carbon to CO_2 for distillate oil. CO_2 (Natural Gas) [lb/MMBtu] = (0.0036 scf/Btu)(%CON)(C)(D), where %CON = weight percent conversion of fuel carbon to CO_2, C = carbon content of fuel by weight, and D = density of fuel. For natural gas, C is assumed at 75%, and D is assumed at 4.1 E+04 lb/10^6scf. For distillate oil, CO_2 (Distillate Oil) [lb/MMBtu] = (26.4 gal/MMBtu) (%CON)(C)(D), where C is assumed at 87%, and the D is assumed at 6.9 lb/gallon.

[g] Emission factor is carried over from the previous revision to AP-42 (Supplement B, October 1996) and is based on limited source tests on a single turbine with water-steam injection (Reference 5).

[h] All sulfur in the fuel is assumed to be converted to SO_2. S = percent sulfur in fuel. Example, if sulfur content in the fuel is 3.4 percent, then S = 3.4. If S is not available, use 3.4 E-03 lb/MMBtu for natural gas turbines, and 3.3 E-02 lb/MMBtu for distillate oil turbines (the equations are more accurate).

[j] VOC emissions are assumed equal to the sum of organic emissions.

[k] Pollutant referenced as THC in the gathered emission tests. It is assumed as TOC, because it is based on EPA Test Method 25A.

[l] Emission factors are based on combustion turbines using water-steam injection.

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES[a]
(SCC 2-02-002-54)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	4.08 E+00	B
NO_x[c] <90% Load	8.47 E-01	B
CO[c] 90 - 105% Load	3.17 E-01	C
CO[c] <90% Load	5.57 E-01	B
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	1.47 E+00	A
Methane[g]	1.25 E+00	C
VOC[h]	1.18 E-01	C
PM10 (filterable)[i]	7.71 E-05	D
PM2.5 (filterable)[i]	7.71 E-05	D
PM Condensable[j]	9.91 E-03	D
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[k]	<4.00 E-05	E
1,1,2-Trichloroethane[k]	<3.18 E-05	E
1,1-Dichloroethane	<2.36 E-05	E
1,2,3-Trimethylbenzene	2.30 E-05	D
1,2,4-Trimethylbenzene	1.43 E-05	C
1,2-Dichloroethane	<2.36 E-05	E
1,2-Dichloropropane	<2.69 E-05	E
1,3,5-Trimethylbenzene	3.38 E-05	D
1,3-Butadiene[k]	2.67E-04	D
1,3-Dichloropropene[k]	<2.64 E-05	E
2-Methylnaphthalene[k]	3.32 E-05	C
2,2,4-Trimethylpentane[k]	2.50 E-04	C
Acenaphthene[k]	1.25 E-06	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES (Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Acenaphthylene[k]	5.53 E-06	C
Acetaldehyde[k,l]	8.36 E-03	A
Acrolein[k,l]	5.14 E-03	A
Benzene[k]	4.40 E-04	A
Benzo(b)fluoranthene[k]	1.66 E-07	D
Benzo(e)pyrene[k]	4.15 E-07	D
Benzo(g,h,i)perylene[k]	4.14 E-07	D
Biphenyl[k]	2.12 E-04	D
Butane	5.41 E-04	D
Butyr/Isobutyraldehyde	1.01 E-04	C
Carbon Tetrachloride[k]	<3.67 E-05	E
Chlorobenzene[k]	<3.04 E-05	E
Chloroethane	1.87 E-06	D
Chloroform[k]	<2.85 E-05	E
Chrysene[k]	6.93 E-07	C
Cyclopentane	2.27 E-04	C
Ethane	1.05 E-01	C
Ethylbenzene[k]	3.97 E-05	B
Ethylene Dibromide[k]	<4.43 E-05	E
Fluoranthene[k]	1.11 E-06	C
Fluorene[k]	5.67 E-06	C
Formaldehyde[k,l]	5.28 E-02	A
Methanol[k]	2.50 E-03	B
Methylcyclohexane	1.23 E-03	C
Methylene Chloride[k]	2.00 E-05	C
n-Hexane[k]	1.11 E-03	C
n-Nonane	1.10 E-04	C

Table 3.2-2. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES
(Continued)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
n-Octane	3.51 E-04	C
n-Pentane	2.60 E-03	C
Naphthalene[k]	7.44 E-05	C
PAH[k]	2.69 E-05	D
Phenanthrene[k]	1.04 E-05	D
Phenol[k]	2.40 E-05	D
Propane	4.19 E-02	C
Pyrene[k]	1.36 E-06	C
Styrene[k]	<2.36 E-05	E
Tetrachloroethane[k]	2.48 E-06	D
Toluene[k]	4.08 E-04	B
Vinyl Chloride[k]	1.49 E-05	C
Xylene[k]	1.84 E-04	B

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

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

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

[c] Emission tests with unreported load conditions were not included in the data set.

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10^6 scf, and

h = heating value of natural gas (assume 1020 Btu/scf at 60°F).

[e] Based on 100% conversion of fuel sulfur to SO_2. Assumes sulfur content in natural gas of 2,000 gr/10^6scf.

[f] Emission factor for TOC is based on measured emission levels from 22 source tests.

[g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.31 lb/MMBtu vs. 1.25 lb/MMBtu, respectively.

[h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.

[i] Considered $\leq$ 1 μm in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).

[j] PM Condensable = PM Condensable Inorganic + PM-Condensable Organic

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

[l] For lean burn engines, aldehyde emissions quantification using CARB 430 may reflect interference with the sampling compounds due to the nitrogen concentration in the stack. The presented emission factor is based on FTIR measurements. Emissions data based on CARB 430 are available in the background report.

13.2.2 Unpaved Roads

13.2.2.1 General

When a vehicle travels an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed.

The particulate emission factors presented in the previous draft version of this section of AP-42, dated October 2001, implicitly included the emissions from vehicles in the form of exhaust, brake wear, and tire wear as well as resuspended road surface material[25]. EPA included these sources in the emission factor equation for unpaved public roads (equation 1b in this section) since the field testing data used to develop the equation included both the direct emissions from vehicles and emissions from resuspension of road dust.

This version of the unpaved public road emission factor equation only estimates particulate emissions from resuspended road surface material [23, 26]. The particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using EPA's MOBILE6.2 [24]. This approach eliminates the possibility of double counting emissions. Double counting results when employing the previous version of the emission factor equation in this section and MOBILE6.2 to estimate particulate emissions from vehicle traffic on unpaved public roads. It also incorporates the decrease in exhaust emissions that has occurred since the unpaved public road emission factor equation was developed. The previous version of the unpaved public road emission factor equation includes estimates of emissions from exhaust, brake wear, and tire wear based on emission rates for vehicles in the 1980 calendar year fleet. The amount of PM released from vehicle exhaust has decreased since 1980 due to lower new vehicle emission standards and changes in fuel characteristics.

13.2.2.2 Emissions Calculation And Correction Parameters[1-6]

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Field investigations also have shown that emissions depend on source parameters that characterize the condition of a particular road and the associated vehicle traffic. Characterization of these source parameters allow for "correction" of emission estimates to specific road and traffic conditions present on public and industrial roadways.

Dust emissions from unpaved roads have been found to vary directly with the fraction of silt (particles smaller than 75 micrometers [µm] in diameter) in the road surface materials.[1] The silt fraction is determined by measuring the proportion of loose dry surface dust that passes a 200-mesh screen, using the ASTM-C-136 method. A summary of this method is contained in Appendix C of AP-42. Table 13.2.2-1 summarizes measured silt values for industrial unpaved roads. Table 13.2.2-2 summarizes measured silt values for public unpaved roads. It should be noted that the ranges of silt content vary over two orders of magnitude. Therefore, the use of data from this table can potentially introduce considerable error. Use of this data is strongly discouraged when it is feasible to obtain locally gathered data.

Since the silt content of a rural dirt road will vary with geographic location, it should be measured for use in projecting emissions. As a conservative approximation, the silt content of the parent soil in the area can be used. Tests, however, show that road silt content is normally lower than in the surrounding parent soil, because the fines are continually removed by the vehicle traffic, leaving a higher percentage of coarse particles.

Other variables are important in addition to the silt content of the road surface material. For example, at industrial sites, where haul trucks and other heavy equipment are common, emissions are highly correlated with vehicle weight. On the other hand, there is far less variability in the weights of cars and pickup trucks that commonly travel publicly accessible unpaved roads throughout the United States. For those roads, the moisture content of the road surface material may be more dominant in determining differences in emission levels between, for example a hot, desert environment and a cool, moist location.

The PM-10 and TSP emission factors presented below are the outcomes from stepwise linear regressions of field emission test results of vehicles traveling over unpaved surfaces. Due to a limited amount of information available for PM-2.5, the expression for that particle size range has been scaled against the result for PM-10. Consequently, the quality rating for the PM-2.5 factor is lower than that for the PM-10 expression.

Table 13.2.2-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIAL ON INDUSTRIAL UNPAVED ROADS[a]

Industry	Road Use Or Surface Material	Plant Sites	No. Of 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 area	1	1	-	7.1
Stone quarrying and processing	Plant road	2	10	2.4 - 16	10
	Haul road to/from 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 pit	1	12	3.9 - 9.7	5.8
Western surface coal mining	Haul road to/from 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 (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

[a]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:

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

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

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

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 lb/VMT = 281.9 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[a]	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

[a] 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 [23]. The emission factor also varies with aerodynamic size range as shown in Table 13.2.2-4

Table 13.2.2-4. EMISSION FACTOR FOR 1980'S VEHICLE FLEET EXHAUST, BRAKE WEAR AND TIRE WEAR

Particle Size Range[a]	*C*, Emission Factor for Exhaust, Brake Wear and Tire Wear[b] lb/VMT
$PM_{2.5}$	0.00036
PM_{10}	0.00047
PM_{30}[c]	0.00047

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.
[b] Units shown are pounds per vehicle mile traveled (lb/VMT).
[c] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

It is important to note that the vehicle-related source conditions refer to the average weight, speed, and number of wheels for all vehicles traveling the road. For example, if 98 percent of traffic on the road are 2-ton cars and trucks while the remaining 2 percent consists of 20-ton trucks, then the mean weight is 2.4 tons. More specifically, Equations 1a and 1b are *not* intended to be used to calculate a separate emission factor for each vehicle class within a mix of traffic on a given unpaved road. That is, in the example, one should *not* determine one factor for the 2-ton vehicles and a second factor for the 20-ton trucks. Instead, only one emission factor should be calculated that represents the "fleet" average of 2.4 tons for all vehicles traveling the road.

Moreover, to retain the quality ratings when addressing a group of unpaved roads, it is necessary that reliable correction parameter values be determined for the road in question. The field and laboratory procedures for determining road surface silt and moisture contents are given in AP-42 Appendices C.1 and C.2. Vehicle-related parameters should be developed by recording visual observations of traffic. In some cases, vehicle parameters for industrial unpaved roads can be determined by reviewing maintenance records or other information sources at the facility.

In the event that site-specific values for correction parameters cannot be obtained, then default values may be used.In the absence of site-specific silt content information, an appropriate mean value from Table 13.2.2-1 may be used as a default value, but the quality rating of the equation is reduced by two letters. Because of significant differences found between different types of road surfaces and between different areas of the country, use of the default moisture content value of 0.5 percent in Equation 1b is discouraged. The quality rating should be downgraded two letters when the default moisture content value is used. (It is assumed that readers addressing industrial roads have access to the information needed to develop average vehicle information in Equation 1a for their facility.)

The effect of routine watering to control emissions from unpaved roads is discussed below in Section 13.2.2.3, “Controls”. However, all roads are subject to some natural mitigation because of rainfall and other precipitation. The Equation 1a and 1b emission factors can be extrapolated to annual 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:

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

where:

E_{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 <u>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</u> 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[18-22]

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

1. <u>Vehicle restrictions</u> 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.

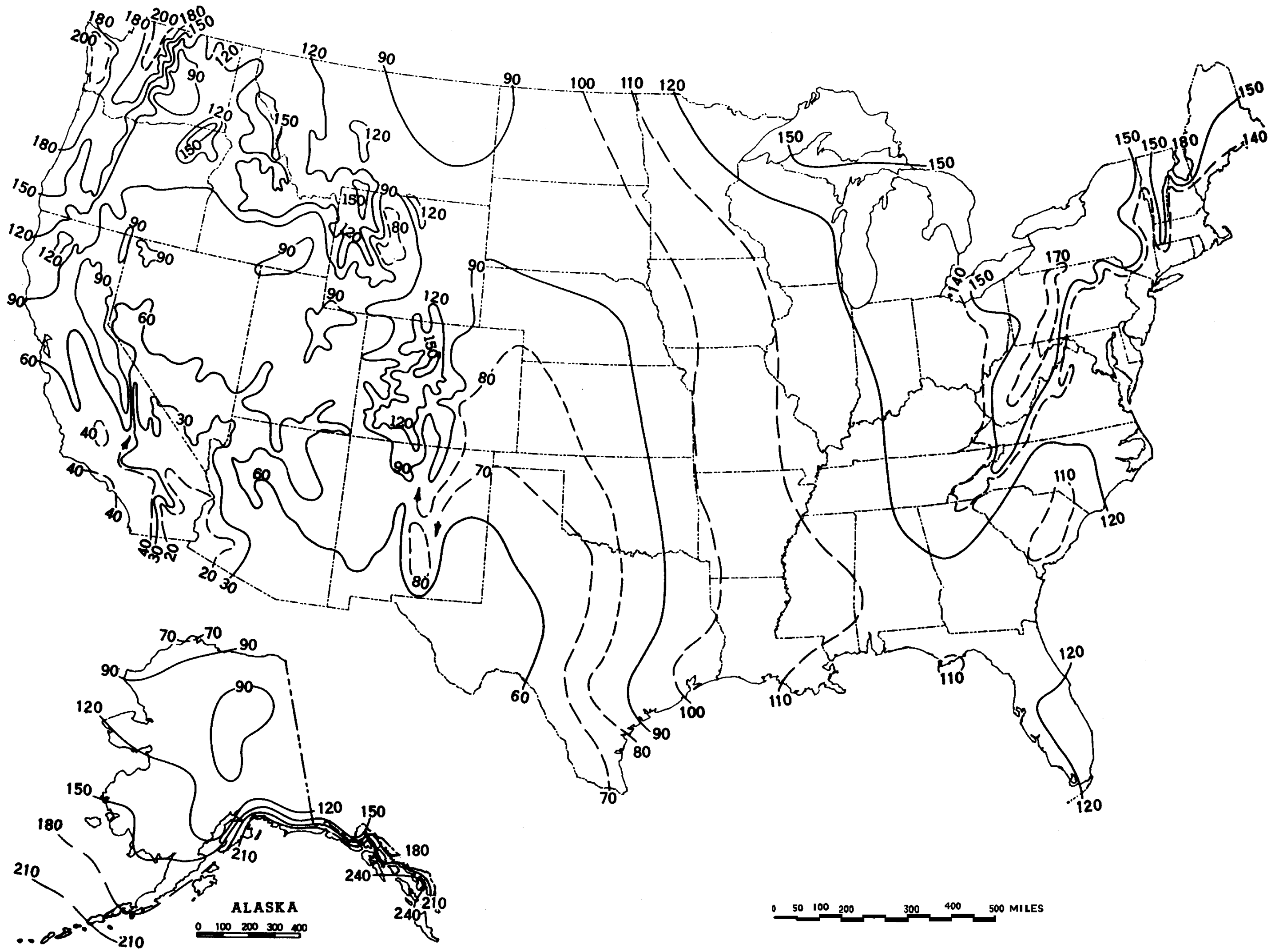


Figure 13.2.2-1. Mean number of days with 0.01 inch or more of precipitation in United States.

Surface improvements. Control options in this category alter the road surface. As opposed to the "surface treatments" discussed below, improvements are relatively "permanent" and do not require periodic retreatment.

The most obvious surface improvement is paving an unpaved road. This option is quite expensive and is probably most applicable to relatively short stretches of unpaved road with at least several hundred vehicle passes per day. Furthermore, if the newly paved road is located near unpaved areas or is used to transport material, it is essential that the control plan address routine cleaning of the newly paved road surface.

The control efficiencies achievable by paving can be estimated by comparing emission factors for unpaved and paved road conditions. The predictive emission factor equation for paved roads, given in Section 13.2.1, requires estimation of the silt loading on the traveled portion of the paved surface, which in turn depends on whether the pavement is periodically cleaned. Unless curbing is to be installed, the effects of vehicle excursion onto unpaved shoulders (berms) also must be taken into account in estimating the control efficiency of paving.

Other improvement methods cover the road surface with another material that has a lower silt content. Examples include placing gravel or slag on a dirt road. Control efficiency can be estimated by comparing the emission factors obtained using the silt contents before and after improvement. The silt content of the road surface should be determined after 3 to 6 months rather than immediately following placement. Control plans should address regular maintenance practices, such as grading, to retain larger aggregate on the traveled portion of the road.

Surface treatments refer to control options which require periodic reapplication. Treatments fall into the two main categories of (a) "wet suppression" (i. e., watering, possibly with surfactants or other additives), which keeps the road surface wet to control emissions and (b) "chemical stabilization/ treatment", which attempts to change the physical characteristics of the surface. The necessary reapplication frequency varies from several minutes for plain water under summertime conditions to several weeks or months for chemical dust suppressants.

Watering increases the moisture content, which conglomerates particles and reduces their likelihood to become suspended when vehicles pass over the surface. The control efficiency depends on how fast the road dries after water is added. This in turn depends on (a) the amount (per unit road surface area) of water added during each application; (b) the period of time between applications; (c) the weight, speed and number of vehicles traveling over the watered road during the period between applications; and (d) meteorological conditions (temperature, wind speed, cloud cover, etc.) that affect evaporation during the period.

Figure 13.2.2-2 presents a simple bilinear relationship between the instantaneous control efficiency due to watering and the resulting increase in surface moisture. The moisture ratio "M" (i.e., the x-axis in Figure 13.2.2-2) is found by dividing the surface moisture content of the watered road by the surface moisture content of the uncontrolled road. As the watered road surface dries, both the ratio M and the predicted instantaneous control efficiency (i.e., the y-axis in the figure) decrease. The figure shows that between the uncontrolled moisture content and a value twice as large, a small increase in moisture content results in a large increase in control efficiency. Beyond that, control efficiency grows slowly with increased moisture content.

Given the complicated nature of how the road dries, characterization of emissions from watered roadways is best done by collecting road surface material samples at various times between water truck passes. (Appendices C.1 and C.2 present the sampling and analysis procedures.) The moisture content measured can then be associated with a control efficiency by use of Figure 13.2.2-2. Samples that reflect average conditions during the watering cycle can take the form of either a series of samples between water applications or a single sample at the midpoint. It is essential that samples be collected during periods with active traffic on the road. Finally, because of different evaporation rates, it is recommended that samples be collected at various times during the year. If only one set of samples is to be collected, these must be collected during hot, summertime conditions.

When developing watering control plans for roads that do not yet exist, it is strongly recommended that the moisture cycle be established by sampling similar roads in the same geographic area. If the moisture cycle cannot be established by similar roads using established watering control plans, the more complex methodology used to estimate the mitigation of rainfall and other precipitation can be used to estimate the control provided by routine watering. An estimate of the maximum daytime Class A pan evaporation (based upon daily evaporation data published in the monthly Climatological Data for the state by the National Climatic Data Center) should be used to insure that adequate watering capability is available during periods of highest evaporation. The hourly precipitation values in the spreadsheet should be replaced with the equivalent inches of precipitation (where the equivalent of 1 inch of precipitation is provided by an application of 5.6 gallons of water per square yard of road). Information on the long term average annual evaporation and on the percentage that occurs between May and October was published in the Climatic Atlas (Reference 16). Figure 13.2.2-3 presents the geographical distribution for "Class A pan evaporation" throughout the United States. Figure 13.2.2-4 presents the geographical distribution of the percentage of this evaporation that occurs between May and October. The U. S. Weather Bureau Class A evaporation pan is a cylindrical metal container with a depth of 10 inches and a diameter of 48 inches. Periodic measurements are made of the changes of the water level.

The above methodology should be used <u>only for prospective analyses</u> and for designing watering programs for existing roadways. The quality rating of an emission factor for a watered road that is based on this methodology should be downgraded two letters. Periodic road surface samples should be collected and analyzed to verify the efficiency of the watering program.

As opposed to watering, chemical dust suppressants have much less frequent reapplication requirements. These materials suppress emissions by changing the physical characteristics of the existing road surface material. Many chemical unpaved road dust suppressants form a hardened surface that binds particles together. After several applications, a treated road often resembles a paved road except that the surface is not uniformly flat. Because the improved surface results in more grinding of small particles, the silt content of loose material on a highly controlled surface may be substantially higher than when the surface was uncontrolled. For this reason, the models presented as Equations 1a and 1b cannot be used to estimate emissions from chemically stabilized roads. Should the road be allowed to return to an uncontrolled state with no visible signs of large-scale cementing of material, the Equation 1a and 1b emission factors could then be used to obtain conservatively high emission estimates.

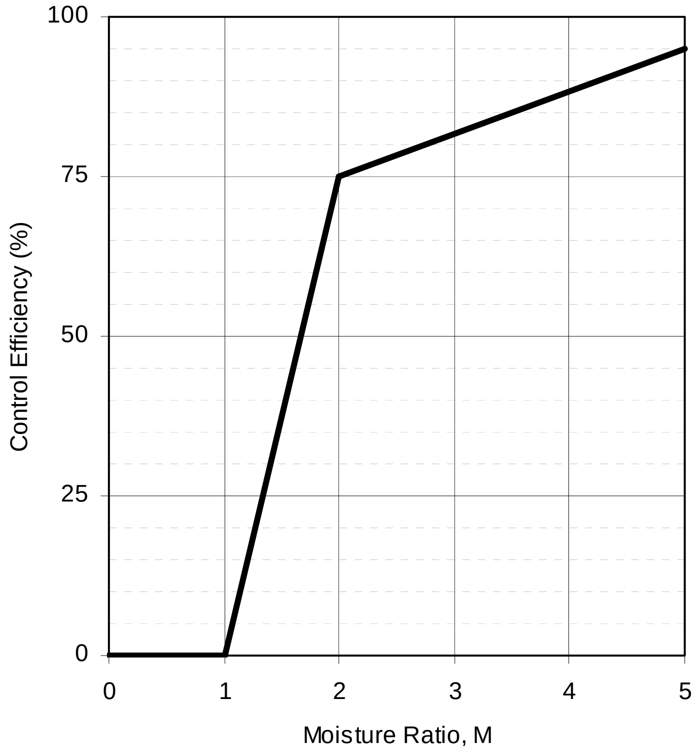


Figure 13.2.2-2. Watering control effectiveness for unpaved travel surfaces

The control effectiveness of chemical dust suppressants appears to depend on (a) the dilution rate used in the mixture; (b) the application rate (volume of solution per unit road surface area); (c) the time between applications; (d) the size, speed and amount of traffic during the period between applications; and (e) meteorological conditions (rainfall, freeze/thaw cycles, etc.) during the period. Other factors that affect the performance of dust suppressants include other traffic characteristics (e. g., cornering, track-on from unpaved areas) and road characteristics (e. g., bearing strength, grade). The variabilities in the above factors and differences between individual dust control products make the control efficiencies of chemical dust suppressants difficult to estimate. Past field testing of emissions from controlled unpaved roads has shown that chemical dust suppressants provide a PM-10 control efficiency of about 80 percent when applied at regular intervals of 2 weeks to 1 month.

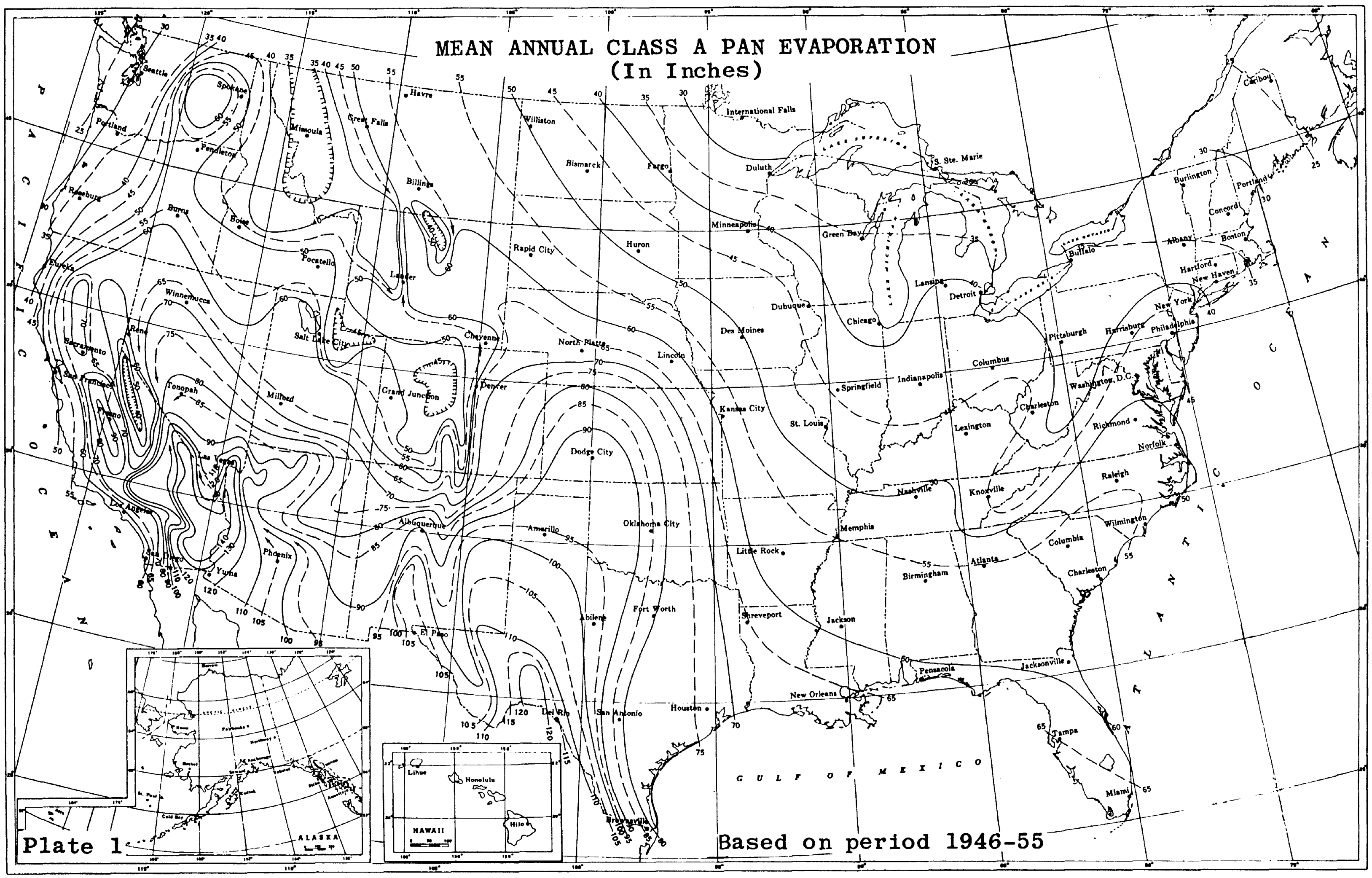


Figure 13.2.2-3. Annual evaporation data.

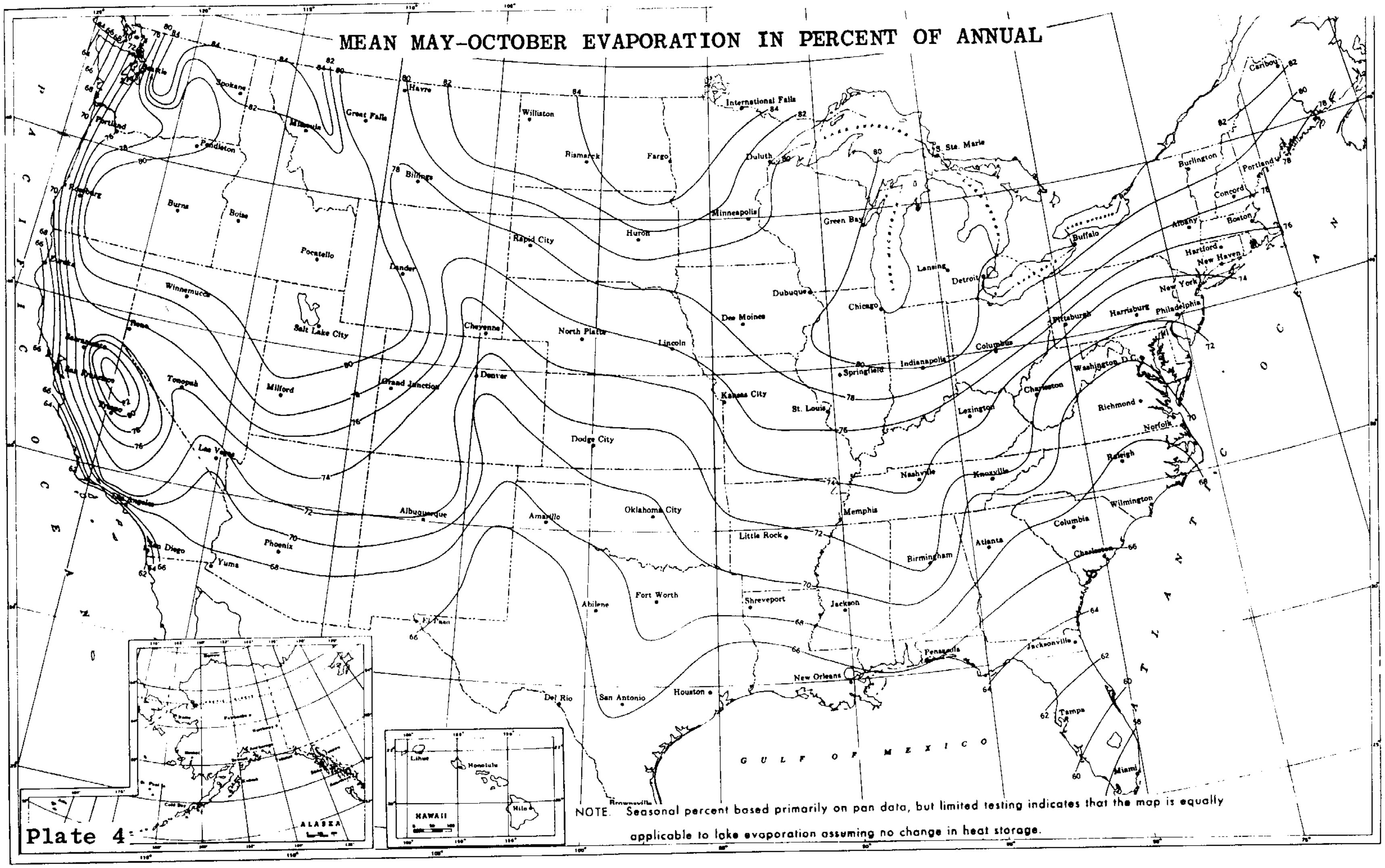


Figure 13.2.2-4. Geographical distribution of the percentage of evaporation occurring between May and October.

Petroleum resin products historically have been the dust suppressants (besides water) most widely used on industrial unpaved roads. Figure 13.2.2-5 presents a method to estimate average control efficiencies associated with petroleum resins applied to unpaved roads.[20] Several items should be noted:

1. The term "ground inventory" represents the total volume (per unit area) of petroleum resin concentrate (*not solution*) applied since the start of the dust control season.

2. Because petroleum resin products must be periodically reapplied to unpaved roads, the use of a time-averaged control efficiency value is appropriate. Figure 13.2.2-5 presents control efficiency values averaged over two common application intervals, 2 weeks and 1 month. Other application intervals will require interpolation.

3. Note that zero efficiency is assigned until the ground inventory reaches 0.05 gallon per square yard (gal/yd^2). Requiring a minimum ground inventory ensures that one must apply a reasonable amount of chemical dust suppressant to a road before claiming credit for emission control. Recall that the ground inventory refers to the amount of petroleum resin concentrate rather than the total solution.

As an example of the application of Figure 13.2.2-5, suppose that Equation 1a was used to estimate an emission factor of 7.1 lb/VMT for PM-10 from a particular road. Also, suppose that, starting on May 1, the road is treated with 0.221 gal/yd^2 of a solution (1 part petroleum resin to 5 parts water) on the first of each month through September. Then, the average controlled emission factors, shown in Table 13.2.2-5, are found.

Table 13.2-2-5. EXAMPLE OF AVERAGE CONTROLLED EMISSION FACTORS FOR SPECIFIC CONDITIONS

Period	Ground Inventory, gal/yd^2	Average Control Efficiency, %[a]	Average Controlled Emission Factor, lb/VMT
May	0.037	0	7.1
June	0.073	62	2.7
July	0.11	68	2.3
August	0.15	74	1.8
September	0.18	80	1.4

[a] From Figure 13.2.2-5, $\leq$10 µm. Zero efficiency assigned if ground inventory is less than 0.05 gal/yd^2.
1 lb/VMT = 281.9 g/VKT. 1 gal/yd^2 = 4.531 L/m^2.

Besides petroleum resins, other newer dust suppressants have also been successful in controlling emissions from unpaved roads. Specific test results for those chemicals, as well as for petroleum resins and watering, are provided in References 18 through 21.

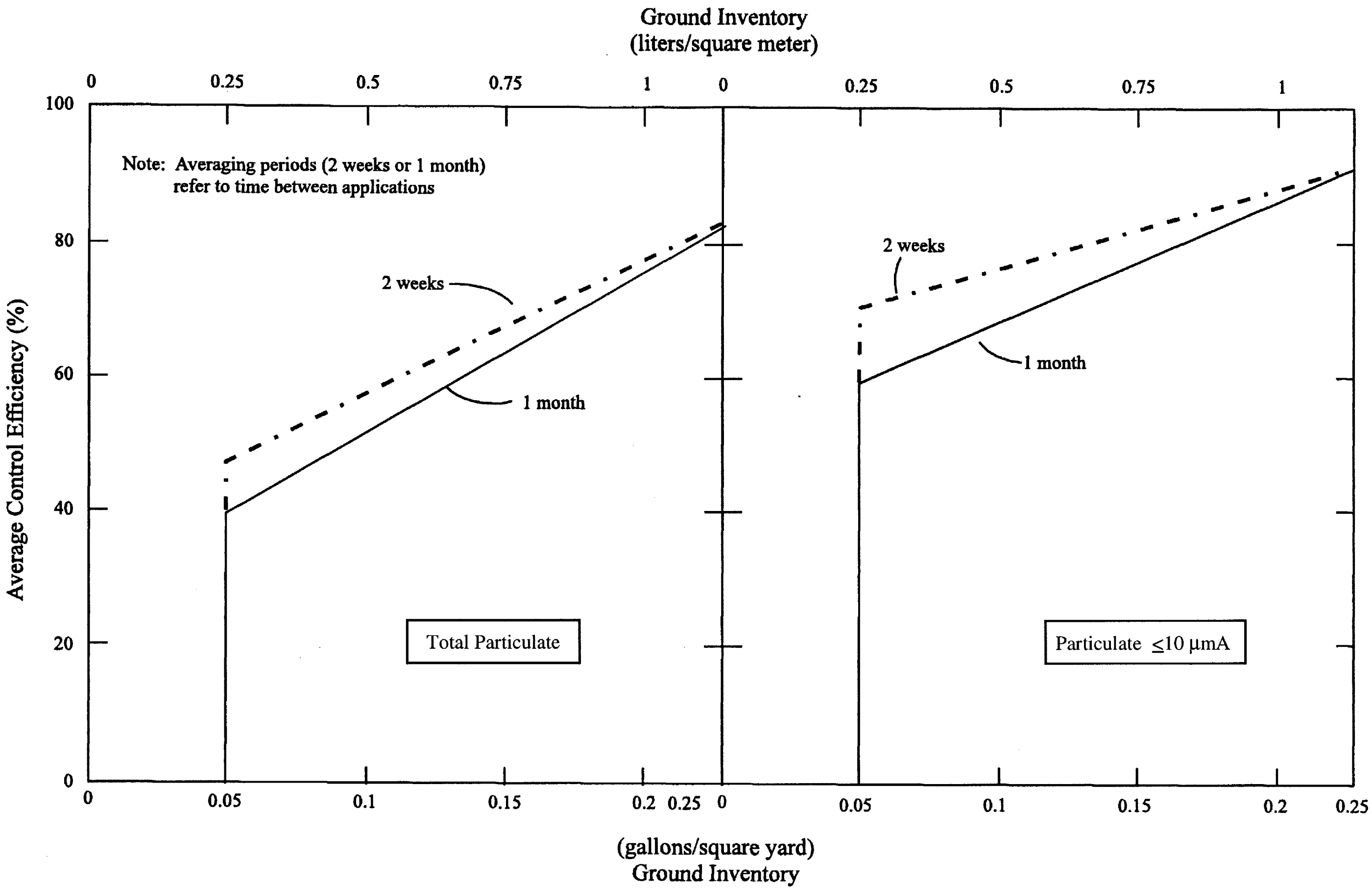


Figure 13.2.2-5. Average control efficiencies over common application intervals.

13.2.2.4 Updates Since The Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the background report for this section (Reference 6).

October 1998 (Supplement E)– This was a major revision of this section. Significant changes to the text and the emission factor equations were made.

October 2001 – Separate emission factors for unpaved surfaces at industrial sites and publicly accessible roads were introduced. Figure 13.2.2-2 was included to provide control effectiveness estimates for watered roads.

December 2003 – The public road emission factor equation (equation 1b) was adjusted to remove the component of particulate emissions from exhaust, brake wear, and tire wear. The parameter C in the new equation varies with aerodynamic size range of the particulate matter. Table 13.2.2-4 was added to present the new coefficients.

January 2006 – The PM-2.5 particle size multipliers (i.e., factors) in Table 13.2.2-2 were modified and the quality ratings were upgraded from C to B based on the wind tunnel studies of a variety of dust emitting surface materials.

References For Section 13.2.2

1. C. Cowherd, Jr., *et al., Development Of Emission Factors For Fugitive Dust Sources*, EPA-450/3-74-037, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1974.

2. R. J. Dyck and J. J. Stukel, "Fugitive Dust Emissions From Trucks On Unpaved Roads", *Environmental Science And Technology, 10*(10):1046-1048, October 1976.

3. R. O. McCaldin and K. J. Heidel, "Particulate Emissions From Vehicle Travel Over Unpaved Roads", Presented at the 71st Annual Meeting of the Air Pollution Control Association, Houston, TX, June 1978.

4. C. Cowherd, Jr, *et al., Iron And Steel Plant Open Dust Source Fugitive Emission Evaluation*, EPA-600/2-79-013, U. S. Environmental Protection Agency, Cincinnati, OH, May 1979.

5. G. Muleski, *Unpaved Road Emission Impact*, Arizona Department of Environmental Quality, Phoenix, AZ, March 1991.

6. *Emission Factor Documentation For AP-42, Section 13.2.2, Unpaved Roads, Final Report*, Midwest Research Institute, Kansas City, MO, September 1998.

7. T. Cuscino, Jr., *et al., Taconite Mining Fugitive Emissions Study*, Minnesota Pollution Control Agency, Roseville, MN, June 1979.

8. *Improved Emission Factors For Fugitive Dust From Western Surface Coal Mining Sources*, 2 Volumes, EPA Contract No. 68-03-2924, Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC.