Enterprise Products

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

ENTERPRISE PRODUCTS OPERATING LLC

July 10, 2023

7021 0950 0000 6828 3689
Return Receipt Requested

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

**Re: Title V Permit No. P264-R1M1 Renewal and Significant Modification
Enterprise Fields Services, LLC – Chaparral Gas Plant
Eddy County, New Mexico**

Sir or Madam:

Enterprise Field Services, LLC (Enterprise) is submitting this Title V application for a Renewal and Significant Modification to the current Title V Permit No. P264-R1M1, issued on July 30, 2020, for the Chaparral Gas Plant. The proposed updates to the Title V permit will reflect the current NSR Construction Permit No. 3662-M9, issued on July 26, 2022.

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 | | June 9, 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.<br>If "Yes" to question 5a, state whether each facility that was constructed or operated without the required air quality permit met at least one of the following exceptions:<br><br>a. The unpermitted facility was discovered after acquisition during a timely environmental audit that was authorized by the Department; or<br><br>b. The operator of the facility estimated that the facility's emissions would not require an air permit, **and** the operator applied for an air permit within 30 calendar days of discovering that an air permit was required for the facility. | ☐ 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:**<br><br>New Mexico Environment Department<br>Air Quality Bureau<br>Permits Section<br>525 Camino de los Marquez, Suite 1<br>Santa Fe, New Mexico, 87505<br><br>Phone: (505) 476-4300<br>Fax: (505) 476-4375<br>www.env.nm.gov/aqb | | **For Department use only:** |

# Universal Air Quality Permit Application

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

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

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

**Acknowledgements:**
☑ I acknowledge that a pre-application meeting is available to me upon request. ☑ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
☐ $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).
☐ Check No.: in the amount of
☑ 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: **20.2.70.300.B.(2) NMAC** and **20.2.70.404.C.(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 (see 1st 3 to 5 #s of permit IDEA ID No.): 26896 | Updating Permit/NOI #: P264-R1M1 |
|---|---|---|---|
| 1 | Facility Name:<br>Chaparral Gas Plant | Plant primary SIC Code (4 digits): 1321<br>Plant NAIC code (6 digits): 211130 | |
| a | Facility Street Address (If no facility street address, provide directions from a prominent landmark):<br>To reach the facility from Loco Hills, NM head east on US-82 E toward Goat Ropers Rd for 5.7 miles, then turn right onto Shugart Rd and continue for 10.6 miles. Then turn right onto an access road and drive 2.4 miles to the entrance for the Chaparral Gas Plant. | | |
| 2 | Plant Operator Company Name: Enterprise Products Operating, LLC | Phone/Fax: (713) 381-5766 / (713) 759-3931 | |
| a | Plant Operator Address: PO Box 4324 Houston, TX 77210-4324 | | |

| | | |
|---|---|---|
| b | Plant Operator's New Mexico Corporate ID or Tax ID: 328 9188 | |
| 3 | Plant Owner(s) name(s): Enterprise Field Services, LLC | Phone/Fax: (713) 381-5766 / (287) 887-8086 |
| 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) 381-5766 / (713) 759-3931 |
| a | Mailing Address: PO Box 4324 Houston, TX 77210-4324 | E-mail: environmental@eprod.com |
| 5 | ☑ Preparer: Jing Li<br>☐ Consultant: N/A | 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: Rob Dunaway | Phone/Fax: (575) 628-6802 |
| a | Address: PO Box 4324, Houston TX 77210-4324 | E-mail: rhdunaway@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?<br>☐ 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?<br>☑ 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?<br>☐ Yes ☐ No ☑ N/A | |
| 6 | Does this facility have a Title V operating permit (20.2.70 NMAC)?<br>☑ Yes ☐ No | If yes, the permit No. is: P-264-R1M1 |
| 7 | Has this facility been issued a No Permit Required (NPR)?<br>☐ 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)?<br>☑ Yes ☐ No | If yes, the permit No. is: 3662-M9 |
| 10 | Is this facility registered under a General permit (GCP-1, GCP-2, etc.)?<br>☐ 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: 2.9 MMscf/hour | Daily: 70 MMscf/day | Annually: 25,550 MMscf/year |
| b | Proposed | Hourly: 2.9 MMscf/hour | Daily: 70 MMscf/day | Annually: 25,550 MMscf/year |
| 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: 2.9 MMscf/hour | Daily: 70 MMscf/day | Annually: 25,550 MMscf/year |
| b | Proposed | Hourly: 2.9 MMscf/hour | Daily: 70 MMscf/day | Annually: 25,550 MMscf/year |

## Section 1-D: Facility Location Information

| | | | | | |
|---|---|---|---|---|---|
| 1 | Section: 17 | Range: 31E | Township: 19S | County: Eddy | Elevation (ft): 3,431 |
| 2 | UTM Zone: ☐ 12 or ☑ 13 | | | Datum: ☐ NAD 27 ☐ NAD 83 ☑ WGS 84 | |
| a | UTM E (in meters, to nearest 10 meters): 603,640 m E | | | UTM N (in meters, to nearest 10 meters): 3,613,490 m N | |
| b | **AND** Latitude (deg., min., sec.): 32°39'15.06"N | | | Longitude (deg., min., sec.): 103°53'41.54"W | |
| 3 | Name and zip code of nearest New Mexico town: Loco Hills, NM 88255 | | | | |
| 4 | Detailed Driving Instructions from nearest NM town (attach a road map if necessary): To reach the facility from Loco Hills, NM head east on US-82 E toward Goat Ropers Rd for 5.7 miles, then turn right onto Shugart Rd and continue for 10.6 miles. Then turn right onto an access road and drive 2.4 miles to the entrance for the Chaparral Gas Plant. | | | | |
| 5 | The facility is 12 miles southwest of Loco Hills, NM 88255. | | | | |
| 6 | Status of land at facility (check one): ☐ Private ☐ Indian/Pueblo ☑ Federal BLM ☐ Federal Forest Service ☐ Other (specify) | | | | |
| 7 | List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: **Municipalities:** None. **Indian tribes:** None. **Counties:** Eddy County, Lea County. | | | | |
| 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/](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: | | | | |
| 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): 67.7 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: 19,593 m | | | | |
| 12 | Method(s) used to delineate the Restricted Area: Fence<br><br>"**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area. | | | | |
| 13 | Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC?<br>☐ Yes ☑ No<br>A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites. | | | | |
| 14 | Will this facility operate in conjunction with other air regulated parties on the same property? ☒ No ☐ Yes<br>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 ($\frac{\text{hours}}{\text{day}}$): 24 | ($\frac{\text{days}}{\text{week}}$): 7 | | ($\frac{\text{weeks}}{\text{year}}$): 52 | ($\frac{\text{hours}}{\text{year}}$): 8760 | |
| 2 | Facility's maximum daily operating schedule (if less than 24 $\frac{\text{hours}}{\text{day}}$)? | Start: N/A | ☐AM ☐PM | End: N/A | | ☐AM ☐PM |
| 3 | Month and year of anticipated start of construction: N/A | | | | | |
| 4 | Month and year of anticipated construction completion: N/A | | | | | |
| 5 | Month and year of anticipated startup of new or modified facility: N/A | | | | | |
| 6 | Will this facility operate at this site for more than one year? ☑ 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: ____N/A________________<br><br>Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user. | | |

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

| | | |
|---|---|---|
| 1 | ☐ 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: P.O. Box 4324, Houston, TX 77210-4324 | |
| 2 | Alternate Responsible Official (20.2.70.300.D.2 NMAC): Rodney M. Sartor | Phone: (713) 381-6595 |
| a | A. R.O. Title: Senior Director | A. R.O. e-mail: environmental@eprod.com |
| b | A. R. O. Address: P.O. Box 4324, Houston, TX 77210-4324 | |
| 3 | Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship): Enterprise Field Services, LLC and Enterprise Products Operating, LLC | |
| 4 | Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.): Enterprise Product Partners, LP | |
| a | Address of Parent Company: 1100 Louisiana St., Houston, TX 77002 | |
| 5 | Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.): N/A | |
| 6 | Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: 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:<br>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 – 78 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]<br>Date of Construction/ Reconstruction[2] | Controlled by Unit #<br>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. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E-1000 | Compressor Engine | Caterpillar | G3516 TALE | WPW02043 | 1340 hp | 1340 hp | 15-Feb-08<br>23-Jul-17 | E-1000<br>E-1000 | 31000203 | ☐ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☑ To Be Modified ☐ To be Replaced | 4SLB | N/A |
| E-2000 | Compressor Engine | Caterpillar | G3516 TALE | WPW01848 | 1340 hp | 1340 hp | 27-Nov-07<br>21-Sep-17 | E-2000<br>E-2000 | 31000203 | ☐ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☑ To Be Modified ☐ To be Replaced | 4SLB | N/A |
| E-3000 | Compressor Engine | Waukesha | 7042 GL | 296656 | 1547 hp | 1547 hp | 30-Jan-79<br>19-Feb-16 | E-3000<br>E-3000 | 31000203 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | 4SLB | N/A |
| E-4000 | Compressor Engine | Waukesha | 7042 GL | 335197 | 1547 hp | 1547 hp | 23-May-79<br>24-May-16 | E-4000<br>E-4000 | 31000203 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | 4SLB | N/A |
| E-5000 | Compressor Engine | Caterpillar | G3516 TALE | 4EK01789 | 1340 hp | 1340 hp | 24-Jun-94<br>1-Jan-08 | E-5000<br>E-5000 | 31000203 | ☐ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☑ To Be Modified ☐ To be Replaced | 4SLB | N/A |
| E-6000 | Compressor Engine | Caterpillar | G3516 TALE | WPW02312 | 1340 hp | 1340 hp | 29-Jul-08<br>29-May-18 | E-6000<br>E-6000 | 31000203 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | 4SLB | N/A |
| E-7000 | Compressor Engine | Caterpillar | G3516 TALE | WPW01845 | 1340 hp | 1340 hp | 26-Nov-07<br>1-Jul-18 | E-7000<br>E-7000 | 31000203 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | 4SLB | N/A |
| AMINE-1 & 2** | Amine Sweetening Unit - Flash Tank and Still Vent | OPD | N/A | 08040-1<br>08040-3 | 19.9 gpm | 19.9 gpm | 1-Jul-08<br>1-May-09 | FLARE<br>FLARE | 31000305 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| CRYO[5] | Cryogenic Unit (NGL, Distillation Train) | LA Turbine | N/A | 10034ESC | 70 MMscfd | 70 MMscfd | 1-Jan-88<br>1-May-09 | N/A<br>N/A | 31000199 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| DEHY-1a (Reboiler) | Glycol Dehy Reboiler Burner | Hanover | N/A | 3418 | 2.0 MMbtu/hr (Reboiler) | 2.0 MMbtu/hr (Reboiler) | 1-Feb-06<br>1-May-09 | DEHY-1<br>DEHY-1a (Reboiler) | 31000302 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| DEHY-1b (Still Vent) | Glycol Dehy Still Vent/Flash Tank | Smith | N/A | CR5097 | 70 MMscfd (Vent/Flash Tank) | 70 MMscfd (Vent/Flash Tank) | 1-Apr-06<br>1-May-09 | BTEX/ ECD<br>BTEX/ ECD | 31000301 | ☐ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☑ To Be Modified ☐ To be Replaced | N/A | N/A |
| DEHY-2a (Reboiler) | Glycol Dehy Reboiler Burner | Flame Co | N/A | 1310-72K | 1.0 MMbtu/hr (Reboiler) | 1.0 MMbtu/hr (Reboiler) | 1-Jan-14<br>1-Jan-14 | DEHY-2<br>DEHY-2 | 31000302 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| DEHY-2b (Still Vent) | Glycol Dehy Still Vent/Flash Tank | Valerus | N/A | P3908 | 70 MMscfd (Vent/Flash Tank) | 70 MMscfd (Vent/Flash Tank) | 1-Jan-14<br>1-Jan-15 | BTEX Buster/Flare<br>BTEX Buster/Flare | 31000301 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| MOLE-1 | Molecular Sieve Regenerator Heater | Power Flame Inc. | C4-F-25 | 61246080 | 2.8 MMbtu/hr | 2.8 MMbtu/hr | 1-Jan-88<br>1-May-88 | N/A<br>MOLE-1 | 31000404 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ 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]<br>Date of Construction/ Reconstruction[2] | Controlled by Unit #<br>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. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TK-1 | Condensate Tank | Permian Tank | N/A | 48396 | 300 bbl | 300 bbl | 1-Jan-09<br>1-Jan-09 | N/A<br>TK-1 | 40400311 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| TK-2 | Condensate Tank | Permian Tank | N/A | 41892 | 300 bbl | 300 bbl | 1-Apr-06<br>1-Dec-07 | N/A<br>TK-2 | 40400311 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| TK-3 | Condensate Tank | N/A | N/A | N/A | 300 bbl | 300 bbl | 5-Jan-09<br>5-Jan-09 | N/A<br>TK-3 | 40400311 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| LOAD-1 | Truck Loading of Condensate | N/A | N/A | N/A | 60,000 bpy | 60,000 bpy | 1-Jan-08<br>1-Jan-08 | N/A<br>N/A | 31000199 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| FLARE[5] | Process Flare | Flare Industries | N/A | 8416 | 1.4 MMscf/hr | 1.4 MMscf/hr | 1-Jan-09<br>1-Jan-09 | N/A<br>FLARE | 31000215 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| FLARE[5] | Emergency Flare | Flare Industries | N/A | 8416 | 0.024 MMscf/hr | 0.024 MMscf/hr | 1-Jan-09<br>1-Jan-09 | N/A<br>FLARE | 31000215 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| ECD-1 | Enclosed Combustor | SpiralX | N/A | TBD | 1.4 MMscf/hr | 1.4 MMscf/hr | 1-Oct-21<br>1-Feb-22 | N/A<br>ECD-1 | 31000215 | ☑ Existing (unchanged) ☐ To be Removed<br>New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| FUG-1 | Sitewide Fugitives - KKK | N/A | N/A | N/A | N/A | N/A | N/A<br><22-AUG-11 | N/A<br>N/A | 31088811 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| FUG-2 | Sitewide Fugitives - KKK | N/A | N/A | N/A | N/A | N/A | N/A<br><22-AUG-11 | N/A<br>N/A | 31088811 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| HAUL | Unpaved Haul Road Emissions | N/A | N/A | N/A | N/A | N/A | N/A<br>N/A | N/A<br>N/A | 31088811 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| SSM/M1 | Startup, Shutdown, Maintenance and Malfunction Emissions | N/A | N/A | N/A | N/A | N/A | N/A<br>N/A | N/A<br>N/A | 31088811 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| MRU[6] | Mechanical Refrigeration Unit (MRU) | TBD | TBD | TBD | 70 MMscfd | 70 MMscfd | 1-Oct-14<br>9-Apr-15 | N/A<br>N/A | 31000199 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| P24A | Centrifugal Pump | Schlumberger | 100330179 | H12T23870147-11 1 | 125 bbl/hr | 125 bbl/hr | 10-Jan-11<br>22-Dec-15 | N/A<br>N/A | 31000309 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| P24B | Centrifugal Pump | Schlumberger | 100330179 | H12T638628 61-11 1 | 125 bbl/hr | 125 bbl/hr | 1-Oct-11<br>22-Dec-15 | N/A<br>N/A | 31000309 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced | N/A | N/A |
| E-VRU-1 | VRU Compressor Engine | Caterpillar | G3508 LE | 9TG0045 | 515 | 515 | 2-Oct-96<br>1-Dec-21 | E-VRU-1<br>E-VRU-1 | 31000203 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ 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] | |
| TK-Misc | Slop Tank | N/A | N/A | N/A | 20.2.72.202.B.5 | N/A | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | N/A | List Item #1.a | N/A | |
| P24A | Centrifugal pump | Schlumberger | G3A1B | 125 | 20.2.72.202.B.5 | Oct. 2011 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | XDB2I23982 | bbl/hr | List Item #1.a | TBD | |
| P24B | Centrifugal pump | Schlumberger | G3A1B | 125 | 20.2.72.202.B.5 | Oct. 2011 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | XDB2I21574 | bbl/hr | List Item #1.a | TBD | |
| C-1000 | Reciprocating Compressor | Ariel | JGT/4 | 1400 | 20.2.72.202.B.5 | 1-Aug-08 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | F-30575 | rpm | List Item #1.a | <8/23/2011 | |
| C-2000 | Reciprocating Compressor | Ariel | JGT/4 | 1400 | 20.2.72.202.B.5 | 1-Aug-08 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | F-30959 | rpm | List Item #1.a | <8/23/2011 | |
| C-3000 | Reciprocating Compressor | Ingersoll Rand | 4 cyl RDS | 1400 | 20.2.72.202.B.5 | 1-Jan-90 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | YRY104 | rpm | List Item #1.a | <8/23/2011 | |
| C-4000 | Reciprocating Compressor | Ingersoll Rand | 4 cyl RDS | 1400 | 20.2.72.202.B.5 | 1-Jan-90 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | YRY104 | rpm | List Item #1.a | <8/23/2011 | |
| C-5000 | Reciprocating Compressor | Ariel | JGE/4 | 1400 | 20.2.72.202.B.5 | 1-Jun-94 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | F-9596 | rpm | List Item #1.a | <8/23/2011 | |
| C-6000 | Reciprocating Compressor | Ariel | JGE/4 | 1400 | 20.2.72.202.B.5 | 1-Apr-04 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | F-19952 | rpm | List Item #1.a | <8/23/2011 | |
| C-7000 | Reciprocating Compressor | Ariel | JGE/4 | 1400 | 20.2.72.202.B.5 | 1-Sep-08 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | F-30960 | rpm | List Item #1.a | Jul-18 | |
| C-VRU1 | Reciprocating Compressor | Ariel | JGH2 | 1400 | 20.2.72.202.B.5 | 1-Sep-96 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | F11461 | rpm | List Item #1.a | Dec-21 | |
| TK-LO | Lube Oil Tank | N/A | N/A | 1020 | 20.2.72.202.B.5 | 1-Aug-08 | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | <8/23/2011 | |
| TK-EC | Engine Coolant Tank | N/A | N/A | 1020 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | TBD | |
| TK-PC | Booster Pump Coolant Tank | N/A | N/A | 750 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed<br>☐ New/Additional ☐ Replacement Unit<br>☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | TBD | |

| 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] | |
| TK-AF | Antifreeze Tank | N/A | N/A | 500 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | TBD | |
| TK-M2 | Methanol Tank | N/A | N/A | 1000 | 20.2.72.202.B.5 | <8/23/2011 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | <8/23/2011 | |
| TK-M3 | Methanol Tank | N/A | N/A | 1000 | 20.2.72.202.B.5 | <8/23/2011 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | <8/23/2011 | |
| TK-M4 | Methanol Tank | N/A | N/A | 500 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | TBD | |
| TK-G1 | Glycol Tank | N/A | N/A | 100 | 20.2.72.202.B.5 | <8/23/2011 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | IA List Item #5 | <8/23/2011 | |
| TK-G2 | Glycol Tank | N/A | N/A | 3000 | 20.2.72.202.B.5 | <8/23/2011 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | <8/23/2011 | |
| TK-TEG1 | TEG Tank | N/A | N/A | 3000 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | TBD | |
| TK-A1 | Amine Make-Up Tank | N/A | N/A | 210 | 20.2.72.202.B.5 | <8/23/2011 | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | IA List Item #5 | <8/23/2011 | |
| TK-Misc | Slop Oil Tank | N/A | N/A | 400 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | IA List Item #5 | TBD | |
| TK-DIESEL | Diesel Tank | N/A | N/A | 300 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | IA List Item #5 | TBD | |
| FT-1 | Gasoline Tank | N/A | N/A | 500 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | gallons | List Item #1.a | TBD | |
| LD-Misc | Oil Loading | N/A | N/A | 400 | 20.2.72.202.B.5 | TBD | ☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced |
| | | | N/A | bbl | IA List Item #5 | 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 |
|---|---|---|---|---|---|---|
| E-1000 | AFRC and Catalytic Converter | 23-Jul-17 | CO, VOC, HAPs | E-1000 | 83% CO, HCHO; 50% VOC | Engineering Est. |
| E-3000 | AFRC and Catalytic Converter | 19-Feb-16 | CO, HAPs | E-3000 | 80% CO and HAPs | Engineering Est. |
| E-4000 | AFRC and Catalytic Converter | 24-May-16 | CO, HAPs | E-4000 | 80% CO and HAPs | Engineering Est. |
| E-6000 | AFRC and Catalytic Converter | 29-May-18 | CO, HAPs | E-6000 | 80% CO and HAPs | Engineering Est. |
| E-7000 | AFRC and Catalytic Converter | 1-Jul-18 | CO, HAPs | E-7000 | 80% CO and HAPs | Engineering Est. |
| DEHY-1 | Flare, Firebox, Condenser, Enclosed Combustor | 1-May-09 | VOC, HAPs | DEHY-1 | 98% | Manufacturer Specifications |
| | BTEX Buster | 1-May-09 | VOC, HAPs | DEHY-1 | ~90% | Engineering Est. |
| DEHY-2 | Condenser, BTEX Buster | 1-May-09 | VOC, HAPs | DEHY-2 | ~90% | GRI-GLYCalc |
| | Flare, Firebox, Glow Plug | 1-Jan-14 | VOC, HAPs | DEHY-2 | 98% | Engineering Est. |
| FLARE | Flare | 1-Jan-09 | VOC, HAPs | Various | 98% | Engineering Est. |
| E-VRU-1 | AFRC and Catalytic Converter | 1-Dec-21 | NOx, CO, VOC, HAPs | VRU-1 | 83% CO, HCHO; 50% VOC | Engineering Est. |
| AMINE-1 | Flare | 1-May-09 | VOC, $H_2S$, HAPs | AMINE-1 | 98% | Engineering Est. |
| ECD-1 | Enclosed Combustor | 1-Feb-22 | VOC, HAPs | DEHY-1 | 98% | Manufacturer Specifications |
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[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 indica 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 |
| E-1000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| E-2000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.099 | 0.43 | 0.099 | 0.43 | 0.099 | 0.43 | - | - | - | - |
| E-3000 | 5.12 | 22.41 | 9.04 | 39.59 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | - | - |
| E-4000 | 5.12 | 22.41 | 9.04 | 39.59 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | - | - |
| E-5000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| E-6000 | 5.91 | 25.88 | 5.49 | 24.07 | 0.77 | 3.36 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| E-7000 | 5.91 | 25.88 | 6.85 | 30.02 | 1.24 | 5.43 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| DEHY-1a (reboiler) | 0.21 | 0.92 | 0.18 | 0.77 | 0.012 | 0.051 | 0.030 | 0.13 | 0.016 | 0.070 | 0.016 | 0.070 | 0.016 | 0.070 | - | - | - | - |
| DEHY-1b (Still vent) | - | - | - | - | 52.35 | 229.29 | - | - | - | - | - | - | - | - | 0.027 | 0.12 | - | - |
| DEHY-2a (reboiler) | 0.11 | 0.46 | 0.088 | 0.39 | 0.0058 | 0.025 | 0.015 | 0.066 | 0.0080 | 0.035 | 0.0080 | 0.035 | 0.0080 | 0.035 | - | - | - | - |
| DEHY-2b (still vent) | - | - | - | - | 56.94 | 249.41 | - | - | - | - | - | - | - | - | 0.034 | 0.15 | - | - |
| AMINE 1 and 2 | - | - | - | - | 2.02 | 8.84 | - | - | - | - | - | - | - | - | 0.094 | 0.41 | - | - |
| MOLE-1 | 0.28 | 1.21 | 0.23 | 1.01 | 0.015 | 0.066 | 0.042 | 0.19 | 0.021 | 0.092 | 0.021 | 0.092 | 0.021 | 0.092 | - | - | - | - |
| TK-1 through TK-3 | - | - | - | - | * | 14.98 | - | - | - | - | - | - | - | - | - | - | - | - |
| LOAD-1 | - | - | - | - | * | 9.73 | - | - | - | - | - | - | - | - | - | - | - | - |
| FLARE | 0.020 | 0.086 | 0.039 | 0.17 | - | - | 0.0021 | 0.0094 | - | - | - | - | - | - | - | - | - | - |
| HAUL | - | - | - | - | - | - | - | - | 5.52 | 3.37 | 1.25 | 0.77 | 0.13 | 0.077 | - | - | - | - |
| FUG-1 | - | - | - | - | * | 44.58 | - | - | - | - | - | - | - | - | * | 0.0011 | - | - |
| FUG-2 | - | - | - | - | * | 23.40 | - | - | - | - | - | - | - | - | * | 0.00058 | - | - |
| E-VRU-1 | 2.27 | 9.95 | 2.27 | 9.95 | 0.79 | 3.48 | 0.058 | 0.25 | 0.039 | 0.17 | 0.039 | 0.17 | 0.039 | 0.17 | - | - | - | - |
| ECD-1 | 0.023 | 0.10 | 0.046 | 0.20 | - | - | 0.0020 | 0.0088 | - | - | - | - | - | - | - | - | - | - |
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| **Totals** | 38.25 | 167.52 | 49.23 | 215.62 | 125.31 | 641.54 | 1.24 | 5.42 | 6.33 | 6.90 | 2.06 | 4.29 | 0.93 | 3.61 | 0.16 | 0.68 | - | - |

[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 |
| E-1000 | 4.43 | 19.41 | 0.90 | 3.96 | 0.72 | 3.17 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| E-2000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| E-3000 | 5.12 | 22.41 | 1.81 | 7.92 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | - | - |
| E-4000 | 5.12 | 22.41 | 1.81 | 7.92 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | - | - |
| E-5000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| E-6000 | 5.91 | 25.88 | 5.49 | 24.07 | 0.77 | 3.36 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| E-7000 | 5.91 | 25.88 | 1.37 | 6.00 | 1.24 | 5.43 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | - | - |
| DEHY-1a (reboiler) | 0.21 | 0.92 | 0.18 | 0.77 | 0.012 | 0.051 | 0.030 | 0.13 | 0.016 | 0.070 | 0.016 | 0.070 | 0.016 | 0.070 | - | - | - | - |
| DEHY-1b (Still vent) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DEHY-2a (reboiler) | 0.11 | 0.46 | 0.088 | 0.39 | 0.0058 | 0.025 | 0.015 | 0.066 | 0.0080 | 0.035 | 0.0080 | 0.035 | 0.0080 | 0.035 | - | - | - | - |
| DEHY-2b (still vent) | - | - | - | - | 0.60 | 2.61 | 0.048 | 0.21 | - | - | - | - | - | - | 0.00052 | 0.0023 | - | - |
| AMINE 1 and 2 | - | - | - | - | 2.02 | 8.84 | - | - | - | - | - | - | - | - | 0.094 | 0.41 | - | - |
| MOLE-1 | 0.28 | 1.21 | 0.23 | 1.01 | 0.015 | 0.066 | 0.042 | 0.19 | 0.021 | 0.092 | 0.021 | 0.092 | 0.021 | 0.092 | - | - | - | - |
| TK-1 through TK-3 | - | - | - | - | * | 14.98 | - | - | - | - | - | - | - | - | - | - | - | - |
| LOAD-1 | - | - | - | - | * | 9.73 | - | - | - | - | - | - | - | - | - | - | - | - |
| FLARE | 5.27 | 23.09 | 10.52 | 46.09 | 24.82 | 108.71 | 0.065 | 0.28 | - | - | - | - | - | - | 0.00068 | 0.0030 | - | - |
| HAUL | - | - | - | - | - | - | - | - | 5.52 | 3.37 | 1.25 | 0.77 | 0.13 | 0.077 | - | - | - | - |
| FUG-1[2] | - | - | - | - | * | 44.58 | - | - | - | - | - | - | - | - | * | 0.0011 | - | - |
| FUG-2[2] | - | - | - | - | * | 23.40 | - | - | - | - | - | - | - | - | * | 0.0006 | - | - |
| E-VRU-1 | 2.27 | 9.95 | 0.39 | 1.69 | 0.40 | 1.74 | 0.058 | 0.25 | 0.039 | 0.17 | 0.039 | 0.17 | 0.039 | 0.17 | - | - | - | - |
| ECD-1 | 0.092 | 0.40 | 0.18 | 0.80 | 0.42 | 1.85 | 0.0020 | 0.0088 | - | - | - | - | - | - | - | - | - | - |
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| **Totals** | 43.57 | 190.83 | 33.61 | 147.21 | 40.74 | 271.11 | 1.35 | 5.91 | 6.33 | 6.90 | 2.06 | 4.30 | 0.93 | 3.61 | 0.10 | 0.42 | - | - |

[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

# 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 |
| SSM/M1 | 230.27 | 10.00 | 459.71 | 10.00 | 1857.90 | 5.00 | 0.95 | 4.15 | - | - | - | - | - | - | 0.010 | 0.045 | - | - |
| SSM vent | | | | | | 5.00 | | | | | | | | | | | | |
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| **Totals** | 230.27 | 10.00 | 459.71 | 10.00 | 1857.90 | 10.00 | 0.95 | 4.15 | - | - | - | - | - | - | 0.010 | 0.045 | - | - |

[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).

# 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 |
| N/A - There are no special stacks present at the facility. | | | | | | | | | | | | | | | | | |
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| 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) | | | |
| E-1000 | E-1000 | V | No | 24 | 840 | 106.9 | - | - | 100.0 | 1.20 |
| E-2000 | E-2000 | V | No | 24 | 840 | 106.9 | - | - | 100.0 | 1.20 |
| E-3000 | E-3000 | V | No | 24 | 810 | 153.0 | - | - | 86.6 | 1.50 |
| E-4000 | E-4000 | V | No | 24 | 810 | 153.0 | - | - | 86.6 | 1.50 |
| E-5000 | E-5000 | V | No | 21 | 840 | 106.9 | - | - | 100.0 | 1.20 |
| E-6000 | E-6000 | V | No | 21 | 873 | 127.7 | - | - | 112.9 | 1.20 |
| E-7000 | E-7000 | V | No | 21 | 873 | 127.7 | | | 112.9 | 1.20 |
| DEHY-1 | DEHY-1 | V | No | 15 | 212 | 8.4 | - | - | 43.0 | 0.50 |
| DEHY-2 | DEHY-2 | V | No | 15 | 212 | 4.3 | - | - | 21.7 | 0.50 |
| MOLE-1 | MOLE-1 | V | No | 15 | 212 | 12.0 | - | - | 61.0 | 0.50 |
| FLARE | FLARE | V | No | 100 | 1832 | N/A | - | - | 65.6 | 1.50 |
| E-VRU-1 | E-VRU-1 | V | No | 18 | 1007 | 68.8 | - | - | 195.1 | 0.67 |
| ECD-1 | ECD-1 | V | No | 9.42 | 1150 | 2.0 | - | - | 0.4 | 2.50 |
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# 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 | | Acrolein ☑HAP or ☐ TAP | | Benzene ☑ HAP or ☐ TAP | | n-Hexane ☑HAP or ☐ TAP | | Provide Pollutant Name Here ☐ HAP or ☐ TAP | | Provide Pollutant Name Here ☐ 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 | lb/hr | ton/yr |
| E-1000 | E-1000 | 0.12 | 0.53 | 0.089 | 0.39 | 0.014 | 0.062 | 0.0087 | 0.038 | 7.40E-04 | 0.0033 | 0.0019 | 0.0082 | - | - | - | - | - | - |
| E-2000 | E-2000 | 0.72 | 3.14 | 0.52 | 2.30 | 0.083 | 0.36 | 0.051 | 0.22 | 0.0040 | 0.019 | 0.0110 | 0.048 | - | - | - | - | - | - |
| E-3000 | E-3000 | 0.24 | 1.06 | 0.20 | 0.87 | 0.019 | 0.082 | 0.012 | 0.051 | 9.91E-04 | 0.0043 | 0.0025 | 0.011 | - | - | - | - | - | - |
| E-4000 | E-4000 | 0.24 | 1.06 | 0.20 | 0.87 | 0.019 | 0.082 | 0.012 | 0.051 | 9.91E-04 | 0.0043 | 0.0025 | 0.011 | - | - | - | - | - | - |
| E-5000 | E-5000 | 0.72 | 3.14 | 0.52 | 2.30 | 0.083 | 0.36 | 0.051 | 0.22 | 0.0040 | 0.019 | 0.0110 | 0.048 | - | - | - | - | - | - |
| E-6000 | E-6000 | 0.70 | 3.08 | 0.51 | 2.25 | 0.081 | 0.36 | 0.050 | 0.22 | 0.0043 | 0.019 | 0.011 | 0.047 | - | - | - | - | - | - |
| E-7000 | E-7000 | 0.17 | 0.73 | 0.13 | 0.57 | 0.016 | 0.071 | 0.010 | 0.044 | 0.00086 | 0.0038 | 0.0022 | 0.0095 | - | - | - | - | - | - |
| DEHY-1 | DEHY-1[1] | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DEHY-2 | DEHY-2 | 0.22 | 0.96 | 0.00084 | 0.0037 | 0.00073 | 0.0032 | - | - | 0.14 | 0.61 | 0.015 | 0.066 | - | - | - | - | - | - |
| FLARE | AMINE-1&2 | 0.39 | 1.71 | - | - | - | - | - | - | 0.31 | 1.38 | 0.00 | 0.0040 | - | - | - | - | - | - |
| MOLE-1 | MOLE-1 | 0.040 | 0.18 | 0.0024 | 0.010 | 0.0021 | 0.0090 | - | - | 0.0021 | 0.0092 | 0.0039 | 0.017 | - | - | - | - | - | - |
| TK-1 through TK-3 | TK-1 through TK-3 | * | 0.10 | - | - | - | - | - | - | * | 0.035 | * | 0.038 | - | - | - | - | - | - |
| N/A | LOAD-1 | * | 0.065 | - | - | - | - | - | - | * | 0.023 | * | 0.024 | - | - | - | - | - | - |
| FLARE | FLARE | 1.70 | 7.43 | - | - | - | - | - | - | 0.61 | 2.66 | 0.88 | 3.84 | - | - | - | - | - | - |
| N/A | FUG-1 | * | 0.81 | - | - | - | - | - | - | * | 0.22 | - | 0.43 | - | - | - | - | - | - |
| N/A | FUG-2 | * | 0.42 | - | - | - | - | - | - | * | 0.12 | * | 0.23 | - | - | - | - | - | - |
| E-VRU-1 | E-VRU-1 | 0.042 | 0.18 | 0.024 | 0.11 | 0.0031 | 0.014 | 0.0014 | 0.0063 | 0.00068 | 0.0030 | 0.00062 | 0.0027 | - | - | - | - | - | - |
| ECD-1 | ECD-1 | 0.036 | 0.16 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| N/A | SSM/M1 | 20.61 | 0.072 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
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| | | | | | | | | | | | | | | | | | | | |
| **Totals:** | | 25.95 | 24.84 | 2.21 | 9.66 | 0.32 | 1.41 | 0.20 | 0.86 | 1.08 | 5.14 | 0.94 | 4.83 | - | - | - | - | - | - |

# 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 |
| E-1000 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 10.5 Mscf | 91.6 MMscf | 5 gr S/ 100 scf | Negligible |
| E-2000 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 10.5 Mscf | 91.6 MMscf | 5 gr S/ 100 scf | Negligible |
| E-3000 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 12.0 Mscf | 104.8 MMscf | 5 gr S/ 100 scf | Negligible |
| E-4000 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 12.0 Mscf | 104.8 MMscf | 5 gr S/ 100 scf | Negligible |
| E-5000 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 10.5 Mscf | 91.6 MMscf | 5 gr S/ 100 scf | Negligible |
| E-6000 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 10.4 Mscf | 91.5 MMscf | 5 gr S/ 100 scf | Negligible |
| E-7000 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 10.4 Mscf | 91.5 MMscf | 5 gr S/ 100 scf | Negligible |
| DEHY-1 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 2.1 Mscf | 18.4 MMscf | 5 gr S/ 100 scf | Negligible |
| DEHY-2 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 1.1 Mscf | 9.2 MMscf | 5 gr S/ 100 scf | Negligible |
| FLARE (pilot) | Natural Gas | Pipeline Quality Natural Gas | 1816 Btu/scf[1] | 150 scf | 1.3 MMscf | 5 gr S/ 100 scf | Negligible |
| FLARE (process) | Natural Gas | Pipeline Quality Natural Gas,Facility Offgas | 1816 Btu/scf[2] | 19.5 Mscf[3] | 171.0 MMscf[4] | 5 gr S/ 100 scf | Negligible |
| MOLE-1 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 3.0 Mscf | 25.9 MMscf | 5 gr S/ 100 scf | Negligible |
| E-VRU-1 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 4.1 Mscf | 35.7 MMscf | 5 gr S/ 100 scf | Negligible |
| ECD-1 | Natural Gas | Pipeline Quality Natural Gas | 950 Btu/scf | 175 scf | 1.53 MMscf | 5 gr S/ 100 scf | Negligible |
| | | | | | | | |
| | | | | | | | |

[1]The Flare's Pilot runs with waste gas.

[2]The Process Flare runs with waste gas.

[3]Pilot Flow + Process Flow = (0.019 MMscf/hr * 1X106 scf/ MMscf) + 150 scf/hr = 19525 scf/hr = 19.5 Mscf/hr

[4]Then, to convert Mscf/hr to MMscf/ yr : (19.5 Mscf/hr) * (8760 hrs/yr) * (1MMscf/1000 Mscf) = 171.0 MMscf/yr

# 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-1 | 40400311 | Condensate | Mixed Hydrocarbon Liquids | 5.6 | 67 | 76.3 | 6.3 | 93.2 | 8.5 |
| TK-2 | 40400311 | Condensate | Mixed Hydrocarbon Liquids | 5.6 | 67 | 76.3 | 6.3 | 93.2 | 8.5 |
| TK-3 | 40400311 | Condensate | Mixed Hydrocarbon Liquids | 5.6 | 67 | 76.3 | 6.3 | 93.2 | 8.5 |

# 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-1 | Jan-09 | Condensate | N/A | FX | 300 | 48 | 3.7 | 2.3 | OT: Red Primer | OT: Red Primer | Poor | 840,000 | 66.6 |
| TK-2 | Apr-06 | Condensate | N/A | FX | 300 | 48 | 3.7 | 2.3 | OT: Red Primer | OT: Red Primer | Poor | 840,000 | 66.6 |
| TK-3 | Jan-09 | Condensate | N/A | FX | 300 | 48 | 3.7 | 2.3 | OT: Red Primer | OT: Red Primer | Poor | 840,000 | 66.6 |

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

| Roof Type | Seal Type, Welded Tank Seal Type | | Seal Type, Riveted Tank Seal Type | | Roof, Shell Color | Paint Condition |
|---|---|---|---|---|---|---|
| **FX**: Fixed Roof | **Mechanical Shoe Seal** | **Liquid-mounted resilient seal** | **Vapor-mounted resilient seal** | **Seal Type** | **WH**: White | Good |
| **IF**: Internal Floating Roof | **A**: Primary only | **A**: Primary only | **A**: Primary only | **A**: Mechanical shoe, primary only | **AS**: Aluminum (specular) | Poor |
| **EF**: External Floating Roof | **B**: Shoe-mounted secondary | **B**: Weather shield | **B**: Weather shield | **B**: Shoe-mounted secondary | **AD**: Aluminum (diffuse) | |
| **P**: Pressure | **C**: Rim-mounted secondary | **C**: Rim-mounted secondary | **C**: Rim-mounted secondary | **C**: Rim-mounted secondary | **LG**: Light Gray | |
| | | | | | **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)** |
| Natural Gas | Mixed Hydrocarbons | Gas | 70 MMscf/day | Natural Gas | Mixed Hydrocarbons | Gas | 70 MMscf/day |
| | | | | Condensate | Mixed Hydrocarbons | Liquid | ~164 bbl/day |
| | | | | NGL | Mixed Hydrocarbons | Liquid | 2218 bbl/day |
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# 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 - There is no CEM equipment located at the facility. | | | | | | | | | |
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# Table 2-O: Parametric Emissions Measurement Equipment

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

| Unit No. | Parameter/Pollutant Measured | Location of Measurement | Unit of Measure | Acceptable Range | Frequency of Maintenance | Nature of Maintenance | Method of Recording | Averaging Time |
|---|---|---|---|---|---|---|---|---|
| N/A - There is no PEM equipment located at the facility. | | | | | | | | |
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# Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total 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 $CO_2$e ton/yr[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit No.** | **GWPs [1]** | 1 | 298 | 25 | 22,800 | footnote 3 | | | | | | | | | | |
| **E-1000** | mass GHG | 5,090.90 | 0.0096 | 0.096 | | | | | | | | | | | 5,091.01 | |
| | $CO_2$e | 5,090.90 | 2.86 | 2.40 | | | | | | | | | | | | 5,096.16 |
| **E-2000** | mass GHG | 5,090.90 | 0.0096 | 0.096 | | | | | | | | | | | 5,091.01 | |
| | $CO_2$e | 5,090.90 | 2.86 | 2.40 | | | | | | | | | | | | 5,096.16 |
| **E-3000** | mass GHG | 5,825.76 | 0.011 | 0.11 | | | | | | | | | | | 5,825.88 | |
| | $CO_2$e | 5,825.76 | 3.27 | 2.74 | | | | | | | | | | | | 5,831.78 |
| **E-4000** | mass GHG | 5,825.76 | 0.011 | 0.11 | | | | | | | | | | | 5,825.88 | |
| | $CO_2$e | 5,825.76 | 3.27 | 2.74 | | | | | | | | | | | | 5,831.78 |
| **E-5000** | mass GHG | 5,090.90 | 0.0096 | 0.096 | | | | | | | | | | | 5,091.01 | |
| | $CO_2$e | 5,090.90 | 2.86 | 2.40 | | | | | | | | | | | | 5,096.16 |
| **E-6000** | mass GHG | 5,083.99 | 0.0096 | 0.10 | | | | | | | | | | | 5,084.10 | |
| | $CO_2$e | 5,083.99 | 2.86 | 2.40 | | | | | | | | | | | | 5,089.24 |
| **E-7000** | mass GHG | 5,083.99 | 0.010 | 0.10 | | | | | | | | | | | 5,084.10 | |
| | $CO_2$e | 5,083.99 | 2.86 | 2.40 | | | | | | | | | | | | 5,089.24 |
| **DEHY-1** | mass GHG | 1,142.29 | 0.0022 | 0.022 | | | | | | | | | | | 1,142.32 | |
| | $CO_2$e | 1,142.29 | 0.64 | 0.54 | | | | | | | | | | | | 1,143.47 |
| **DEHY-2** | mass GHG | 522.02 | 0.00098 | 0.0098 | | | | | | | | | | | 522.03 | |
| | $CO_2$e | 522.02 | 0.29 | 0.246 | | | | | | | | | | | | 522.56 |
| **AMINE-1 and 2** | mass GHG | 1,332.90 | - | 0.60 | | | | | | | | | | | 1,333.50 | |
| | $CO_2$e | 1,332.90 | - | 14.8 | | | | | | | | | | | | 1,347.66 |
| **MOLE-1** | mass GHG | 1,606.63 | 0.0030 | 0.030 | | | | | | | | | | | 1,606.67 | |
| | $CO_2$e | 1,606.63 | 0.90 | 0.76 | | | | | | | | | | | | 1,608.29 |
| **TK-1** | mass GHG | - | - | - | | | | | | | | | | | | |
| | $CO_2$e | - | - | - | | | | | | | | | | | | |
| **TK-2** | mass GHG | - | - | - | | | | | | | | | | | | |
| | $CO_2$e | - | - | - | | | | | | | | | | | | |
| **TK-3** | mass GHG | - | - | - | | | | | | | | | | | | |
| | $CO_2$e | - | - | - | | | | | | | | | | | | |
| **LOAD-1** | mass GHG | - | - | - | | | | | | | | | | | | |
| | $CO_2$e | - | - | - | | | | | | | | | | | | |
| **FLARE** | mass GHG | 52.05 | 0.037 | 1,598.21 | | | | | | | | | | | 1,650.30 | |
| | $CO_2$e | 52.05 | 10.95 | 39,955.31 | | | | | | | | | | | | 40,018.31 |
| **HAUL** | mass GHG | - | - | - | | | | | | | | | | | | |
| | $CO_2$e | - | - | - | | | | | | | | | | | | |
| **FUG-1** | mass GHG | - | - | - | | | | | | | | | | | | |
| | CO2e | - | - | - | | | | | | | | | | | | |

| | | $CO_2$ 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] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FUG-2 | mass GHG | - | - | - | | | | | | | | | | | | |
| | $CO_2e$ | - | - | - | | | | | | | | | | | | |
| E-VRU-1 | mass GHG | 1,981.63 | 0.0037 | 0.037 | | | | | | | | | | | 1,981.67 | |
| | $CO_2e$ | 1,981.63 | 1.11 | 0.93 | | | | | | | | | | | | 1,983.68 |
| SSM/M 1 | mass GHG | 1,126.32 | 0.0014 | 1.73 | | | | | | | | | | | 1,128.05 | |
| | $CO_2e$ | 1,126.32 | 0.41 | 43.18 | | | | | | | | | | | | 1,169.91 |
| ECD-1 | mass GHG | 310.04 | 0.00058 | 0.0058 | | | | | | | | | | | 310.05 | |
| | $CO_2e$ | 310.04 | 0.17 | 0.15 | | | | | | | | | | | | 310.36 |
| Total | mass GHG | 45,166.11 | 0.12 | 1,601.34 | | | | | | | | | | | 46,767.57 | |
| | $CO_2e$ | 45,166.11 | 35.31 | 40,033.36 | | | | | | | | | | | | 85,234.77 |

[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

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

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Enterprise Field Services, LLC (Enterprise) is submitting this application for a Renewal (pursuant to 20.2.70.300(B)(2) NMAC) and Significant Modification application (pursuant to 20.2.70.404.C(1)(a) NMAC) to the current Title V Permit No. P264-R1M1, issued on July 30, 2020, for the Chaparral Gas Plant (Chaparral). The proposed updates to the Title V permit will reflect the current NSR Construction Permit No. 3662-M9, issued on July 26, 2022.

Chaparral is a natural gas processing plant, which currently consists of seven (7) natural gas combustion engines used for natural gas compression, two TEG dehydrators, a molecular sieve dehydrator, an amine sweetening system for liquid treating, a cryogenic natural gas processing train, three (3) 300-barrel condensate tanks, and a flare. Other equipment being included are considered exempt and are not sources of regulated emissions. The facility is located in Eddy County, New Mexico approximately 12 miles southwest of Loco Hills, NM.

The purpose of this Title V Significant Modification and renewal application is to update the Title V operating permit to reflect the NSR Construction Permit No. 3662-M9, issued on July 26, 2022, which authorized an increase to the permitted horsepower capacity of combustion engines E-1000, E-2000, and E-5000. These engines have had recent upgrades and are now capable of running at the manufacturer-rated capacity of 1340-horsepower (hp). The engines are currently permitted to operate at 1151-hp. There are no changes to the engine emission factors used in previous permit applications, but with the increased engine horsepower capacity, engine emissions will be increasing with this application.

# Section 4

## Process Flow Sheet

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

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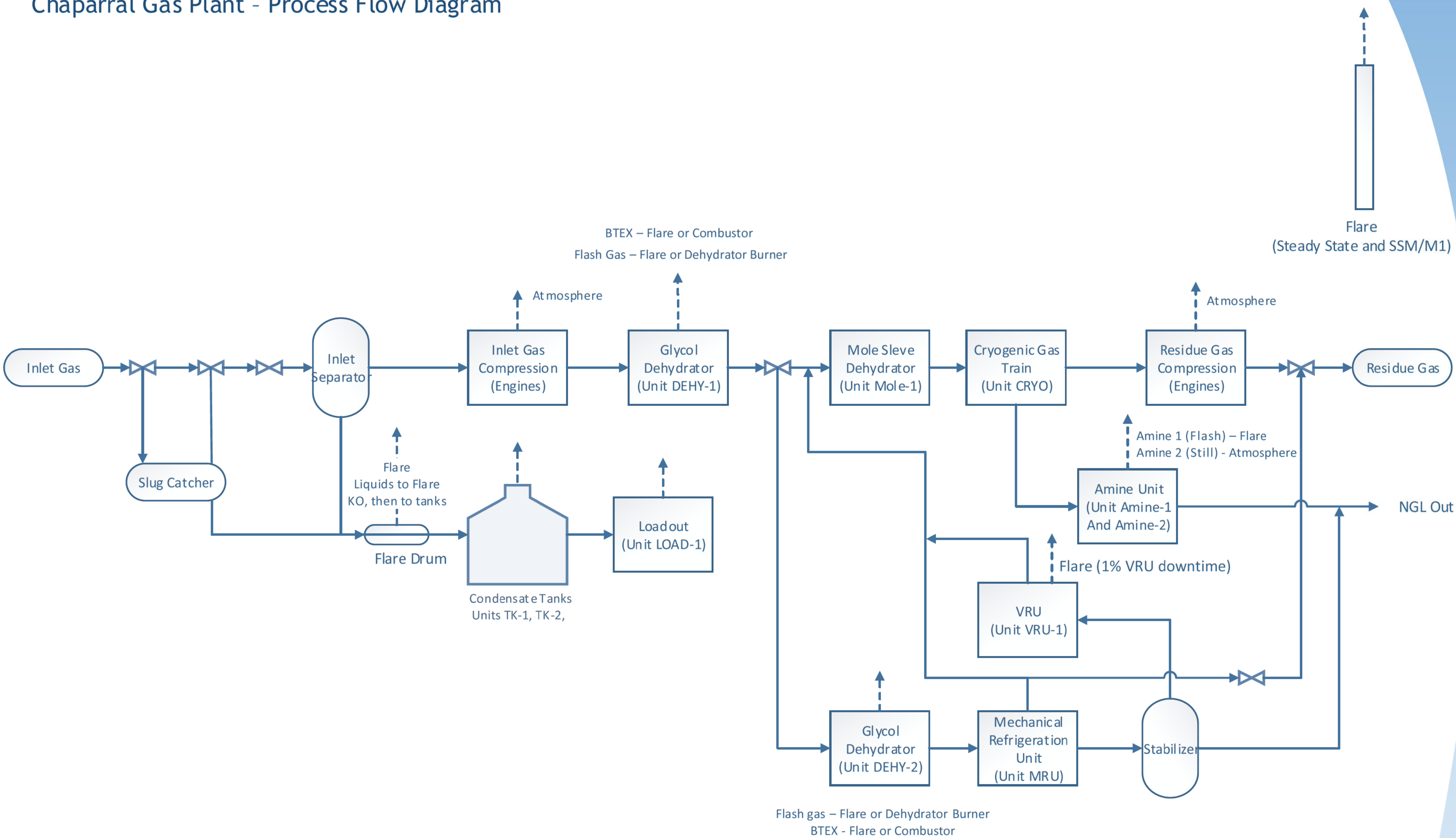
A process flow diagram is attached.

# Enterprise Products

## Chaparral Gas Plant – Process Flow Diagram

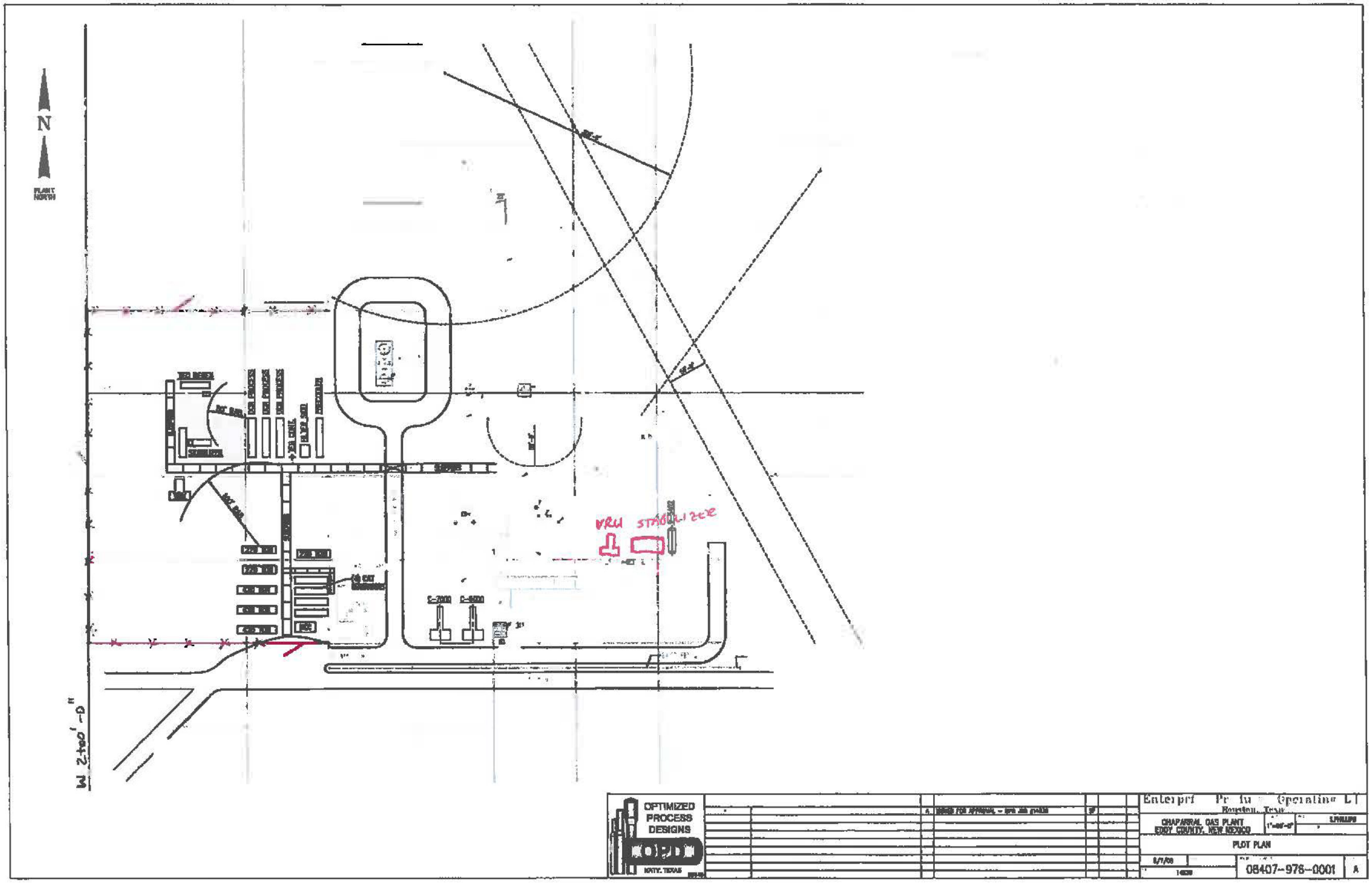


# Section 5

## 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 is attached.


N
PLANT NORTH
W 2400'-0"
VRU
STABILIZER
C-7000
C-8000
OPTIMIZED
PROCESS
DESIGNS
OPD
KATY, TEXAS
CHAPARRAL GAS PLANT
EDDY COUNTY, NEW MEXICO
PLOT PLAN
8/7/08
08407-976-0001
A

# Section 6

## All Calculations

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

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

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

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

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

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

**Significant Figures:**
**A.** All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.
**B.** At least 5 significant figures shall be retained in all intermediate calculations.
**C.** In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

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

**Control Devices:** In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

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## Compressor Engines:

**CAT G3516 Compressor Engine (E-1000, E-2000, and E-5000)**
Combustion engines E-1000, E-2000, and E-5000 have had upgrades and are now capable of running at their manufacturer-rated capacity of 1340-horsepower (hp). The engines are currently permitted to operate at 1151-hp. There are no changes to the engine emission factors used in previous permit applications, but with the increased engine horsepower capacity, engine emissions will be increasing with this application. Engine emissions are calculated using the manufacturer emission factors for NOx, CO, and VOC; AP-42 emission factors for PM; and pipeline specifications of 5 grains Sulfur per 100 standard cubic feet for $SO_2$ emissions. HAP emissions are based on emissions calculated using AP-42, Section 3.2 for 4-stroke lean burn engines and from GRI-HAPCalc.

**Waukesha Compressor Engine (E-3000 and E-4000)**
Emissions of $NO_x$, CO, VOC, and formaldehyde from these units were calculated using manufacturer's data. Units E-3000 and E-4000 are equipped with AFRC and catalytic converters that control CO and HAP emissions by 80%. Emissions of $SO_2$ were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and an assumed 100% conversion of fuel elemental sulfur to $SO_2$. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions, other than formaldehyde. GHG emissions were calculated with 40 CFR 98 Subpart C.

**CAT G3516 Compressor Engine (E-6000)**
Uncontrolled Emissions of $NO_x$, CO and VOC from this unit were calculated using manufacturer's data. Emissions of $SO_2$ were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and an assumed 100% conversion of fuel elemental sulfur to $SO_2$. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions. GHG emissions were calculated with 40 CFR 98 Subpart C.

**CAT G3516 Compressor Engine (E-7000)**
Uncontrolled Emissions of $NO_x$, CO and VOC from this unit were calculated using manufacturer's data. Emissions of $SO_2$ were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and an assumed 100% conversion of fuel elemental sulfur to $SO_2$. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions. GHG emissions were calculated with 40 CFR 98 Subpart C.

**Cryogenic Unit (CRYO)**
This unit is not a source of regulated pollutants, other than fugitives, and is therefore encompassed in the facility fugitive emission calculations.

**Amine Units (AMINE-1, AMINE-2)**
Emissions of VOC, $H_2S$ and HAPs were calculated using ProMax. All pollutants have a 25% safety factor applied. Fugitive emissions from the sweetening unit are included in the facility fugitive emission estimates. Flare emission rates control amine flash emissions to the flare. GHG were calculated using Promax®. AMINE-1 emissions will be controlled by the EPN Flare.

**Dehydrator (DEHY-1)**
Dehy-1 emissions are based on a higher input flowrate. Regenerator and flash tank emissions are re-calculated using Promax® simulations at the higher flowrate. Since the flash tank gas stream is being recycled and compressed, flash tank emissions are assumed to be zero. Reboiler $NO_x$, CO, VOC, and PM emissions were calculated using AP-42 Table 1.4-1 & 2. Emissions of $SO_2$ were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and an assumed 100% conversion of fuel elemental sulfur to $SO_2$. GRI-HAPCalc was used to estimate HAP emissions. GHG emissions were calculated with 40 CFR 98 Subpart C.

**Dehydrator (DEHY-2)**
Uncontrolled $NO_x$, CO, PM, and Reboiler VOC emission from this unit were calculated using AP-42 Table 1.4-1 & 2. Uncontrolled Still Vent VOC, $H_2S$, and HAP emissions were calculated using Promax® simulations of the BTEX Vent and Flash Gas emissions. Controlled Still Vent VOC, $H_2S$, and HAP emissions were calculated using Promax® simulations of just the BTEX Vent emissions with a 98% control efficiency. Emissions of $SO_2$ were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and assumed 100% conversion of fuel elemental sulfur to $SO_2$. GHG emissions were calculated with 40 CFR 98 Subpart C.

**Molecular Sieve Regenerator Heater (MOLE-1)**
Emissions of $NO_x$, CO, VOC, and particulates were calculated using emission factors from AP-42 Tables 1.4-1 and 1.4-2. Emissions of $SO_2$ were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and an assumed 100% conversion of fuel elemental sulfur to SO2. GRI-HAPCalc was used to estimate HAP emissions. In addition, the emissions factors were updated to adjust for heat content (Btu/scf). GHG emissions were calculated according with 40 CFR 98 Subpart C.

**Condensate Tanks (TK-1 through TK-3)**
Working and breathing VOC and HAP emissions are calculated using TANKS 4.0.9d. Flash emissions are fully captured by the flare gas stream leaving from the flare knockout; hence, there is no flashing potential for any of the tanks. 100% of condensate facility throughput (30,000 bbl/yr) was used to calculate emissions. Individual emissions for these three tanks are combined into a single emission limit.

**Truck Loading (LOAD-1)**
Emissions of VOCs were estimated using the calculation methodology outlined in AP-42 Section 5.2. The throughput used for these calculations accounts for three (3) tanks (TK-1, TK-2 and TK-3).

**Flare (Unit: FLARE)**
Flare emissions $NO_x$, CO, VOC, and Total HAPs flaring emissions were Promax® simulation at a higher flow rate and emission factors were from TNRCC RG-109 and AP-42 13.5-1. The mass flow for $H_2S$ was calculated using the above mentioned Promax® simulation. $SO_2$ emissions are calculated using the mass flow of $H_2S$ and an estimated 98% conversion of $H_2S$ to $SO_2$.

**Enclosed Combustor (ECD-1)**
The enclosed combustor emissions are calculated using the manufacturer specifications for fuel usage to determine emissions. Emission factors from TNRCC RG-109 as well as AP-42 1.4-2 are used for NOx, CO, PM, and $SO_x$. Emissions for VOCs and HAPs were based on the ProMax streams from the glycol dehydrator still vent emissions and the DRE of the combustor.

**Facility Fugitive Emissions (FUG-1)**
Facility fugitive VOC and HAP emissions were calculated using GRI-HAPCalc 3.01 with EPA average emission factors and facility-specific component counts. As part of this permit application, the safety factor used for all VOC was changed to 10%.

**Facility Fugitive Emissions (FUG-2)**
Fugitive VOC and HAP emissions from the MRU equipment were estimated assuming 50% of the emissions for the fugitives from the existing equipment. These emissions associated with this equipment are monitored under NSPS OOOO.

**Haul Road Emissions (Unit HAUL)**
Twelve truck round trips per day with a maximum of six per hour are used for emission calculations. The haul roads at the facility are gravel roads. It was assumed the silt content of the gravel was 40% less than the silt content of the dirt, based on the average silt contents for dirt and gravel roads given by the background documentation for AP-42 13.2.2. This reduction produces a silt content of 2.7% for the gravel.

**Mechanical Refrigeration Unit (MRU)**
This unit is not a source of regulated pollutants, other than fugitives, and is therefore encompassed in the facility fugitive emission calculations.

**SSM/M1 Emissions (SSM/M1)**
Following the "Implementation Guidance for Permitting SSM Emissions and Excess Emissions" document issued June 7, 2012, emissions from both SSM and upset/malfunction are consolidated with a total limit of 10 tons per year for each pollutant.

**VRU Compressor Engine (E-VRU-1)**
Uncontrolled Emissions of $NO_x$, CO and VOC from this unit were calculated using manufacturer's data. Emissions of $SO_2$ were calculated using a fuel sulfur pipeline content of 5 grains total sulfur per 100 scf and an assumed 100% conversion of fuel elemental sulfur to $SO_2$. Particulate emissions were calculated based on AP-42 Table 3.2-2 emission factors. GRI-HAPCalc was used to estimate HAP emissions. GHG emissions were calculated according with 40 CFR 98 Subpart C.

Controlled emissions were calculated assuming an 83% control on CO and formaldehyde and 50% control of VOCs.

# Section 6.a

## Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

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**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 $CO_2$e emissions from your facility.
**2.** GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG $CO_2$e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
**3.** Emissions from routine or predictable start up, shut down, and maintenance must be included.
**4.** Report GHG mass and GHG $CO_2$e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
**5.** All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and 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)

**Uncontrolled Emissions for Revision**

| | NOx | | CO | | VOC | | $SO_2$ | | TSP | | PM-10 | | PM-2.5 | | $H_2S$ | | $CO_2e$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **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** |
| E-1000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.099 | 0.43 | 0.099 | 0.43 | 0.099 | 0.43 | - | - | 5096.12 |
| E-2000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.099 | 0.43 | 0.099 | 0.43 | 0.099 | 0.43 | - | - | 5096.12 |
| E-3000 | 5.12 | 22.41 | 9.04 | 39.59 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | 5831.78 |
| E-4000 | 5.12 | 22.41 | 9.04 | 39.59 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | 5831.78 |
| E-5000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.099 | 0.43 | 0.099 | 0.43 | 0.099 | 0.43 | - | - | 5096.12 |
| E-6000 | 5.91 | 25.88 | 5.49 | 24.07 | 0.77 | 3.36 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | 5089.24 |
| E-7000 | 5.91 | 25.88 | 6.85 | 30.02 | 1.24 | 5.43 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | 5089.24 |
| DEHY-1a (reboiler) | 0.21 | 0.92 | 0.18 | 0.77 | 0.012 | 0.051 | 0.030 | 0.132 | 0.016 | 0.070 | 0.016 | 0.070 | 0.016 | 0.070 | - | - | 1025.77 |
| DEHY-1b (Still vent) | - | - | - | - | 52.35 | 229.29 | - | - | - | - | - | - | - | - | 0.027 | 0.12 | - |
| DEHY-2a (reboiler) | 0.11 | 0.46 | 0.088 | 0.39 | 0.0058 | 0.025 | 0.015 | 0.066 | 0.0080 | 0.035 | 0.0080 | 0.035 | 0.0080 | 0.035 | - | - | 522.56 |
| DEHY-2b (still vent) | - | - | - | - | 56.94 | 249.41 | - | - | - | - | - | - | - | - | 0.034 | 0.15 | - |
| ECD-1 | 0.023 | 0.10 | 0.046 | 0.20 | - | - | 2.00E-03 | 8.76E-03 | - | - | - | - | - | - | - | - | 310.36 |
| AMINE 1&2 | - | - | - | - | 2.02 | 8.84 | - | - | - | - | - | - | - | - | 0.094 | 0.41 | 1347.66 |
| MOLE-1 | 0.28 | 1.21 | 0.23 | 1.01 | 0.015 | 0.066 | 0.042 | 0.19 | 0.021 | 0.092 | 0.021 | 0.09 | 0.021 | 0.092 | - | - | 1608.29 |
| TK-1 through TK-3 | - | - | - | - | * | 14.98 | - | - | - | - | - | - | - | - | - | - | - |
| LOAD-1 | - | - | - | - | * | 9.73 | - | - | - | - | - | - | - | - | - | - | - |
| FLARE (Pilot Only) | 0.020 | 0.086 | 0.039 | 0.17 | - | - | 0.0021 | 0.0094 | - | - | - | - | - | - | - | - | - |
| HAUL | - | - | - | - | - | - | - | - | 5.52 | 3.37 | 1.25 | 0.77 | 0.13 | 0.077 | - | - | - |
| FUG-1 | - | - | - | - | * | 44.58 | - | - | - | - | - | - | - | - | * | 0.0011 | - |
| FUG-2 | - | - | - | - | * | 23.40 | - | - | - | - | - | - | - | - | * | 5.83E-04 | - |
| E-VRU-1 | 2.27 | 9.95 | 2.27 | 9.95 | 0.79 | 3.48 | 0.058 | 0.25 | 0.039 | 0.17 | 0.039 | 0.17 | 0.039 | 0.17 | - | - | 1983.68 |
| SSM/M1 | 230.27 | 10.00 | 459.71 | 10.00 | 1857.9 | 10.00 | 0.95 | 4.15 | - | - | - | - | - | - | 0.010 | 0.045 | 1169.91 |
| **Totals** | **268.52** | **177.52** | **508.94** | **225.63** | **1983.21** | **651.54** | **2.19** | **9.58** | **6.33** | **6.90** | **2.06** | **4.30** | **0.93** | **3.61** | **0.17** | **0.73** | **45098.6** |

**Uncontrolled HAP Emissions for Revision**

| | HAPs | | Formaldehyde | | Acetaldehyde | | Acrolein | | Benzene | | n-Hexane | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unit** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** |
| E-1000 | 0.72 | 3.14 | 0.52 | 2.30 | 0.08 | 0.36 | 0.05 | 0.22 | 0.004 | 0.019 | 0.011 | 0.048 |
| E-2000 | 0.72 | 3.14 | 0.52 | 2.30 | 0.08 | 0.36 | 0.05 | 0.22 | 0.004 | 0.019 | 0.011 | 0.048 |
| E-3000 | 1.21 | 5.29 | 0.99 | 4.33 | 0.094 | 0.41 | 0.058 | 0.25 | 0.0050 | 0.022 | 0.012 | 0.055 |
| E-4000 | 1.21 | 5.29 | 0.99 | 4.33 | 0.094 | 0.41 | 0.058 | 0.25 | 0.0050 | 0.022 | 0.012 | 0.055 |
| E-5000 | 0.72 | 3.14 | 0.52 | 2.30 | 0.083 | 0.36 | 0.051 | 0.22 | 0.0044 | 0.019 | 0.0110 | 0.048 |
| E-6000 | 0.70 | 3.08 | 0.51 | 2.25 | 0.081 | 0.36 | 0.050 | 0.22 | 0.0043 | 0.019 | 0.011 | 0.047 |
| E-7000 | 0.17 | 0.73 | 0.13 | 0.57 | 0.016 | 0.071 | 0.010 | 0.044 | 0.00086 | 0.0038 | 0.0022 | 0.0095 |
| DEHY-1 | 9.49 | 41.56 | 1.69E-03 | 7.40E-03 | - | - | - | - | 5.78 | 25.32 | 1.31 | 5.75 |
| DEHY-2 | 11.42 | 50.02 | 8.45E-04 | 0.0037 | 7.31E-04 | 0.0032 | - | - | 7.42 | 32.52 | 1.11 | 4.86 |
| ECD-1 | - | - | - | - | - | - | - | - | - | - | - | - |
| AMINE 1&2 | 0.39 | 1.71 | - | - | - | - | - | - | 0.31 | 1.38 | 9.20E-04 | 0.0040 |
| MOLE-1 | 0.040 | 0.18 | 0.0024 | 0.010 | 0.0021 | 0.0090 | - | - | 0.0021 | 0.0092 | 0.0039 | 0.017 |
| TK-1 through TK-3 | * | 0.10 | - | - | - | - | - | - | * | 0.035 | * | 0.038 |
| LOAD-1 | * | 0.065 | - | - | - | - | - | - | * | 0.023 | * | 0.024 |
| FLARE | - | - | - | - | - | - | - | - | - | - | - | - |
| FUG-1 | * | 0.81 | - | - | - | - | - | - | * | 0.22 | * | 0.43 |
| FUG-2 | * | 0.42 | - | - | - | - | - | - | * | 0.12 | * | 0.23 |
| E-VRU-1 | 0.20 | 0.86 | 0.14 | 0.63 | 0.019 | 0.081 | 0.0084 | 0.037 | 0.0040 | 0.017 | 0.0037 | 0.016 |
| SSM/M1[1] | 20.61 | 0.072 | - | - | - | - | - | - | - | - | - | - |
| **Totals** | **47.58** | **119.60** | **4.35** | **19.03** | **0.56** | **2.44** | **0.34** | **1.48** | **13.55** | **59.77** | **2.50** | **11.68** |

* Indicates an hourly emission rate is not appropriate for this unit
[1] Annual HAP emissions for SSM/M1 calculated assuming same HAP/VOC ratio as hourly emission rates [HAP tpy = HAP lb/hr / VOC lb/hr * VOC tpy]

Enterprise Field Services
Chaparral Gas Plant

| Controlled Emissions for Revision | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NOx | | CO | | VOC | | $SO_2$ | | TSP | | PM-10 | | PM-2.5 | | $H_2S$ | | $CO_2e$ |
| **Unit** | **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** |
| E-1000 | 4.43 | 19.41 | 0.90 | 3.96 | 0.72 | 3.17 | 0.15 | 0.65 | 0.099 | 0.43 | 0.099 | 0.43 | 0.099 | 0.43 | - | - | 5096.12 |
| E-2000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.099 | 0.43 | 0.099 | 0.43 | 0.099 | 0.43 | - | - | 5096.12 |
| E-3000 | 5.12 | 22.41 | 1.81 | 7.92 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | 5831.78 |
| E-4000 | 5.12 | 22.41 | 1.81 | 7.92 | 3.41 | 14.94 | 0.17 | 0.75 | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 | 0.50 | - | - | 5831.78 |
| E-5000 | 4.43 | 19.41 | 5.32 | 23.29 | 1.45 | 6.34 | 0.15 | 0.65 | 0.099 | 0.43 | 0.099 | 0.43 | 0.10 | 0.43 | - | - | 5096.12 |
| E-6000 | 5.91 | 25.88 | 5.49 | 24.07 | 0.77 | 3.36 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | 5089.24 |
| E-7000 | 5.91 | 25.88 | 1.37 | 6.00 | 1.24 | 5.43 | 0.15 | 0.65 | 0.10 | 0.43 | 0.10 | 0.43 | 0.10 | 0.43 | - | - | 5089.24 |
| DEHY-1a (reboiler) | 0.21 | 0.92 | 0.18 | 0.77 | 0.012 | 0.051 | 0.030 | 0.132 | 0.016 | 0.07 | 0.016 | 0.07 | 0.016 | 0.07 | - | - | 1025.77 |
| DEHY-1b (Still vent) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| DEHY-2a (reboiler) | 0.11 | 0.46 | 0.088 | 0.39 | 0.0058 | 0.025 | 0.015 | 0.066 | 0.0080 | 0.035 | 0.0080 | 0.035 | 0.0080 | 0.035 | - | - | 522.56 |
| DEHY-2b (still vent) | - | - | - | - | 0.60 | 2.61 | 0.048 | 0.21 | - | - | - | - | - | - | 5.17E-04 | 0.0023 | - |
| ECD-1 | 0.092 | 0.40 | 0.18 | 0.80 | 0.42 | 1.85 | 0.002 | 0.009 | - | - | - | - | - | - | - | - | 310.36 |
| AMINE 1&2 | - | - | - | - | 2.02 | 8.84 | - | - | - | - | - | - | - | - | 0.094 | 0.41 | 1347.66 |
| MOLE-1 | 0.28 | 1.21 | 0.23 | 1.01 | 0.015 | 0.066 | 0.042 | 0.19 | 0.021 | 0.092 | 0.021 | 0.092 | 0.021 | 0.092 | - | - | 1608.29 |
| TK-1 through TK-3 | - | - | - | - | * | 14.98 | - | - | - | - | - | - | - | - | - | - | - |
| LOAD-1 | - | - | - | - | * | 9.73 | - | - | - | - | - | - | - | - | - | - | - |
| FLARE | 5.27 | 23.09 | 10.52 | 46.09 | 24.82 | 108.71 | 0.065 | 0.28 | - | - | - | - | - | - | 6.82E-04 | 0.0030 | 40018.31 |
| HAUL | - | - | - | - | - | - | - | - | 5.52 | 3.37 | 1.25 | 0.77 | 0.13 | 0.077 | - | - | - |
| FUG-1 | - | - | - | - | * | 44.58 | - | - | - | - | - | - | - | - | * | 0.0011 | - |
| FUG-2 | - | - | - | - | * | 23.40 | - | - | - | - | - | - | - | - | * | 5.83E-04 | - |
| E-VRU-1 | 2.27 | 9.95 | 0.39 | 1.69 | 0.40 | 1.74 | 0.058 | 0.25 | 0.039 | 0.17 | 0.039 | 0.17 | 0.039 | 0.17 | - | - | 1983.68 |
| SSM/M1 | 230.27 | 10.00 | 459.71 | 10.00 | 1857.90 | 10.00 | 0.95 | 4.15 | - | - | - | - | - | - | 0.010 | 0.045 | 1169.91 |
| **Totals** | **273.84** | **200.83** | **493.32** | **157.21** | **1898.64** | **281.11** | **2.30** | **10.06** | **6.33** | **6.90** | **2.06** | **4.30** | **0.93** | **3.61** | **0.11** | **0.46** | **85116.9** |

| Controlled HAP Emissions for Revision | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HAPs | | Formaldehyde | | Acetaldehyde | | Acrolein | | Benzene | | n-Hexane | |
| **Unit** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** | **lb/hr** | **tpy** |
| E-1000 | 0.12 | 0.53 | 0.089 | 0.39 | 0.014 | 0.062 | 0.0087 | 0.038 | 7.43E-04 | 0.0033 | 0.0019 | 0.0082 |
| E-2000 | 0.72 | 3.14 | 0.52 | 2.30 | 0.083 | 0.36 | 0.051 | 0.22 | 0.0044 | 0.019 | 0.0110 | 0.048 |
| E-3000 | 0.24 | 1.06 | 0.20 | 0.87 | 0.019 | 0.082 | 0.012 | 0.051 | 0.0010 | 0.0043 | 0.0025 | 0.011 |
| E-4000 | 0.24 | 1.06 | 0.20 | 0.87 | 0.019 | 0.082 | 0.012 | 0.051 | 0.0010 | 0.0043 | 0.0025 | 0.011 |
| E-5000 | 0.72 | 3.14 | 0.52 | 2.30 | 0.083 | 0.36 | 0.051 | 0.22 | 0.0044 | 0.019 | 0.0110 | 0.048 |
| E-6000 | 0.70 | 3.08 | 0.51 | 2.25 | 0.081 | 0.36 | 0.050 | 0.22 | 0.0043 | 0.019 | 0.011 | 0.047 |
| E-7000 | 0.17 | 0.73 | 0.13 | 0.57 | 0.016 | 0.071 | 0.010 | 0.044 | 8.58E-04 | 0.0038 | 0.0022 | 0.0095 |
| DEHY-1 | - | - | - | - | - | - | - | - | - | - | - | - |
| DEHY-2 | 0.22 | 0.96 | 8.45E-04 | 0.0037 | 7.31E-04 | 0.0032 | - | - | 0.14 | 0.61 | 0.015 | 0.066 |
| ECD-1 | 0.036 | 0.16 | - | - | - | - | - | - | - | - | - | - |
| AMINE 1&2 | 0.39 | 1.71 | - | - | - | - | - | - | 0.31 | 1.38 | 9.20E-04 | 0.0040 |
| MOLE-1 | 0.040 | 0.18 | 0.0024 | 0.010 | 0.0021 | 0.0090 | - | - | 0.0021 | 0.0092 | 0.0039 | 0.017 |
| TK-1 through TK-3 | * | 0.10 | - | - | - | - | - | - | * | 0.035 | * | 0.038 |
| LOAD-1 | * | 0.065 | - | - | - | - | - | - | * | 0.023 | * | 0.024 |
| FLARE | 1.70 | 7.43 | - | - | - | - | - | - | 0.61 | 2.66 | 0.88 | 3.84 |
| FUG-1 | * | 0.81 | - | - | - | - | - | - | * | 0.22 | - | 0.43 |
| FUG-2 | * | 0.42 | - | - | - | - | - | - | * | 0.12 | * | 0.23 |
| E-VRU-1 | 0.042 | 0.18 | 0.024 | 0.11 | 0.0031 | 0.014 | 0.0014 | 0.0063 | 6.75E-04 | 0.0030 | 6.21E-04 | 0.0027 |
| SSM/M1[1] | 20.61 | 0.072 | - | - | - | - | - | - | - | - | - | - |
| **Totals** | **25.95** | **24.84** | **2.21** | **9.66** | **0.32** | **1.41** | **0.20** | **0.86** | **1.08** | **5.14** | **0.94** | **4.83** |

* Indicates an hourly emission rate is not appropriate for this unit

[1] Annual HAP emissions for SSM/M1 calculated assuming same HAP/VOC ratio as hourly emission rates [HAP tpy = HAP lb/hr / VOC lb/hr * VOC tpy]

Enterprise Field Services
Chaparral Gas Plant

| | | | |
|---|---|---|---|
| Unit(s): | E-1000 | | |
| Description: | CAT G3516 LE Natural gas-fired reciprocating compressor engines | | |

**Engine Horsepower and RPM**

| | | | |
|---|---|---|---|
| Engine speed: | 1200 | rpm | Mfg data |
| Rating: | 1340 | hp | |
| Load: | 100% | | |

**Fuel Consumption**

| | | | |
|---|---|---|---|
| BSFC: | 7415 | Btu/hp-hr | Mfg data |
| Fuel heat value: | 950 | Btu/scf | Nominal LHV |
| Heat input: | 9.9 | MMBtu/hr | BSFC * site hp |
| Fuel consumption: | 10.5 | Mscf/hr | Heat input / fuel heat value |
| Annual fuel usage: | 91.6 | MMscf/yr | 8760 hrs/yr operation |

**Uncontrolled Emissions**

| $NO_x$ | CO | NMHC | $SO_2$[1] | PM[2] | | |
|---|---|---|---|---|---|---|
| 1.5 | 1.8 | 0.49 | | | g/hp-hr | Mfg data |
| | | | | 9.99E-03 | lb/MMBtu | AP-42 Table 3.2-2 (7/00) |
| | | | 5 | | gr S/100 scf | Pipeline specification |
| **4.43** | **5.32** | **1.45** | **0.15** | **0.099** | lb/hr[4] | Hourly emission rate |
| **19.41** | **23.29** | **6.34** | **0.65** | **0.43** | tpy[5] | Annual emission rate (8760 hrs/yr) |

**Controlled Emissions**

| $NO_x$ | CO | NMHC | $SO_2$[1] | PM[2] | |
|---|---|---|---|---|---|
| 0% | 83% | 50% | 0% | 0% | %Control |
| **4.43** | **0.90** | **0.72** | **0.15** | **0.099** | lb/hr |
| **19.41** | **3.96** | **3.17** | **0.65** | **0.43** | tpy |

**HAP Emissions[3]**

| Pollutant | EF | Uncontrolled Emissions | | Controlled Emissions | |
|---|---|---|---|---|---|
| | (lb/MMBtu) | (lb/hr) | (tpy) | (lb/hr) | (tpy) |
| 1,1,2,2-Tetrachloroethane | 4.00E-05 | 0.0004 | 0.00174 | 0.00007 | 0.00030 |
| 1,1,2-Trichloroethane | 3.18E-05 | 0.0003 | 0.00138 | 0.00005 | 0.00024 |
| 1,3-Butadiene | 2.67E-04 | 0.0027 | 0.01162 | 0.00045 | 0.00198 |
| 1,3-Dichloropropene | 2.64E-05 | 0.0003 | 0.00115 | 0.00004 | 0.00020 |
| 2-Methylnaphthalene | 3.32E-05 | 0.0003 | 0.00144 | 0.00006 | 0.00025 |
| 2,2,4-Trimethylpentane | 2.50E-04 | 0.0025 | 0.01088 | 0.00042 | 0.00185 |
| Acenaphthene | 1.25E-06 | 0.0000 | 0.00005 | 0.00000 | 0.00001 |
| Acenaphthylene | 5.53E-06 | 0.0001 | 0.00024 | 0.00001 | 0.00004 |
| Acetaldehyde | 8.36E-03 | 0.0831 | 0.36383 | 0.01412 | 0.06185 |
| Acrolein | 5.14E-03 | 0.0511 | 0.22369 | 0.00868 | 0.03803 |
| Benzene | 4.40E-04 | 0.0044 | 0.01915 | 0.00074 | 0.00326 |
| Benzo(b)fluoranthene | 1.66E-07 | 0.0000 | 0.00001 | 0.00000 | 0.00000 |
| Benzo(e)pyrene | 4.15E-07 | 0.0000 | 0.00002 | 0.00000 | 0.00000 |
| Benzo(g,h,i)perylene | 4.14E-07 | 0.0000 | 0.00002 | 0.00000 | 0.00000 |
| Biphenyl | 2.12E-04 | 0.0021 | 0.00923 | 0.00036 | 0.00157 |
| Carbon Tetrachloride | 3.67E-05 | 0.0004 | 0.00160 | 0.00006 | 0.00027 |
| Chlorobenzene | 3.04E-05 | 0.0003 | 0.00132 | 0.00005 | 0.00022 |
| Chloroform | 2.85E-05 | 0.0003 | 0.00124 | 0.00005 | 0.00021 |
| Chrysene | 6.93E-07 | 0.0000 | 0.00003 | 0.00000 | 0.00001 |
| Ethylbenzene | 3.97E-05 | 0.0004 | 0.00173 | 0.00007 | 0.00029 |
| Ethylene Dibromide | 4.43E-05 | 0.0004 | 0.00193 | 0.00007 | 0.00033 |
| Fluoranthene | 1.11E-06 | 0.0000 | 0.00005 | 0.00000 | 0.00001 |
| Fluorene | 5.67E-06 | 0.0001 | 0.00025 | 0.00001 | 0.00004 |
| Formaldehyde | 5.28E-02 | 0.5246 | 2.29786 | 0.08919 | 0.39064 |
| Methanol | 2.50E-03 | 0.0248 | 0.10880 | 0.00422 | 0.01850 |
| Methylene Chloride | 2.00E-05 | 0.0002 | 0.00087 | 0.00003 | 0.00015 |
| n-Hexane | 1.11E-03 | 0.0110 | 0.04831 | 0.00187 | 0.00821 |
| Naphthalene | 7.44E-05 | 0.0007 | 0.00324 | 0.00013 | 0.00055 |
| PAH | 2.69E-05 | 0.0003 | 0.00117 | 0.00005 | 0.00020 |
| Phenanthrene | 1.04E-05 | 0.0001 | 0.00045 | 0.00002 | 0.00008 |
| Phenol | 2.40E-05 | 0.0002 | 0.00104 | 0.00004 | 0.00018 |
| Pyrene | 1.36E-06 | 0.0000 | 0.00006 | 0.00000 | 0.00001 |
| Styrene | 2.36E-05 | 0.0002 | 0.00103 | 0.00004 | 0.00017 |
| Tetrachloroethane | 2.48E-06 | 0.0000 | 0.00011 | 0.00000 | 0.00002 |
| Toluene | 4.08E-04 | 0.0041 | 0.01776 | 0.00069 | 0.00302 |
| Vinyl Chloride | 1.49E-05 | 0.0001 | 0.00065 | 0.00003 | 0.00011 |
| Xylene | 1.84E-04 | 0.0018 | 0.00801 | 0.00031 | 0.00136 |
| | **Total** | **0.72** | **3.14** | **0.12** | **0.53** |

***HAP emissions are controlled at 83% by oxidation catalyst.**

[1] $SO_2$ calculation assumes 100% converstion of fuel elemental sulfur to $SO_2$.
[2] TSP = PM-10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable
[3] HAPs calculated using AP-42 Table 3.2-2 (7/2000) for 4SLB engines
[4] $NO_x$, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF (lb/MMBtu) * Heat Input (MMBtu/hr)
[5] tpy = lb/hr * hours of operation * 1ton/2000lb

**Greenhouse Gas Calculations[7]**

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.1 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[8] |
| 1162.3 | 0.0022 | 0.022 | 1163.5 | lb/hr[9] |
| 5090.9 | 0.0096 | 0.096 | 5096.1 | tpy[6] |

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[8] 40 CFR 98 Subpart A, Table A-1
[9] $CO_2$, $N_2O$, $CH_4$ lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/$10^6$Btu
$CO_2e$ lb/hr = $CO_2$ lb/hr + ($CH_4$ lb/hr * GWP) + ($N_2O$ lb/hr * GWP)

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust temp (Tstk): | 840 | °F | Mfg data |
| Stack height: | 23.5 | ft | Eng estimate |
| Stack diameter: | 1.167 | ft | Eng estimate |
| Exhaust flow: | 6415 | acfm | Mfg data |
| Exhaust velocity: | 100.0 | ft/sec | Exhaust flow ÷ stack area |

Enterprise Field Services
Chaparral Gas Plant

| | |
|---|---|
| Unit(s): | E-2000,E-5000 |
| Description: | CAT G3516 LE Natural gas-fired reciprocating compressor engines |

**Engine Horsepower and RPM**

| | | | |
|---|---|---|---|
| Engine speed: | 1200 | rpm | Mfg data |
| Rating: | 1340 | hp | |
| Load: | 100% | | |

**Fuel Consumption**

| | | | |
|---|---|---|---|
| BSFC: | 7415 | Btu/hp-hr | Mfg data |
| Fuel heat value: | 950 | Btu/scf | Nominal LHV |
| Heat input: | 9.9 | MMBtu/hr | BSFC * site hp |
| Fuel consumption: | 10.5 | Mscf/hr | Heat input / fuel heat value |
| Annual fuel usage: | 91.6 | MMscf/yr | 8760 hrs/yr operation |

**Uncontrolled Emissions**

| $NO_x$ | CO | NMHC | $SO_2$[1] | PM[2] | | |
|---|---|---|---|---|---|---|
| 1.5 | 1.8 | 0.49 | | | g/hp-hr | Mfg data |
| | | | | 9.99E-03 | lb/MMBtu | AP-42 Table 3.2-2 (7/00) |
| | | | 5 | | gr S/100 scf | Pipeline specification |
| **4.43** | **5.32** | **1.45** | **0.15** | **0.099** | lb/hr[4] | Hourly emission rate |
| **19.41** | **23.29** | **6.34** | **0.65** | **0.43** | tpy[5] | Annual emission rate (8760 hrs/yr) |

**Controlled Emissions**

| $NO_x$ | CO | NMHC | $SO_2$[1] | PM[2] | |
|---|---|---|---|---|---|
| 0% | 0% | 0% | 0% | 0% | %Control |
| **4.43** | **5.32** | **1.45** | **0.15** | **0.099** | lb/hr |
| **19.41** | **23.29** | **6.34** | **0.65** | **0.43** | tpy |

**HAP Emissions[3]**

| Pollutant | EF | Emissions | |
|---|---|---|---|
| | (lb/MMBtu) | (lb/hr) | (tpy) |
| 1,1,2,2-Tetrachloroethane | 4.00E-05 | 0.0004 | 0.00174 |
| 1,1,2-Trichloroethane | 3.18E-05 | 0.0003 | 0.00138 |
| 1,3-Butadiene | 2.67E-04 | 0.0027 | 0.01162 |
| 1,3-Dichloropropene | 2.64E-05 | 0.0003 | 0.00115 |
| 2-Methylnaphthalene | 3.32E-05 | 0.0003 | 0.00144 |
| 2,2,4-Trimethylpentane | 2.50E-04 | 0.0025 | 0.01088 |
| Acenaphthene | 1.25E-06 | 0.0000 | 0.00005 |
| Acenaphthylene | 5.53E-06 | 0.0001 | 0.00024 |
| Acetaldehyde | 8.36E-03 | 0.0831 | 0.36383 |
| Acrolein | 5.14E-03 | 0.0511 | 0.22369 |
| Benzene | 4.40E-04 | 0.0044 | 0.01915 |
| Benzo(b)fluoranthene | 1.66E-07 | 0.0000 | 0.00001 |
| Benzo(e)pyrene | 4.15E-07 | 0.0000 | 0.00002 |
| Benzo(g,h,i)perylene | 4.14E-07 | 0.0000 | 0.00002 |
| Biphenyl | 2.12E-04 | 0.0021 | 0.00923 |
| Carbon Tetrachloride | 3.67E-05 | 0.0004 | 0.00160 |
| Chlorobenzene | 3.04E-05 | 0.0003 | 0.00132 |
| Chloroform | 2.85E-05 | 0.0003 | 0.00124 |
| Chrysene | 6.93E-07 | 0.0000 | 0.00003 |
| Ethylbenzene | 3.97E-05 | 0.0004 | 0.00173 |
| Ethylene Dibromide | 4.43E-05 | 0.0004 | 0.00193 |
| Fluoranthene | 1.11E-06 | 0.0000 | 0.00005 |
| Fluorene | 5.67E-06 | 0.0001 | 0.00025 |
| Formaldehyde | 5.28E-02 | 0.5246 | 2.29786 |
| Methanol | 2.50E-03 | 0.0248 | 0.10880 |
| Methylene Chloride | 2.00E-05 | 0.0002 | 0.00087 |
| n-Hexane | 1.11E-03 | 0.0110 | 0.04831 |
| Naphthalene | 7.44E-05 | 0.0007 | 0.00324 |
| PAH | 2.69E-05 | 0.0003 | 0.00117 |
| Phenanthrene | 1.04E-05 | 0.0001 | 0.00045 |
| Phenol | 2.40E-05 | 0.0002 | 0.00104 |
| Pyrene | 1.36E-06 | 0.0000 | 0.00006 |
| Styrene | 2.36E-05 | 0.0002 | 0.00103 |
| Tetrachloroethane | 2.48E-06 | 0.0000 | 0.00011 |
| Toluene | 4.08E-04 | 0.0041 | 0.01776 |
| Vinyl Chloride | 1.49E-05 | 0.0001 | 0.00065 |
| Xylene | 1.84E-04 | 0.0018 | 0.00801 |
| | Total | **0.72** | **3.14** |

[1] $SO_2$ calculation assumes 100% converstion of fuel elemental sulfur to $SO_2$.
[2] TSP = PM-10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable
[3] HAPs calculated using GRI-HAPCalc
[4] $NO_x$, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF (lb/MMBtu) * Heat Input (MMBtu/hr)
[5] tpy = lb/hr * hours of operation * 1ton/2000lb

**Greenhouse Gas Calculations[7]**

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.1 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[8] |
| 1162.3 | 0.0022 | 0.022 | 1163.5 | lb/hr[9] |
| 5090.9 | 0.0096 | 0.096 | 5096.1 | tpy[6] |

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[8] 40 CFR 98 Subpart A, Table A-1
[9] $CO_2$, $N_2O$, $CH_4$ lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/$10^6$Btu
$CO_2e$ lb/hr = $CO_2$ lb/hr + ($CH_4$ lb/hr * GWP) + ($N_2O$ lb/hr * GWP)

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust temp (Tstk): | 840 | °F | Mfg data |
| Stack height: | 23.8, 21 | ft | Eng estimate |
| Stack diameter: | 1.167 | ft | Eng estimate |
| Exhaust flow: | 6415 | acfm | Mfg data |
| Exhaust velocity: | 100.0 | ft/sec | Exhaust flow ÷ stack area |

| | |
|---|---|
| Unit(s): | E-3000, E-4000 |
| Description: | Natural gas-fired reciprocating compressor engines |
| Manufacturer: | Wauskesha |
| Model: | L7042 GL |
| Aspiration: | TA |
| Compression ratio: | 10.5:1 |

**Engine Horsepower and RPM**

| | | | |
|---|---|---|---|
| Engine speed: | 1200 | rpm | Mfg data |
| Rating: | 1547 | hp | |
| Load: | 100% | | |

**Fuel Consumption**

| | | | |
|---|---|---|---|
| BSFC: | 7350 | Btu/hp-hr | Mfg data |
| Fuel heat value: | 950 | Btu/scf | Nominal LHV |
| Heat input: | 11.4 | MMBtu/hr | BSFC * site hp |
| Fuel consumption: | 12.0 | Mscf/hr | Heat input / fuel heat value |
| Annual fuel usage: | 104.8 | MMscf/yr | 8760 hrs/yr operation |

**Uncontrolled Emissions**

| $NO_x$ [2] | CO [2] | NMHC [2] | $SO_2$ [1] | TSP [2] | | |
|---|---|---|---|---|---|---|
| 1.5 | 2.65 | 1.0 | | | g/hp-hr | Mfg data |
| | | | 5 | | grains S/100 scf | Pipeline specification |
| | | | | 9.99E-03 | lb/MMBtu | AP-42 Table 3.2-2 (7/00) |
| **5.1** | **9.0** | **3.4** | **0.17** | **0.11** | lb/hr | Hourly emission rate |
| **22.4** | **39.6** | **14.9** | **0.75** | **0.50** | tpy | Annual emission rate (8760 hrs/yr) |

**Controlled Emissions**

| $NO_x$ [2] | CO [2] | NMHC [2] | $SO_2$ [1] | TSP [3] | | |
|---|---|---|---|---|---|---|
| 5.1 | 9.04 | 3.4 | 0.17 | 0.11 | lb/hr | Calculated above |
| | 80% | | | | | Catalyst control efficiency |
| **5.1** | **1.8** | **3.4** | **0.17** | **0.11** | lb/hr | Hourly emission rate |
| **22.4** | **7.9** | **14.9** | **0.75** | **0.50** | tpy | Annual emission rate (8760 hrs/yr) |

| HAPs | g/hp-hr | tpy [5] | Control | Controlled (tpy) |
|---|---|---|---|---|
| Formaldehyde [2] | 0.29 | 4.3321 | 80% | 0.87 |
| Methanol | | 0.1231 | 80% | 0.025 |
| Acetaldehyde | | 0.4118 | 80% | 0.082 |
| Acrolein | | 0.2532 | 80% | 0.051 |
| Benzene | | 0.0217 | 80% | 0.0043 |
| Toluene | | 0.0201 | 80% | 0.0040 |
| Ethylbenzene | | 0.0020 | 80% | 0.0004 |
| Xylene | | 0.0091 | 80% | 0.0018 |
| n-Hexane | | 0.0547 | 80% | 0.01094 |
| Other HAPs | | 0.060 | 80% | 0.012 |
| Total HAPs | | 5.2876 | 80% | 1.06 |

[1] $SO_2$ calculation assumes 100% converstion of fuel elemental sulfur to $SO_2$.
[2] Manufacturer's Data
[3] TSP = PM-10 = AP-42 PM10(filterable) + PM Condensable
[4] PM-2.5 = AP-42 PM2.5(filterable) + PM Condensable
[5] GRI-HAPCalc 3.01
[6] $NO_x$, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr = (5gr S/100 scf) * (1lb/7000 gr) * Fuel Consumption (Mscf/hr) * 64g/molSO2 / 32g/mol S
PM lb/hr = EF * Fuel Consumption * hp * 1MMBtu/$10^6$Btu
[7] tpy = lb/hr * hours of operation * 1ton/2000lb

**Greenhouse Gas Calculations[8]**

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.1 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[9] |
| 1330.1 | 0.0025 | 0.025 | 1331.5 | lb/hr[10] |
| 5825.8 | 0.011 | 0.11 | 5831.8 | tpy[7] |

[8] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[9] 40 CFR 98 Subpart A, Table A-1
[10] $CO_2$, $N_2O$, $CH_4$ lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/$10^6$Btu
$CO_2e$ lb/hr = $CO_2$ lb/hr + ($CH_4$ lb/hr * GWP) + ($N_2O$ lb/hr * GWP)

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust temp (Tstk): | 810 | °F | Mfg data |
| Exhaust flow | 16450 | lb/hr | Mfg data |
| Exhaust flow | 9183.1 | acfm | Mfg data |
| Stack diameter: | 1.5 | ft | Design |
| Stack height: | 24 | ft | Design |
| Exhaust velocity: | 86.6 | ft/sec | Exhaust flow ÷ stack area |

Enterprise Field Services
Chaparral Gas Plant

| | |
|---|---|
| Unit(s): | E-6000 |
| Description: | CAT G3516LE natural gas-fired reciprocating compressor engine |

**Engine Horsepower and RPM**

| | | | |
|---|---|---|---|
| Engine speed: | 1400 | rpm | Mfg data |
| Rating: | 1340 | hp | |
| Load: | 100% | | |

**Fuel Consumption**

| | | | |
|---|---|---|---|
| BSFC: | 7405 | Btu/hp-hr | Mfg data |
| Fuel heat value: | 950 | Btu/scf | Nominal LHV |
| Heat input: | 9.9 | MMBtu/hr | BSFC * site hp |
| Fuel consumption: | 10.4 | Mscf/hr | Heat input / fuel heat value |
| Annual fuel usage: | 91.5 | MMscf/yr | 8760 hrs/yr operation |

**Uncontrolled Emissions**

| $NO_x$ | CO | NMHC | $SO_2$[1] | TSP[2] | | |
|---|---|---|---|---|---|---|
| 2.00 | 1.86 | 0.26 | | | g/hp-hr | Mfg data |
| | | | 5 | | gr S/100scf | Pipeline specification |
| | | | | 9.987E-03 | lb/MMBtu | AP-42 Table 3.2-2 (7/00) |
| **5.9** | **5.5** | **0.77** | **0.15** | **0.10** | lb/hr[4] | Hourly emission rate |
| **25.9** | **24.1** | **3.4** | **0.65** | **0.43** | tpy[5] | Annual emission rate (8760 hrs/yr) |

**Controlled Emissions**

| $NO_x$ | CO | NMHC | $SO_2$[1] | PM[2] | |
|---|---|---|---|---|---|
| 0% | 0% | 0% | 0% | 0% | %Control |
| **5.9** | **5.49** | **0.77** | **0.15** | **0.099** | lb/hr |
| **25.9** | **24.1** | **3.4** | **0.65** | **0.43** | tpy |

**HAPs Emissions[3]**

| HCHO | Methanol | Acetaldehyde | Acrolein | Benzene | Toluene | e-Benzene | Xylene | n-Hexane | Other HAPs | Total HAPs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5143 | 0.0244 | 0.0814 | 0.0501 | 0.0043 | 0.0040 | 0.0004 | 0.0018 | 0.0108 | 0.012 | 0.7032 | lb/hr |
| 2.2528 | 0.1067 | 0.3567 | 0.2193 | 0.0188 | 0.0174 | 0.0017 | 0.0079 | 0.0474 | 0.051 | 3.0802 | tpy |
| 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | %Control |
| 0.5143 | 0.0244 | 0.0814 | 0.0501 | 0.0043 | 0.0040 | 0.0004 | 0.0018 | 0.0108 | 0.012 | 0.7032 | lb/hr |
| 2.2528 | 0.1067 | 0.3567 | 0.2193 | 0.0188 | 0.0174 | 0.0017 | 0.0079 | 0.0474 | 0.051 | 3.0802 | tpy |

[1] $SO_2$ calculation assumes 100% converstion of fuel elemental sulfur to $SO_2$.
[2] TSP = PM10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable
[3] HAPs calculated using GRI-HAPCalc
[4] NOx, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF * Fuel Consumption * hp * 1MMBtu/106Btu
[5] tpy = lb/hr * hours of operation * 1ton/2000lb

**Greenhouse Gas Calculations[7]**

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.1 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[8] |
| 1160.7 | 0.0022 | 0.022 | 1161.9 | lb/hr[9] |
| 5084.0 | 0.010 | 0.10 | 5089.2 | tpy[6] |

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[8] 40 CFR 98 Subpart A, Table A-1
[9] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/106Btu
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust temp (Tstk): | 873 | °F | Mfg data |
| Stack height: | 21 | ft | Eng estimate |
| Stack diameter: | 1.20 | ft | Eng estimate |
| Exhaust flow: | 7663 | acfm | Mfg data |
| Exhaust velocity: | 112.9 | ft/sec | Exhaust flow ÷ stack area |

Enterprise Field Services
Chaparral Gas Plant

| | |
|---|---|
| Unit Numbers: | E-7000 |
| Source description: | 4SLB |
| Manufacturer: | Caterpillar |
| Model: | G3516LE |
| Aspiration: | Turbocharged-Aftercooled |

**Engine Horsepower and RPM**

| | | | |
|---|---|---|---|
| Engine speed: | 1,400.0 | rpm | Mfg data |
| Sea level hp: | 1,340.0 | hp | Mfg data |
| | - | % | Per 1,000 ft above 4,000 ft |
| Elevation | 3,431.0 | ft | |
| Derated hp: | 1,340.00 | hp | |
| Conversion Factor | 1.34 | hp/kW | |
| Conversion Factor | 0.0022 | g/lb | |
| Conversion Factor | 2,000.00 | lb/ton | |
| Annual Hours of Operation | 8,760.00 | hr | |
| Fuel Rate | 47.00 | L/hr | |
| Fuel Rate | 12.42 | gal/hr | |

**Fuel Consumption**

| | | | |
|---|---|---|---|
| BSFC: | 7405.00 | Btu/hp-hr | Mfg data |
| Fuel heat value: | 950.00 | Btu/scf | Pipeline Specifcation |
| Heat Input | 9.92 | MMBtu/hr | BSFC*site hp |
| Fuel Consumption | 10.44 | Mscf/hr | Heat input / fuel heat value |
| Annual Fuel Usage | 91.50 | MMscf/yr | 8760 hrs operation |

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust Temp | 873 | F | Mfg Data |
| Exhaust Flow | 7663.0 | cfm | Mfg Data |

**Emission Calculations**

*Uncontrolled Emissions*

| NOx | CO | VOC | $SO_2$[1] | HCHO | TSP[2] | | |
|---|---|---|---|---|---|---|---|
| 2.0 | 2.32 | 0.42 | | 0.22 | | g/hp-hr | Mfg Data |
| | | | 5.0 | | | gr S/100Scf | Pipeline Specification |
| | | | | | 0.00991 | lb/MMBtu | AP-42 Table 3.2-2(7/00) |
| **5.91** | **6.85** | **1.24** | **0.15** | **0.65** | **0.10** | lb/hr[3] | Hourly emission rate |
| **25.88** | **30.02** | **5.43** | **0.65** | **2.85** | **0.43** | tpy[4] | Annual emission rate |

*Controlled Emissions*

| NOx | CO | VOC | $SO_2$ | TSP | |
|---|---|---|---|---|---|
| 5.9 | 6.9 | 1.2 | 0.15 | 0.10 | |
| 0% | 80% | 0% | 0% | 0% | % Control |
| **5.91** | **1.37** | **1.24** | **0.15** | **0.10** | lb/hr |
| **25.88** | **6.00** | **5.43** | **0.65** | **0.43** | tpy |

*HAPs Emissions* [5]

| HCHO | Methanol | Acetaldehyde | Acrolein | Benzene | Toluene | e-Benzene | Xylene | n-Hexane | Other HAPs | Total HAPs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.6499 | 0.0244 | 0.0814 | 0.0501 | 0.0043 | 0.0040 | 0.0004 | 0.0018 | 0.0108 | 0.012 | 0.8388 | lb/hr |
| 2.8467 | 0.1067 | 0.3567 | 0.2193 | 0.0188 | 0.0174 | 0.0017 | 0.0079 | 0.0474 | 0.051 | 3.6741 | tpy |
| 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | %Control |
| 0.1300 | 0.0049 | 0.0163 | 0.0100 | 0.0009 | 0.0008 | 0.0001 | 0.0004 | 0.0022 | 0.0024 | 0.1678 | lb/hr |
| 0.5693 | 0.0213 | 0.0713 | 0.0439 | 0.0038 | 0.0035 | 0.0003 | 0.0016 | 0.0095 | 0.010 | 0.7348 | tpy |

[1] $SO_2$ calculation assumes 100% converstion of fuel elemental sulfur to $SO_2$.
[2] TSP = PM10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable
[3] NOx, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF * Fuel Consumption * hp * 1MMBtu/106Btu
[4] tpy = lb/hr * hours of operation * 1ton/2000lb
[5] HAPs calculated using GRI-HAPCalc

<u>**Correction of GRI-HAPCalc, HAPs emissions rates to account for Mfg. HCHO rates**</u>

| | | | |
|---|---|---|---|
| Total HAP | 3.0802 | tpy | From Gri-HAPCalc |
| Total HCHO | <u>-2.2528</u> | tpy | From Gri-HAPCalc |
| Total HAP-HCHO | 0.827 | tpy | Total Gri-HAP Calc HAP emission rate without HCHO |
| Mfg HCHO | <u>2.847</u> | tpy | Manufactures HCHO tpy emission rate based on 0.022 g/bhp-hr |
| Total HAP | 3.674 | tpy | Corrected Total HAPs emission rate taking into consideration mfg HCHO emission rate |

**Greenhouse Gas Calculations**[6]

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.1 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[7] |
| 1160.7290 | 0.0022 | 0.0219 | 1161.9 | lb/hr[8] |
| 5083.9932 | 0.0096 | 0.0958 | 5089.2 | tpy |

[6] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[7] 40 CFR 98 Subpart A, Table A-1
[8] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) * Engine hp * 1MMBtu/10^6Btu
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust temp (Tstk): | 873 | °F | Mfg data |
| Stack height: | 21 | ft | Eng estimate |
| Stack diameter: | 1.20 | ft | Eng estimate |
| Exhaust flow: | 7663 | acfm | Mfg data |
| Exhaust velocity: | 112.9 | ft/sec | Exhaust flow ÷ stack area |

Enterprise Field Services
Chaparral Gas Plant

| | |
|---|---|
| Unit(s): | AMINE-1, AMINE-2 |
| Description: | 1109 bbd DEA Amine Liquid-Liquid Treater with Flash Tank and Still Ven |

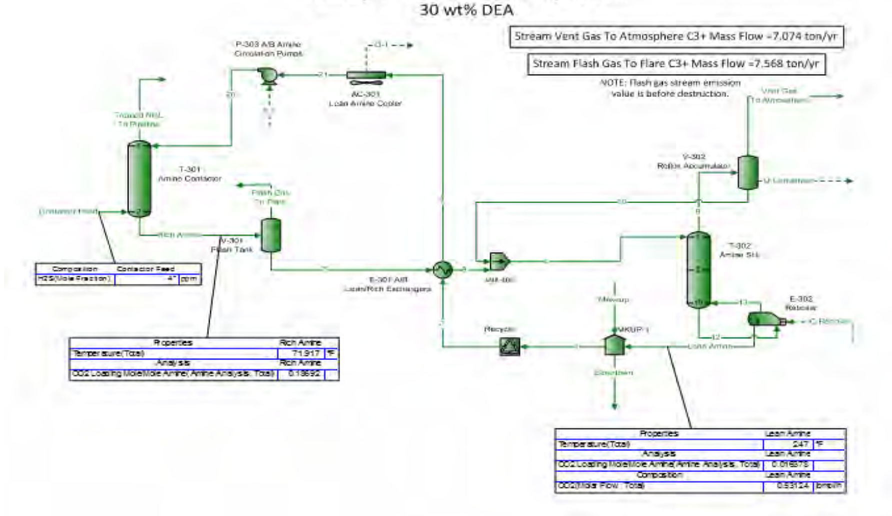
**Emission Rates (Based on ProMax run dated 7/18/2017 @ 12:36:15 PM)**

| | VOC | $H_2S$ | Benzene | Toluene | e-Benzene | Xylenes | n-Hexane | Total HAPs | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1.6** | **0.075** | **0.25** | **0.057** | **2.3E-04** | **2.0E-03** | **7.4E-04** | **0.31** | lb/hr | |
| Flash Tank and Still Vent | 7.07 | 0.33 | 1.10 | 0.25 | 1.0E-03 | 8.6E-03 | 3.2E-03 | 1.37 | tpy | ProMax |
| | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | | Scale-up and safety factor |
| | **8.8** | **0.41** | **1.38** | **0.31** | **1.3E-03** | **1.1E-02** | **4.0E-03** | **1.71** | tpy | |

| | $CO_2e$ | | | |
|---|---|---|---|---|
| Still Vent and Flash Tank | 1066.32 | tpy, $CO_2$ | Promax calculations at 1109 bbd | |
| | 0.47248 | tpy, $CH_4$ | Promax calculations at 1109 bbd | |
| | 25% | | Scale-up and safety factor | |
| | 1,332.9 | tpy, $CO_2$ | tpy w/SF | |
| | 0.6 | tpy, $CH_4$ | tpy w/SF | 14.76488943 |
| | **1347.7** | tpy, $CO_2e$ | | |

## Chaparral Amine System

30 wt% DEA




ProMax Run (7/18)

| Composition | Still Vent (pph) |
|---|---|
| CO2 | 243.452 |
| N2 | 2.36933E-07 |
| C1 | 0.107871 |
| C2 | 4.37793 |
| C3 | 1.09022 |
| iC4 | 0.0460583 |
| nC4 | 0.131689 |
| iC5 | 0.0104068 |
| nC5 | 0.0111702 |
| 2,2-Dimethylpropane | 0.000334195 |
| 2,2-Dimethylbutane | 6.68176E-05 |
| 2,3-Dimethylbutane | 0.000285653 |
| 3-Methylpentane | 0.000388905 |
| 2-Methylpentane | 0.000777727 |
| nC6 | 0.000735999 |
| Methylcyclopentane | 0.00324799 |
| Benzene | 0.251702 |
| Cyclohexane | 0.00740842 |
| 2-Methylhexane | 4.03327E-05 |
| 3-Methylhexane | 3.00314E-05 |
| nC7 | 4.45437E-05 |
| Methylcyclohexane | 0.00120185 |
| Toluene | 0.0571222 |
| nC8 | 6.85961E-06 |
| Ethylbenzene | 0.000229667 |
| m-Xylene | 0.000776113 |
| p-Xylene | 0.000828850 |
| o-Xylene | 0.000353451 |
| n-C9 | 1.01912E-07 |
| n-Decane | 0 |
| nC11 | 0 |
| nC12 | 0 |
| nC13 | 0 |
| nC14 | 0 |
| nC15 | 0 |
| H2O | 4.42959 |
| DEA | 1.23780E-11 |
| H2S | 0.0753853 |

VOC = 1.62
HAPs= 0.31

Enterprise Field Services - Chaparral Gas Plant

## TEG Dehydrator Emissions

**Unit:** REBOILER-1
**Description:** Dehydrator Reboiler

**Streams Controlled:** Flash Gas

| | | | | |
|---|---|---|---|---|
| **Heating Rate** | 2.00 | MMBtu/hr | Input heat rate | |
| **Fuel Heat Value** | 950 | Btu/scf | Default | |
| **Operating Hours** | 8760 | hr/yr | Continuous operation | |
| | 2.11 | Mscf/hr | Caclulated | Heating Rate (MMBtu/hr) * ($10^6$ Btu/MMBtu) / Fuel HV (Btu/scf) * (Mscf/1000 scf) |
| **Fuel Usage** | 50.53 | Mscf/d | Calculated | Hourly fuel usage (Mscf/hr) * 24 hr/d |
| | 18.44 | MMscf/yr | Calculated | Hourly fuel usage (Mscf/hr) * 8760 hr/yr |

| | $NO_x$ | CO | VOC | $SO_2$ [1] | $H_2S$ [1] | PM | | |
|---|---|---|---|---|---|---|---|---|
| Reboiler Fuel Usage (Uncontrolled Emissions) | 100.00 | 84.00 | 5.50 | | | 7.60 | lb/MMscf | Unit emission rates from AP-42 Table 1.4-1 & 2 |
| | | | | 0.0071 | | | lb S/Mscf | Field gas assumed to contain 5 gr S/100scf |
| | | | | 0.0301 | | | lb $SO_2$/hr | $SO_2$ Rate * fuel usage |
| | 0.211 | 0.18 | 0.012 | 0.030 | - | 0.016 | lb/hr | lb/MMscf * (Mscf/hr / 1000 Mscf/1 MMscf) |
| | 0.92 | 0.77 | 0.051 | 0.13 | - | 0.070 | tpy | lb/hr * 8760 hrs/yr / 2000 lb/ton |
| **Controlled Emissions** | **0.21** | **0.18** | **0.012** | **0.030** | **-** | **0.016** | **lb/hr** | |
| | **0.92** | **0.77** | **0.05** | **0.13** | **-** | **0.070** | **tpy** | |

| | n-Hexane | Benzene | Toluene | Ethylbenzene | Xylenes | HCHO | Total HAPs | | |
|---|---|---|---|---|---|---|---|---|---|
| Reboiler Fuel Usage (Uncontrolled Emissions) | 0.0028 | 0.0014 | 0.0020 | 0.0042 | 0.0026 | 0.0017 | 0.0288 | lb/hr | Reboiler Emissions (based on GRI-HAPCalc calculations) |
| | 0.0123 | 0.0060 | 0.0089 | 0.0185 | 0.0116 | 0.0074 | 0.1263 | tpy | |
| **Controlled Emissions** | **0.003** | **0.001** | **0.002** | **0.004** | **0.003** | **0.002** | **0.029** | **lb/hr** | |
| | **0.025** | **0.012** | **0.018** | **0.019** | **0.012** | **0.007** | **0.13** | **tpy** | |

[1] 100% of combusted H2S is converted to $SO_2$.

**GHG Calculations**

| | $CO_2$ [3] | $N_2O$ [3] | $CH_4$ [3] | $CO_2e$ [3] | | |
|---|---|---|---|---|---|---|
| Reboiler Fuel Usage (Uncontrolled Emissions) | 53.06 | 0.00010 | 0.0010 | | kg/MMBtu | 40 CFR 98 Subpart C Tables C-1 and C-2 |
| | 1 | 298 | 25 | | GWP | 40 CFR 98 Table A-1 |
| | 1024.7 | 0.0019 | 0.019 | | tpy | Reboiler |
| | **1024.71** | **0.58** | **0.48** | **1025.77** | tpy $CO_2e$ | |
| **Total** | **1024.71** | **0.58** | **0.48** | **1025.77** | **tpy $CO_2e$** | |

[3] N2O, CH4, and CO2 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

**Reboiler Stack Parameters**

| | | |
|---|---|---|
| Heat Rate: | 2000 MBtu/hr | |
| Exhaust temp (Tstk): | 600 °F | Estimate |
| Site Elevation: | 2,884 ft MSL | |
| Ambient pressure (Pstk): | 26.91 in. Hg | Calculated based on elevation |
| F factor: | 10610 wscf/MMBtu | 40 CFR 60 Appx A Method 19 |
| Exhaust flow | 353.7 scfm | Calculated from F factor and heat rate |
| Exhaust flow: | 801.6 acfm | scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R |
| Stack diameter: | 3.50 ft | Engineering estimate |
| Stack height: | 11.5 ft | Engineering estimate |
| Exhaust velocity: | 1.39 ft/sec | Exhaust flow ÷ stack area |

Enterprise Field Services - Chaparral Gas Plant

## TEG Dehydrator Emissions

Unit: DEHY-1

Description: TEG Gylcol Dehydrator

| Component | Flash Tank Emissions [1] | | BTEX Condenser Emissions [1] | | Total Uncontrolled Emissions | |
|---|---|---|---|---|---|---|
| | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| H2S | 0.011 | 0.049 | 0.016 | 0.070 | 0.027 | 0.119 |
| N2 | 0.260 | 1.138 | 0.003 | 0.012 | 0.262 | 1.150 |
| CO2 | 2.977 | 13.038 | 0.931 | 4.080 | 3.908 | 17.117 |
| C1 | 21.348 | 93.506 | 0.835 | 3.657 | 22.183 | 97.163 |
| C2 | 13.713 | 60.064 | 1.755 | 7.686 | 15.468 | 67.750 |
| C3 | 13.670 | 59.874 | 3.099 | 13.574 | 16.769 | 73.449 |
| iC4 | 2.055 | 9.001 | 0.500 | 2.192 | 2.555 | 11.193 |
| nC4 | 6.210 | 27.200 | 1.973 | 8.640 | 8.183 | 35.841 |
| 2,2-Dimethylpropane | 0.021 | 0.091 | 0.006 | 0.027 | 0.027 | 0.118 |
| iC5 | 2.040 | 8.933 | 0.843 | 3.692 | 2.883 | 12.626 |
| nC5 | 2.351 | 10.298 | 1.012 | 4.435 | 3.364 | 14.733 |
| 2,2-Dimethylbutane | 0.040 | 0.174 | 0.016 | 0.069 | 0.055 | 0.243 |
| Cyclopentane | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2,3-Dimethylbutane | 0.337 | 1.475 | 0.144 | 0.630 | 0.481 | 2.105 |
| 2-Methylpentane | 0.758 | 3.321 | 0.298 | 1.305 | 1.056 | 4.626 |
| 3-Methylpentane | 0.465 | 2.036 | 0.204 | 0.893 | 0.669 | 2.929 |
| nC6 | 0.946 | 4.144 | 0.366 | 1.605 | 1.313 | 5.749 |
| Methylcyclopentane | 0.914 | 4.005 | 0.938 | 4.110 | 1.853 | 8.115 |
| Benzene | 1.408 | 6.167 | 4.374 | 19.158 | 5.782 | 25.325 |
| Cyclohexane | 1.032 | 4.518 | 0.808 | 3.539 | 1.840 | 8.057 |
| 2-Methylhexane | 0.149 | 0.655 | 0.048 | 0.208 | 0.197 | 0.863 |
| 3-Methylhexane | 0.179 | 0.783 | 0.061 | 0.266 | 0.239 | 1.049 |
| 2,2,4-Trimethylpentane | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| nC7 | 0.732 | 3.206 | 0.224 | 0.981 | 0.956 | 4.186 |
| Methylcyclohexane | 0.737 | 3.227 | 0.385 | 1.685 | 1.121 | 4.912 |
| Toluene | 0.727 | 3.186 | 1.434 | 6.279 | 2.161 | 9.465 |
| nC8 | 0.435 | 1.907 | 0.074 | 0.326 | 0.510 | 2.233 |
| Ethylbenzene | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| m-Xylene | 0.042 | 0.186 | 0.042 | 0.184 | 0.084 | 0.369 |
| p-Xylene | 0.042 | 0.182 | 0.040 | 0.174 | 0.081 | 0.356 |
| o-Xylene | 0.030 | 0.129 | 0.038 | 0.167 | 0.068 | 0.296 |
| n-C9 | 0.092 | 0.403 | 0.011 | 0.046 | 0.103 | 0.450 |
| n-Decane | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| H2O | 0.608 | 2.662 | 0.881 | 3.857 | 1.488 | 6.520 |
| TEG | 0.006 | 0.025 | 0.000 | 0.000 | 0.006 | 0.025 |
| **Total VOC** | **35.41** | **155.10** | **16.94** | **74.18** | **52.35** | **229.29** |
| **Total HAP** | **3.19** | **13.99** | **6.29** | **27.57** | **9.49** | **41.56** |

[1] Glycol regenerator overheads are routed to a BTEX condenser are sent to the ECD-1 with a 98%. Flash gas emissions are routed to the fuel system and not to the still vent.

Enterprise Field Services
Chaparral Gas Plant

Unit(s): DEHY-2
Description: 70 MMscf/day Natural gas-fired dehydrator with reboiler, condensor and combustion

Fuel consumption:

| | | | |
|---|---|---|---|
| 1 | MMBtu/hr | Input heat rate | Design specification |
| 950 | Btu/scf | Fuel heat value | Nominal for natural gas |
| 1.1 | Mscf/hr | Fuel rate | Input heat rate / Fuel heat value |
| 9.2 | MMscf/yr | Annual fuel usage | |

**Emission Rates**

| *Uncontrolled Emissions* | NOx | CO | VOC | $SO_2$ | PM | $H_2S$ | Units | |
|---|---|---|---|---|---|---|---|---|
| Reboiler (a) | 100 | 84 | 5.5 | | 7.6 | | lb/MMscf | AP-42 Table 1.4-1 & 2 |
| | | | | 5 | | | gr S/100scf | Nominal |
| | 0.11 | 0.088 | 0.0058 | 0.015 | 0.008 | | lb/hr | EF * Fuel rate (Mscf/hr) * 1000scf/Mscf |
| | 0.46 | 0.39 | 0.025 | 0.07 | 0.035 | | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| Still Vent (b) | | | 56.9 | | | 0.034 | lb/hr | Promax Run TEG-2 |
| | | | 249.4 | | | 0.15 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| Total dehydrator emissions | 0.11 | 0.088 | 56.95 | 0.015 | 0.0080 | 0.034 | lb/hr | Total Emission rates (reboiler+regenerator) |
| | 0.46 | 0.39 | 249.43 | 0.066 | 0.035 | 0.15 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |

| *Controlled Emissions* | NOx | CO | VOC | $SO_2$ | PM | $H_2S$ | Units | |
|---|---|---|---|---|---|---|---|---|
| Reboiler (a) | 100 | 84 | 5.5 | | 7.6 | | lb/MMscf | AP-42 Table 1.4-1 & 2 |
| | | | | 5 | | | gr S/100scf | Nominal |
| | 0.11 | 0.088 | 0.0058 | 0.015 | 0.008 | | lb/hr | EF * Fuel rate (Mscf/hr) * 1000scf/Mscf |
| | 0.46 | 0.39 | 0.025 | 0.07 | 0.035 | | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| Still Vent (b) | | | 0.60 | 0.048 | | 0.00052 | lb/hr | Promax Run with 98 % Control Efficiency* |
| | | | 2.6 | 0.21 | | 0.0023 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| Total dehydrator emissions | 0.11 | 0.088 | 0.60 | 0.063 | 0.0080 | 0.00052 | lb/hr | Total Emission rates (reboiler+regenerator) |
| | 0.46 | 0.39 | 2.63 | 0.27 | 0.035 | 0.0023 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |

* This unit is controlled by a BTEX Buster, a Firebox and a Glow Plug.

Note: Under the uncontrolled scenario, Still Vent emissions are the result of the BTEX Vent and Flash Gas Emissions. Under the control scenario, only the BTEX Vent emissions contribute to the still vent emissions. Flash gas emissions are routed to the fuel system and not to the still vent.

| Process Streams | BTEX Vent | Flash Gas |
|---|---|---|
| Composition | Solved | Solved |
| Phase: Total | VSSL-100 | VSSL-100 |
| | -- | -- |
| **Mass Flow** | **lb/h** | **lb/h** |
| H2S | 0.0258602 | 0.00831695 |
| N2 | 0.00352548 | 0.273376 |
| CO2 | 1.840645 | 2.95352 |
| C1 | 1.330671 | 23.3218 |
| C2 | 3.14414 | 14.2795 |
| C3 | 5.83906 | 13.1589 |
| iC4 | 0.993505 | 1.92145 |
| nC4 | 3.98885 | 5.48377 |
| 2,2-Dimethylpropane | 0.01264485 | 0.0186757 |
| iC5 | 1.678997 | 1.49343 |
| nC5 | 1.96386 | 1.57250 |
| 2,2-Dimethylbutane | 0.026838011 | 0.0218043 |
| Cyclopentane | 0.000000 | 0 |
| 2,3-Dimethylbutane | 0.262883 | 0.184305 |
| 2-Methylpentane | 0.534667 | 0.401879 |
| 3-Methylpentane | 0.347326 | 0.226901 |
| nC6 | 0.652842 | 0.455406 |
| Methylcyclopentane | 1.47358 | 0.350973 |
| Benzene | 6.979161 | 0.444318 |
| Cyclohexane | 1.2138768 | 0.399971 |
| 2-Methylhexane | 0.0762048 | 0.0552776 |
| 3-Methylhexane | 0.102331166 | 0.0663851 |
| 2,2,4-Trimethylpentane | 0.000000 | 0 |
| nC7 | 0.370390 | 0.260888 |
| Methylcyclohexane | 0.56841 | 0.238187 |
| Toluene | 1.9445409 | 0.170868 |
| nC8 | 0.095966312 | 0.110419 |
| Ethylbenzene | 0.0569326 | 0.0105133 |
| m-Xylene | 0.3015059 | 0.0508805 |
| p-Xylene | 0.2873960 | 0.0505237 |
| o-Xylene | 0.0000000 | 0 |
| n-C9 | 0.008546262 | 0.0132369 |
| n-Decane | 0.000000 | 0 |
| H2O | 1.56091E+00 | 0.0961301 |
| TEG | 1.8169E-07 | 0.000513919 |

Volatile Organic Compounds

Enterprise Field Services
Chaparral Gas Plant

Unit(s): DEHY-2
Description: 70 MMscf/day Natural gas-fired dehydrator with reboiler, condensor and combustior

| *Uncontrolled Emissions* | HCHO | Acetaldehyde | Acrolein | Benzene | Toluene | e-Benzene | Xylenes | n-Hexane | Total HAPs | Units | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Reboiler (a) | 0.00084 | 0.00073 | - | 0.00075 | 0.0010 | 0.0013 | 0.0014 | 0.0021 | 0.0144 | lb/hr | Unit Emissions w/Safety Factors |
| | 0.0037 | 0.0032 | - | 0.0033 | 0.0045 | 0.0058 | 0.0062 | 0.0093 | 0.0632 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| | - | - | - | 7.4 | 2.1 | 0.06745 | 0.69031 | 1.10825 | 11.4 | lb/hr | Promax Run TEG Unit 98 wt% |
| | - | - | - | 32.5 | 9.3 | 0.2954 | 3.0235 | 4.85412 | 50.0 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| Total dehydrator emissions[2] | **0.00084** | **0.00073** | **-** | **7.4** | **2.1** | **0.0688** | **0.6917** | **1.110** | **11.4** | lb/hr | Total Emission rates (reboiler+regenerator) |
| | **0.0037** | **0.0032** | **-** | **32.5** | **9.3** | **0.3** | **3.0297** | **4.86** | **50.0** | tpy | lb/hr * 8760 hrs/yr / 2000lb/ton |

| *Controlled Emissions* | HCHO | Acetaldehyde | Acrolein | Benzene | Toluene | e-Benzene | Xylenes | n-Hexane | Total HAPs | Units | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Reboiler (a) | 0.00084 | 0.0007 | - | 0.00075 | 0.0010 | 0.0013 | 0.0014 | 0.0021 | 0.014 | lb/hr | Unit Emissions w/Safety Factors |
| | 0.0037 | 0.0032 | - | 0.0033 | 0.0045 | 0.0058 | 0.0062 | 0.0093 | 0.063 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| | - | - | - | 0.14 | 0.039 | 0.0011 | 0.012 | 0.013 | 0.20 | lb/hr | Promax Run with 98 % Control Efficiency* |
| | - | - | - | 0.61 | 0.17 | 0.005 | 0.052 | 0.0572 | 0.90 | tpy | lb/hr * 8760 hrs/yr * 1ton/2000lb |
| Total dehydrator emissions | **0.00084** | **0.00073** | **-** | **0.14** | **0.040** | **0.002** | **0.013** | **0.015** | **0.22** | lb/hr | Total Emission rates (reboiler+regenerator) |
| | **0.0037** | **0.0032** | **-** | **0.61** | **0.17** | **0.011** | **0.058** | **0.066** | **0.96** | tpy | lb/hr * 8760 hrs/yr / 2000lb/ton |

**Greenhouse Gas Calculations[3]**

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.06 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[8] |
| 119.2 | 0.0002 | 0.0022 | | lb/hr[9] |
| 522.0 | 0.0010 | 0.010 | 522.6 | tpy[6] |

[3] Greenhouse gas emission factors are from 40 CFR 98 Subpart C

**Reboiler Stack Exhaust Parameters**

| | | |
|---|---|---|
| Site elevation: | 3431 ft MSL | |
| Standard pressure: | 29.92 in Hg | |
| Pressure at elevation: | 26.4 in Hg | Hess, Introduction to Theoretical Meteorology, eqn. 6.8 |
| Standard temperature: | 528 R | |
| Exhaust temp: | 212 °F | Eng. estimate |
| Stack height: | 15 ft | Design specification |
| Stack diameter: | 0.5 ft | Design specification |
| F factor: | 10610 wscf/10e6 Btu | 40 CFR 60 Appx A Method 19 |
| Exhaust flow: | 177 scfm | Heat input * F factor/60 |
| Exhaust flow: | 255 acfm | Va = Vs*(Ps/Pa)*(Ta/Ts) |
| Exhaust velocity: | 22 ft/sec | Exhaust flow / stack area |

**Greenhouse Gas Calculations[2]**

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.0 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[3] |
| 130.3 | 0.0002 | 0.002 | 130.4 | lb/hr[4] |
| 570.7 | 0.001 | 0.01 | 571.3 | tpy[5] |

[2] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[3] 40 CFR 98 Subpart A, Table A-1
[4] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel Rate (Mscf/hr) * 10^-3 (MMscf/Mscf)*Heating Value (MMBtu/MMscf
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)
[5] tpy = lb/hr * hours of operation * 1ton/2000lb

Enterprise Field Services
Chaparral Gas Plant

| | | | |
|---|---|---|---|
| Unit(s): | MOLE-1 | | |
| Description: | Natural gas fired heater | | |
| Manufacturer: | Power Flame | | |

**Fuel Consumption**

| | | | |
|---|---|---|---|
| Total input heat rate: | 2.8 | MMBtu/hr | |
| Fuel heat value: | 950 | Btu/scf | Nominal LHV |
| Max fuel rate: | 3.0 | Mscf/hr | Input heat rate / fuel heat value |
| Max annual fuel usage: | 25.9 | MMscf/yr | 8760 hrs/yr operation |

**Emission Rates**

| $NO_x$ | CO | NMHC | $SO_2$ [1] | TSP [2] | |
|---|---|---|---|---|---|
| 100 | 84 | 5.5 | | 7.6 | lb/MMscf |
| 93.14 | 78.24 | 5.12 | | 7.08 | lb/MMscf Convert emission factor based on heat value, divide by 1,020 multiply by 950 Btu/scf |
| | | | 5 | | gr S/100scf |
| **0.28** | **0.23** | **0.015** | **0.042** | **0.021** | lb/hr [3] |
| **1.2** | **1.0** | **0.066** | **0.19** | **0.092** | tpy [4] |

**HAPs**

| HCHO | Methanol | Acetaldehyde | Acrolein | Benzene | Toluene | e-Benzene | Xylene | n-Hexane | Total HAPs | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0024 | 0.0027 | 0.0021 | - | 0.0021 | 0.0029 | 0.0059 | 0.0037 | 0.0039 | 0.0404 | |
| 0.0104 | 0.0118 | 0.0090 | - | 0.0092 | 0.0125 | 0.0259 | 0.0162 | 0.0173 | 0.1769 | tpy GRI-HAPCalc |

[1] 5 gr S/100scf. $SO_2$ calculation assumes 100% conversion of fuel elemental sulfur to $SO_2$.
[2] Assumes PM (Total) = TSP = PM-10 = PM-2.5
[3] lb/hr = Emission Factor (lb/MMscf) x Max Fuel Rate (Mscf/hr) x 10^-3 (MMscf/Mscf)
[4] tpy = lb/hr * hours of operation * 1ton/2000lb
[5] HAPs from GRI-HAPCalc 3.01

**Greenhouse Gas Calculations** [5]

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.1 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP [6] |
| 366.8 | 0.00069 | 0.0069 | 367.2 | lb/hr [7] |
| 1606.6 | 0.0030 | 0.030 | 1608.3 | tpy [4] |

[5] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[6] 40 CFR 98 Subpart A, Table A-1
[7] CO2, N2O, CH4 lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel Rate (Mscf/hr) * 10^-3 (MMscf/Mscf)*Heating Value (MMBtu/MMscf)
CO2e lb/hr = CO2 lb/hr + (CH4 lb/hr * GWP) + (N2O lb/hr * GWP)

**Reboiler Stack Exhaust Parameters**

| | | | |
|---|---|---|---|
| Site elevation: | 3431 | ft MSL | |
| Standard pressure: | 29.92 | in Hg | |
| Pressure at elevation: | 26.4 | in Hg | Hess, Introduction to Theoretical Meteorology, eqn. 6.8 |
| Standard temperature: | 528 | R | |
| Exhaust temp: | 212 | °F | Eng. estimate |
| Stack height: | 15 | ft | Design specification |
| Stack diameter: | 0.5 | ft | Design specification |
| F factor: | 10610 | wscf/10e6 Btu | 40 CFR 60 Appx A Method 19 |
| Exhaust flow: | 497 | scfm | Heat input * F factor/60 |
| Exhaust flow: | 718 | acfm | Va = Vs*(Ps/Pa)*(Ta/Ts) |
| Exhaust velocity: | 61 | ft/sec | Exhaust flow / stack area |

Enterprise Field Services
Chaparral Gas Plant

| | |
|---|---|
| Unit(s): | TK-1, TK-2, TK-3 |
| Description: | 300-bbl condensate storage tank |

**General Tank Information**

| | | | | |
|---|---|---|---|---|
| No of Condensate Tank: | 3 | | | |
| Volume: | 300 | bbl | | |
| Height (shell): | 15 | ft | | |
| Diameter: | 12 | ft | 60000 bbl/yr | Updated Throughput |
| Tank Throughput: | 20,000 | bbl/yr | 2520000 gal/yr | |
| Tank Throughput: | 840,000 | gal/yr | | |
| Turnovers: | 66.67 | maximum turnovers/yr | | |

**Working and Breathing Losses**[1]

| Component | Emissions (lb/yr) | Emissions (tpy) |
|---|---|---|
| VOC | 9986.15 | 4.99 |
| Hexanes | 25.10 | 0.013 |
| Benzene | 23.60 | 0.012 |
| Toluene | 11.73 | 0.0059 |
| Ethylbenzene | 1.63 | 0.00082 |
| Xylenes | 4.79 | 0.0024 |
| Total HAPs | 66.85 | 0.033 |

[1] Working and breathing losses calculated in TANKS 4.0.9d

**Emission Total for unit TK-1 through TK-3**

| | lb/hr | tpy |
|---|---|---|
| **VOC** | - | 14.98 |
| **Total HAPs** | - | 0.10 |
| Benzene | - | 0.035 |
| n-Hexane | - | 0.038 |

| | |
|---|---|
| Emission unit: | Load |
| Source Description: | Oil Loadout |

**$L_L$ = 12.46 (SPM) / T**

*Eq. 1, AP-42 Section 5.2, Transportation and Marketing of Petroleum Liquids*

| Parameter | Value | Unit | Notes |
|---|---|---|---|
| S = | 0.6 | Dimensionless | Submerged Loading, Table 5.2-1 |
| T = | 93.23 | F | Tanks 4.0.9d Max Liquid Temperature |
| P = | 8.5259 | psia | Tanks 4.0.9.d Max Vapor Pressure |
| M = | 67 | lb/lbmole | Tanks 4.0.9.d Vapor Mol. Weight |
| LL = | 7.7 | lb VOC/1000 gal | |

***Uncontrolled VOC Emissions***

| Parameter | Value | Unit |
|---|---|---|
| Truck Capacity | 180 | bbl |
| Max Loadout Rate [1] | 7,560 | gallon/hr |
| | 2,520,000 | gallons/yr |
| | 164 | bbl/day |
| Annual Loadout | 2,520 | Mgal/yr |
| | 60,000 | bbl/yr |
| | 19,453 | lb/yr |
| ***VOC Emissions [2]*** | ***9.73*** | ***tpy*** |

[1] Maximum hourly loadout rate based on the truck capacity, assuming 1 hour loadout time per truck.

[2] Requested emission rate for tpy =Requested Loadout * Loading Loss/1000/2000

***HAP Emissions***

| Parameter | Value | Unit |
|---|---|---|
| Tank VOCs [1] | 15.0 | tpy |
| Loadout VOC | 9.7 | tpy |
| Truck Tank Volume | 7,560 | gallons |
| Annual Loadout | 2,520,000 | gallons/yr |
| Loadout Time | 1 | hour/ loadout |
| Turnovers [2] | 333 | per year |

[1] Working and Breathing emissions for Tank-1 through Tank-3

[2] Turnovers = loading volume / truck tank volume

| HAPs | Tanks Working & Breathing | Uncontrolled Loadout Emissions |
|---|---|---|
| | lb/yr | tpy |
| *Benzene* | 70.80 | 0.023 |
| *Toluene* | 35.19 | 0.011 |
| *Ethylbenzene* | 4.89 | 0.0016 |
| *Xylene (m)* | 14.37 | 0.0047 |
| *n-Hexane* | 75.30 | 0.024 |
| ***TOTAL HAPs*** | ***200.55*** | ***0.065*** |

Enterprise Field Services
Chaparral Gas Plant

| | | | |
|---|---|---|---|
| Unit: | FLARE | | |
| Destruction Efficiency: | 98% | Manufacturer guarantee | |

**Waste stream flaring**

| | | | |
|---|---|---|---|
| Operating hours: | 8760 | hr/yr | |
| Hourly process flow: | 0.019 | MMscf/hr | Per 'Chaparral Flare List_DEW Pt Running_70MMSCFD_REV2' spreadsheet |
| Higher Heating Value: | 1964.0 | Btu/scf | Per 'Chaparral Flare List_DEW Pt Running_70MMSCFD_REV2' spreadsheet |
| Max hourly heat rate: | 38.1 | MMBtu/hr | Heating value of flare analysis (Btu/scf) * Volume (Mscf/hr) |

**Pilot emissions**

| | | | |
|---|---|---|---|
| Pilot gas flow: | 150 | scf/hr | Based on previous emission calculation |
| Natural Gas Heat Value | 950 | Btu/Scf | |
| Max hourly heat rate: | 0.14 | MMBtu/hr | |

| Composition[1] | Mol% | Spec Volume[2] (scf/lb) | Mass Fraction | Mass Flow (lb/hr) |
|---|---|---|---|---|
| Hydrogen Sulfide | 0.0020% | 11.14 | 1.8E-05 | 0.034 |
| Carbon Dioxide | 0.53% | 8.62 | 0.0063 | 11.88 |
| Nitrogen | 0.46% | 13.55 | 0.0034 | 6.55 |
| Methane | 44.49% | 23.65 | 0.1919 | 364.50 |
| Ethane | 17.14% | 12.62 | 0.1385 | 263.09 |
| Propane | 16.07% | 8.61 | 0.1905 | 361.83 |
| i-Butane | 3.14% | 6.53 | 0.0491 | 93.21 |
| n-Butane | 8.60% | 6.53 | 0.1343 | 255.11 |
| i-Pentane | 3.48% | 5.26 | 0.0675 | 128.23 |
| n-Pentane | 3.61% | 5.26 | 0.0700 | 132.95 |
| 2,2-methylpropane | 0.08% | 4.40 | 0.0018 | 3.33 |
| 2,2-dimethylbutane | 0.05% | 4.40 | 0.0012 | 2.30 |
| 2,3-dimethylbutane | 0.30% | 4.40 | 0.0069 | 13.09 |
| 2-methylpentane | 0.52% | 4.40 | 0.0121 | 23.07 |
| 3-methylpentane | 0.82% | 4.40 | 0.0191 | 36.18 |
| n-Hexane | 0.99% | 4.40 | 0.0231 | 43.79 |
| Methylcyclopentane | 0.63% | 4.51 | 0.0143 | 27.09 |
| Benzene | 0.76% | 4.9 | 0.0160 | 30.37 |
| Cyclohexane | 0.79% | 4.51 | 0.0178 | 33.77 |
| 2-methylhexane | 0.14% | 3.79 | 0.0038 | 7.27 |
| 3-methylhexane | 0.11% | 3.79 | 0.0031 | 5.85 |
| n-Heptane | 0.17% | 3.79 | 0.0047 | 8.91 |
| Methylcyclohexane | 0.36% | 3.87 | 0.0096 | 18.14 |
| Toluene | 0.21% | 4.12 | 0.0052 | 9.78 |
| n-Octane | 0.08% | 3.32 | 0.0023 | 4.42 |
| Ethylbenzene | 0.00% | 3.57 | 5.5E-05 | 0.10 |
| m-Xylene | 0.01% | 3.57 | 1.9E-04 | 0.36 |
| p-Xylene | 0.01% | 3.57 | 1.9E-04 | 0.35 |
| o-Xylene | 0.00% | 3.57 | 4.9E-05 | 0.093 |
| n-Nonane | 0.01% | 2.96 | 2.1E-04 | 0.40 |
| n-Decane | 0.00% | 2.67 | 1.4E-05 | 0.027 |
| n-C11 | 0.00% | 2.67 | 5.6E-07 | 1.1E-03 |
| n-C12 | 0.00% | 2.67 | 1.6E-08 | 3.0E-05 |
| n-C13 | 0.00% | 2.67 | 4.2E-10 | 8.1E-07 |
| n-C14 | 0.00% | 2.67 | 7.8E-12 | 1.5E-08 |
| n-C15 | 0.00% | 2.67 | 1.1E-12 | 2.0E-09 |
| | | | **VOC Total** | **1240.03** |
| | | | **Total** | **1886.09** |

| $NO_x$ | CO | VOC | $H_2S$ | $SO_2$[3] | | |
|---|---|---|---|---|---|---|
| 0.138 | 0.2755 | 0.14 | | | lb/MMBtu | TNRCC RG-109 (high Btu; other), AP-42, Ch. 13, Table 13.5-1 (VOC) |
| | | | | 98% | | Estimated conversion of combusted $H_2S$ to $SO_2$ |
| 0.020 | 0.039 | 0.020 | - | 2.14E-03 | lb/hr[4] | Pilot emissions |
| 5.3 | 10.5 | 24.8 | 0.00068 | 0.0629 | | Waste stream flaring |
| 0.09 | 0.17 | 0.09 | - | 0.0094 | tpy | Pilot emissions |
| 23.0 | 45.9 | 108.6 | 0.0030 | 0.2756 | | Waste stream flaring |
| **5.3** | **10.5** | **24.8** | **0.00068** | **0.0651** | **lb/hr** | **Total flare emissions** |
| **23.1** | **46.1** | **108.7** | **0.0030** | **0.2850** | **tpy** | |

| n-Hexane | Benzene | Toluene | Ethylbenzene | Xylenes | Total HAPs | |
|---|---|---|---|---|---|---|
| **0.9** | **0.61** | **0.20** | **0.0021** | **0.016** | **1.7** | **lb/hr[4]** |
| **3.8** | **2.7** | **0.9** | **0.0092** | **0.070** | **7.4** | **tpy** |

[1] Per 'Chaparral Flare List_DEW Pt Running_70MMSCFD_REV2' spreadsheet
[2] From "Physical Properties of Hydrocarbons"
[3] Assumed 98% conversion of combusted $H_2S$ to $SO_2$, Pilot Emissions assume 5 gr S / 100 scf
[4] For NOx and CO, lb/hr = EF (lb/MMBtu) * Heat input (MMBtu/hr)
For VOC, HAPs, and $H_2S$ lb/hr = Flow (lb/hr) * (1 - Control%)

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | | |
|---|---|---|---|---|---|
| 897734.573 | | 75514266.4 | | cf/yr | 40 CFR 98 Eqns. W-19, W-20, W-21, W-40 |
| | 1.00E-04 | | | kg/MMBtu | 40 CFR 98 Eqn. W-40 |
| 0.0526 | | 0.0192 | | kg/cf | 40 CFR 98.233(v) |
| 1 | 298 | 25 | | GWP | 40 CFR 98 Table A-1 |
| | | | | | |
| 52.1 | 3.67E-02 | 1598.2 | 1650.3 | tons/yr | 40 CFR 98 Eqns. W-36 and W-40 |
| 52.1 | 10.95 | 39955.3 | 40018.3 | tons/yr $CO_2e$ | tons/yr * GWP |

**Chaparral Flare Summary**

| | Flare Collection System Summary | | | | | | Vent to Air from Tanks | |
|---|---|---|---|---|---|---|---|---|
| | Total Dump to Flare Drum | | Flow to Flare | | Flow to Condensate Tanks | | Vent to Atmosphere from Tanks | |
| | Mass Frac | Mass Flow, lb/hr | Mass Frac | Mass Flow, lb/hr | Mass Frac | Mass Flow, lb/hr | Mass Frac | Mass Flow, lb/hr |
| H2S | 0.000 | 0.024 | 0.0000 | 0.034 | 0.0000 | 0.000 | 0.0000 | 0.000 |
| CO2 | 0.004 | 8.440 | 0.0063 | 11.885 | 0.0000 | 0.004 | 0.0047 | 0.000 |
| Nitrogen | 0.002 | 4.641 | 0.0034 | 6.552 | 0.0000 | 0.000 | 0.0007 | 0.000 |
| Methane | 0.128 | 258.370 | 0.1919 | 364.497 | 0.0003 | 0.036 | 0.0896 | 0.001 |
| Ethane | 0.093 | 187.359 | 0.1385 | 263.091 | 0.0015 | 0.183 | 0.1200 | 0.002 |
| Propane | 0.130 | 262.041 | 0.1905 | 361.834 | 0.0085 | 1.043 | 0.1971 | 0.003 |
| i-Butane | 0.035 | 70.344 | 0.0491 | 93.210 | 0.0064 | 0.784 | 0.0551 | 0.001 |
| n-Butane | 0.098 | 198.547 | 0.1343 | 255.111 | 0.0264 | 3.236 | 0.1556 | 0.002 |
| i-Pentane | 0.057 | 115.202 | 0.0675 | 128.230 | 0.0360 | 4.419 | 0.0829 | 0.001 |
| n-Pentane | 0.064 | 129.297 | 0.0700 | 132.948 | 0.0519 | 6.368 | 0.0883 | 0.001 |
| 22-Mpropane | 0.001 | 2.664 | 0.0018 | 3.329 | 0.0005 | 0.056 | 0.0020 | 0.000 |
| 22-Mbutane | 0.001 | 2.801 | 0.0012 | 2.296 | 0.0017 | 0.213 | 0.0016 | 0.000 |
| 23-Mbutane | 0.008 | 17.051 | 0.0069 | 13.086 | 0.0115 | 1.411 | 0.0090 | 0.000 |
| 2-Mpentane | 0.016 | 31.691 | 0.0121 | 23.073 | 0.0227 | 2.782 | 0.0161 | 0.000 |
| 3-Mpentane | 0.026 | 53.443 | 0.0191 | 36.180 | 0.0411 | 5.042 | 0.0255 | 0.000 |
| n-Hexane | 0.037 | 73.980 | 0.0231 | 43.790 | 0.0635 | 7.788 | 0.0315 | 0.000 |
| Mcyclopentan | 0.024 | 48.747 | 0.0143 | 27.092 | 0.0437 | 5.358 | 0.0194 | 0.000 |
| Benzene | 0.029 | 57.875 | 0.0160 | 30.373 | 0.0537 | 6.591 | 0.0219 | 0.000 |
| Cyclohexane | 0.035 | 71.660 | 0.0178 | 33.766 | 0.0705 | 8.654 | 0.0244 | 0.000 |
| 2-Mhexane | 0.011 | 22.529 | 0.0038 | 7.270 | 0.0257 | 3.150 | 0.0055 | 0.000 |
| 3-Mhexane | 0.009 | 18.897 | 0.0031 | 5.846 | 0.0218 | 2.675 | 0.0044 | 0.000 |
| n-Heptane | 0.018 | 36.325 | 0.0047 | 8.911 | 0.0443 | 5.440 | 0.0069 | 0.000 |
| Mcyclohexane | 0.035 | 70.059 | 0.0096 | 18.142 | 0.0845 | 10.370 | 0.0137 | 0.000 |
| Toluene | 0.026 | 51.876 | 0.0052 | 9.782 | 0.0664 | 8.147 | 0.0076 | 0.000 |
| n-Octane | 0.026 | 53.356 | 0.0023 | 4.422 | 0.0742 | 9.104 | 0.0037 | 0.000 |
| E-Benzene | 0.001 | 1.700 | 0.0001 | 0.105 | 0.0024 | 0.295 | 0.0001 | 0.000 |
| m-Xylene | 0.004 | 7.093 | 0.0002 | 0.359 | 0.0101 | 1.240 | 0.0003 | 0.000 |
| p-Xylene | 0.003 | 6.832 | 0.0002 | 0.352 | 0.0097 | 1.193 | 0.0003 | 0.000 |
| o-Xylene | 0.001 | 1.986 | 0.0000 | 0.093 | 0.0028 | 0.348 | 0.0001 | 0.000 |
| n-Nonane | 0.007 | 15.116 | 0.0002 | 0.403 | 0.0219 | 2.688 | 0.0004 | 0.000 |
| n-Decane | 0.001 | 3.018 | 0.0000 | 0.027 | 0.0044 | 0.544 | 0.0000 | 0.000 |
| n-C11 | 0.000 | 0.387 | 0.0000 | 0.001 | 0.0006 | 0.070 | 0.0000 | 0.000 |
| n-C12 | 0.000 | 0.029 | 0.0000 | 0.000 | 0.0000 | 0.005 | 0.0000 | 0.000 |
| n-C13 | 0.000 | 0.003 | 0.0000 | 0.000 | 0.0000 | 0.001 | 0.0000 | 0.000 |
| n-C14 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 |
| n-C15 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 |
| H2O | 0.069 | 138.563 | 0.0068 | 12.909 | 0.1912 | 23.459 | 0.0114 | 0.000 |
| TEG | 0.000 | 0.038 | 0.0000 | 0.005 | 0.0001 | 0.006 | 0.0000 | 0.000 |
| **Total Flow, lb/hr** | | 2022.0 | | 1899.0 | | 122.7 | | 0.01 |

| | | |
|---|---|---|
| Mole Wt | 37.20 | |
| Flow | 19,375 | SCFH |
| LHV | 1861 | Btu/SCF |
| HHV | 1964 | Btu/SCF |

Enterprise Field Services - Chaparral Gas Plant

# Enclosed Combustion Device

Emission Unit: ECD-1
Source Description: DEHY-1 Still Vent Emissions

***VOC Heat Input and Flow Rate Calculation Per Unit***

| Parameters | Value | Unit | Notes |
|---|---|---|---|
| Number of ECDs | 1 | - | |
| VOC Emissions | 74.18 | tpy | DEHY-1 Still Vent Emissions |
| HAP Emissions | 6.29 | tpy | DEHY-1 Still Vent Emissions |
| Capture Effiency | 100% | | |
| Captured VOC Emissions | 74.18 | tpy | DEHY-1 Still Vent Emissions |
| Captured HAP Emissions | 6.29 | tpy | DEHY-1 Still Vent Emissions |
| Safety Factor | 25% | | |
| VOC Emissions w/ SF | 92.73 | tpy | DEHY-1 Still Vent Emissions |
| HAP Emissions w/ SF | 7.87 | tpy | DEHY-1 Still Vent Emissions |
| Total Flared Gas Heating Value | 2438.27 | Btu/scf | Weighted average heating value from all streams |
| Total Flared Gas Flow | 164.31 | scf/hr | Total flow from all streams to flare |
| Total Flared Gas Heating Rate | 0.401 | MMBtu/hr | Calculated based on heating value and steady-state flow |
| | 25% | % | Safety factor |
| Flared Gas Flow Rate with Safety Factor | 205.39 | scf/hr | Flow with safety factor |
| | 1.799178 | MMscf/yr | |
| Short-Term Safety Factor | 0% | - | Applied to emissions to account for variations in heat content. |
| Heating Rate | 0.501 | MMBtu/hr | |
| | 140 | scf/hr | Engineering Estimate |
| Flare pilot | 25% | | Safety factor |
| | 175 | scf/hr | Pilot flow with safety factor |
| | 1.75E-04 | MMscf/hr | |
| Hours of Operation | 8760.00 | hrs | |
| Pipeline Gas HHV | 950.00 | Btu/scf | Facility specification |
| Flare Heat Input | 0.166 | MMBtu/hr | |
| | 1.53 | MMscf/yr | |
| Total Flare Flow Rate | 9129.25 | SCF/D | |
| Heating Rate + Pilot | 0.67 | MMBtu/hr | |

**Emission Rates Per Unit**

| | $NO_X$ | CO | VOC[1] | $SO_2$[2] | $H_2S$ | HAPs[1] | Units | Notes |
|---|---|---|---|---|---|---|---|---|
| **Emission Factors** | 0.1380 | 0.2755 | | | | | lb/MMBtu | TNRCC RG-109 (high Btu; other) |
| | | | | | | | lb $H_2S$/Mscf | |
| | | | | 1.00E-03 | | | lb S/hr | |
| | | | 92.73 | | - | 7.87 | tpy | DEHY-1 Still Vent Emissions |
| **Pilot Emissions** | 0.023 | 0.046 | - | 2.00E-03 | | - | lb/hr | |
| | 0.100 | 0.201 | - | 0.009 | | - | tpy | |
| **Process Emissions** | 0.069 | 0.138 | - | - | - | - | lb/hr | |
| | | | 0.42 | - | - | 0.036 | lb/hr | |
| | 0.30 | 0.60 | 1.85 | - | - | 0.16 | tpy | |
| ***Total Emissions*** | ***0.092*** | ***0.18*** | ***0.42*** | ***2.00E-03*** | - | ***0.036*** | lb/hr | |
| | ***0.40*** | ***0.80*** | ***1.85*** | ***8.76E-03*** | - | ***0.16*** | tpy | |

[1] DEHY-1 BTEX emissions are controlled by ECD-1. 98% DRE

[2] Fuel sulfur content is assumed to be 5 gr/100 Scf

"-" Indicates emissions of this pollutant are not expected.

3 From TCEQ "Air Permit Guidance For Chemical Sources, Flare And Vapor Oxidizers" (Draft Oct. 2000) Table 4, emission factors for industrial flares combusting high-Btu vapors.

4 Based on US EPA AP-42 Chapter 1.4, Table 1.4-2, PM emission factor is used with a ratio of the default heating value of natural gas to the heating value of the waste gas.

5 Maximum Potential Hourly Emission Rate (lb/hr) = Gas Stream Heat Input (MMBtu/hr) x Emission Factor (lb/MMBtu)

Example NOx Hourly Emission Rate (lb/hr) $\frac{0.40\ \text{MMBtu}}{\text{hr}} \times \frac{0.138\ \text{lb}}{\text{MMBtu}} = \frac{0.06\ \text{lb}}{\text{hr}}$

6 Maximum Potential Annual Emission Rate (tpy) = Gas Stream Heat Input (MMBtu/yr) x Emission Factor (lb/MMBtu) / (2,000 lb/ton)

Example NOx Annual Emission Rate (tpy) = $\frac{3{,}509\ \text{MMBtu}}{\text{yr}} \times \frac{0.138\ \text{lb}}{\text{MMBtu}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = \frac{0.24\ \text{ton}}{\text{yr}}$

**Exhaust Parameters (F-factor method)**

| | | | |
|---|---|---|---|
| Heat Rate: | 0.67 | MMBtu/hr | Minimum Mfg. Specifications |
| Exhaust temp (Tstk): | 1150 | °F | Engineer Estimate |
| Site Elevation: | 3374 | ft MSL | |
| Ambient pressure (Pstk): | 26.42 | in. Hg | Calculated based on elevation |
| F factor: | 10610 | scf/MMBtu | 40 CFR 60 Appx A Method 19 |
| Exhaust flow | 2.0 | cfs | F Factor (scf/MMBtu) * Input Heat Rate (MMBtu/hr) / (60 min/hr) / (60 sec/min) |
| Stack diameter: | 2.5 | ft | Mfg. Specifications |
| Stack height: | 9.42 | ft | Mfg. Specifications |
| Exhaust velocity: | 0.4 | ft/sec | Exhaust flow ÷ stack area |

| GHGs | EF | Units | Source | CO2e mt/yr | GWP | CO2e mt $CO_{2e}$/yr |
|---|---|---|---|---|---|---|
| $CO_2$ | 53.06 | kg/mmBTU | 40 CFR 98 | 310.042 | 1 | 310.04 |
| $CH_4$ | 1.00E-03 | kg/mmBTU | 40 CFR 98 | 0.00584 | 25 | 0.15 |
| $N_2O$ | 1.00E-04 | kg/mmBTU | 40 CFR 98 | 0.00058 | 298 | 0.17 |
| | | | | | Total | 310.36 |

Unit(s): FUG-1
Description: Facility fugitives associated with existing equipment (monitored under NSPS KKK)

**Gas Analysis**

| Components | MW | Inlet Gas Before Dehydration Mol % | Inlet Gas Before Dehydration Weight % |
|---|---|---|---|
| Nitrogen | 28.01 | 2.0611 | 2.7992 |
| Methane | 16.04 | 79.7031 | 61.9991 |
| Carbon Dioxide | 44.01 | 0.4875 | 1.0404 |
| Hydrogen Sulfide | 34.08 | 0.0010 | 0.0017 |
| Ethane | 30.07 | 10.1545 | 14.8053 |
| Propane | 44.10 | 4.5887 | 9.8114 |
| i-Butane | 58.12 | 0.5395 | 1.5205 |
| n-Butane | 58.12 | 1.2428 | 3.5027 |
| 2,2-Dimethylpropane | 72.15 | 0.0040 | 0.0140 |
| i-Pentane | 72.15 | 0.2827 | 0.9891 |
| n-Pentane | 72.15 | 0.2837 | 0.9926 |
| 2,2-Dimethylbutane | 86.17 | 0.0040 | 0.0167 |
| Cyclopentane | 70.10 | 0.0000 | 0.0000 |
| 2,3-Dimethylbutane | 86.18 | 0.0300 | 0.1252 |
| 2-Methylpentane | 86.18 | 0.0699 | 0.2922 |
| 3-Methylpentane | 86.18 | 0.0390 | 0.1628 |
| i-Hexane | 86.18 | 0.0000 | 0.0000 |
| n-Hexane | 86.18 | 0.0819 | 0.3423 |
| Methylcyclopentane | 84.16 | 0.0470 | 0.1916 |
| Benzene | 78.11 | 0.0470 | 0.1778 |
| CC6 | 84.16 | 0.0619 | 0.2528 |
| 2-Methylhexane | 100.20 | 0.0110 | 0.0534 |
| 3-Methylhexane | 100.20 | 0.0120 | 0.0582 |
| 2,2,4-Trimethylpentane | 114.22 | 0.0000 | 0.0000 |
| i-Heptane | 100.21 | 0.0000 | 0.0000 |
| n-Heptane | 100.21 | 0.0520 | 0.2524 |
| Methylcyclohexane | 98.19 | 0.0410 | 0.1950 |
| Toluene | 92.14 | 0.0230 | 0.1027 |
| i-Octane | 114.23 | 0.0000 | 0.0000 |
| n-Octane | 114.23 | 0.0290 | 0.1605 |
| Ethylbenzene | 106.17 | 0.0000 | 0.0000 |
| p-m-Xylene | 106.16 | 0.0030 | 0.0154 |
| o-Xylene | 106.16 | 0.0010 | 0.0051 |
| i-Nonane | 128.20 | 0.0000 | 0.0000 |
| n-Nonane | 128.20 | 0.0060 | 0.0373 |
| i-Decane | 142.29 | 0.0000 | 0.0000 |
| n-Dexane+ | 142.29 | 0.0000 | 0.0000 |
| i-Undecanes+ | 156.31 | 0.0002 | 0.0015 |
| H2O | 18.02 | 0.0928 | 0.0810 |
| **Total[1]** | 20.62 | 100.00 | 99.92 |
| **Total VOC** | | 7.50 | 19.27 |
| **Total H2S** | | 0.0010 | 0.0017 |
| **Total HAP** | | 0.156 | 0.64 |

**Emission Calculations**

| Component Type | Service | EF[2] (kg/hr/source) | Count[3] | Weight % VOC[4] | Weight % HAP[4] | Weight % $H_2S$[4] | VOC Emissions[5] (lb/hr) | HAP Emissions[5] (lb/hr) | H2S Emissions[5] (lb/hr) |
|---|---|---|---|---|---|---|---|---|---|
| Valves | Gas/Vapor | 4.50E-03 | 1257 | 19.3 | 0.64 | 0.00165 | 2.4 | 0.080 | 2.1E-04 |
| | Light Liquid | 2.50E-03 | 1040 | 99.9 | 1.00 | 0.0 | 5.7 | 0.06 | 0.000 |
| | Heavy Liquid | 8.40E-06 | 124 | 100.0 | 5.00 | 0.0 | 0.0023 | 0.0001 | 0.0000 |
| Flanges | Gas/Vapor | 3.90E-04 | 701 | 19.3 | 0.64 | 0.00165 | 0.12 | 0.004 | 1.0E-05 |
| | Light Liquid | 1.10E-04 | 272 | 99.9 | 1.00 | 0.0 | 0.07 | 0.001 | 0.0000 |
| | Heavy Liquid | 3.90E-07 | 41 | 100 | 5.00 | 0 | 0.0000 | 0.0000 | 0.0000 |
| Open End Lines | Gas/Vapor | 2.00E-03 | 0 | 19.3 | 0.64 | 0.00165 | 0.0000 | 0.0000 | 0.0E+00 |
| | Light Liquid | 1.40E-03 | 0 | 100 | 1.00 | 0.0 | 0.0000 | 0.0000 | 0.0000 |
| | Heavy Liquid | 1.40E-04 | 0 | 100.0 | 5.00 | 0.0 | 0.0000 | 0.0000 | 0.0000 |
| PRVs | Gas/Vapor | 8.80E-03 | 51 | 19.3 | 0.64 | 0.00165 | 0.2 | 0.006 | 1.6E-05 |
| | Light Liquid | 7.50E-03 | 9 | 99.9 | 1.00 | 0.0 | 0.1487 | 0.0015 | 0.0000 |
| | Heavy Liquid | 3.20E-05 | 2 | 100.0 | 5.00 | 0.0 | 0.0001 | 0.0000 | 0.0000 |
| Other | Gas/Vapor | 8.80E-03 | 10 | 19.3 | 0.64 | 0.00165 | 0.037 | 0.0012 | 3.2E-06 |
| | Light Liquid | 7.50E-03 | 0 | 99.9 | 1.00 | 0.0 | 0.0000 | 0.0000 | 0.0000 |
| | Heavy Liquid | 3.20E-05 | 0 | 100.0 | 5.00 | 0.0 | 0.0000 | 0.0000 | 0.0000 |
| Pumps | Gas/Vapor | 2.40E-03 | 0 | 19.3 | 0.64 | 0.00165 | 0.000 | 0.00000 | 0.0E+00 |
| | Light Liquid | 1.30E-02 | 9 | 99.9 | 1.00 | 0.0 | 0.26 | 0.003 | 0.00000 |
| | Heavy Liquid | 1.30E-02 | 4 | 100.0 | 5.00 | 0.0 | 0.1146 | 0.0057 | 0.0000 |
| Connectors | Gas/Vapor | 2.00E-04 | 2521 | 19.3 | 0.64 | 0.00165 | 0.214 | 0.00715 | 1.8E-05 |
| | Light Liquid | 2.10E-04 | 1932 | 99.9 | 1.00 | 0.0 | 0.894 | 0.0089 | 0.0000 |
| | Heavy Liquid | 7.50E-06 | 284 | 100.0 | 5.00 | 0.0 | 0.0047 | 0.0002 | 0.0000 |

**Total Criteria Pollutant Emissions**

| VOC | $H_2S$ | |
|---|---|---|
| 10.2 | 2.5E-04 | lb/hr[6] |
| 0% | 0% | Safety factor |
| | | |
| 10.2 | 2.5E-04 | lb/hr |
| 44.6 | 1.1E-03 | tpy[7] |

**HAP Emissions**

| n-Hexane | Benzene | Toluene | Xylenes | Total HAPs | |
|---|---|---|---|---|---|
| 0.094 | 0.049 | 0.028 | 0.006 | 0.18 | lb/hr[6] |
| 5% | 5% | 5% | 5% | 5% | Safety factor |
| | | | | | |
| 0.098 | 0.051 | 0.029 | 0.0059 | 0.185 | lb/hr |
| 0.43 | 0.224 | 0.129 | 0.0259 | 0.81 | tpy[7] |

Notes

[1] Total MW = $\Sigma$ $MW_i$ x Mol $\%_i$

[2] Emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates, 199!

[3] Facility component count based on similar facility component count

Safety factor = 5% added to facility component count.

[4] Weight% VOC and HAP of light liquid conservatively assumed to be 100% and 5%, respectively

Weight% of n-hexane, benzene, toluene, xylenes, and ethylbenzene in light liquid conservatively assumed to be 1% for each

[5] Emissions per component type (lb/hr) = EF (kg/hr/source) x Component Count x Weight% (VOC, HAP) x 2.20462 lb/kg

[6] Total Emissions (lb/hr) =Weight $\%_{gas}$ (VOC, HAP) x [$\Sigma$ $Ef_{i,\,gas}$ (kg/hr/source) x $Count_{i,\,gas}$]x 2.20462 lb/kg

+ Weight %liquid (VOC, HAP) x [Σ Efi, liquid (kg/hr/source) x Component Counti, liquid] x2.20462 lb/kg

[7] tons/yr = lb/hr * Hours of operation (hr/yr) * 1ton/2000lb

[8] GHG ton/yr =Weight % ($CO_2$, $CH_4$) x [$\Sigma$ $Ef_{i,\,gas}$ (kg/hr/source) * Component $Count_{i,\,gas}$] * 1tonne/1000kg * Hours of operation (hr/yr) * 1.1023ton/tonne

[9] tons/yr $CO_2$e = ton/yr * GWP

Enterprise Field Services
Chaparral Gas Plant

Unit: FUG-2
Description: Facility fugitives associated with MRU equipment
(to be monitored under NSPS OOOO)

**Emission Rates**

| VOC | $H_2S$ | Benzene | Toluene | Xylenes | n-Hexane | Total HAPs | |
|---|---|---|---|---|---|---|---|
| 22.3 | 5.6E-04 | 0.112 | 0.065 | 0.0129 | 0.22 | 0.40 | tpy[1] |
| 5% | 5% | 5% | 5% | 5% | 5% | 5% | Safety Factor[2] |
| 23.4 | 5.8E-04 | 0.117 | 0.068 | 0.0136 | 0.23 | 0.42 | |

1 Assumes emissions for MRU equipment is 50% of the fugitive emissions associated with the equipment monitored under NSPS KKK (FUG-1)

2 10% safety factor added to account for additional fugitive components anticipated within the MRU/closed drain system

Mean Vehicle Weight and Trip Calculator for Unpaved Road Emissions

**Plant Road**

| | Weight (tons) | | | | Vehicles | | |
|---|---|---|---|---|---|---|---|
| Vehicle Typ | Empty Vehicle[1] | Load Size[2] | Loaded Vehicle[3] | Mean Vehicle[4] | Per Day (VPD)[5] | Segments per trip | Trips per hour[6] |
| Condensate | 16 | 21.2 | 37.2 | 26.6 | 24 | 1 | 6 |

| | | |
|---|---|---|
| Hours of Operation per Day | 24 | |
| Total Vehicles Per Day | 24.0 | |
| ted Mean Vehicle Weight (WMVW)[8] | 26.6 | tons |
| Total Trips per Hour | 6.0 | |

[1] Empty vehicle weight includes driver and occupants and full fuel load.
[2] Cargo, transported materials, etc. (5.6 lb/gal RVP10 *7560 gal truck/ 2000lb/ton)
[3] Loaded vehicle weight = Empty + Load Size
[4] Mean Vehicle weight = (Loaded Weight + Empty Weight) / 2
[5] A conservative estimate of vehicles per day.
[6] Maximum expected trips per hour
[7] WMVW = (Mean Vehicle Weight*VPD) ÷ Total Vehicles per Day

**Unpaved Road Emission Factors**

| | Factor Calculation (AP-42 Sec. 13.2.2.3 November, 2006, Equation 2) | | | | | | | | | | | | Hourly Emission Factor | | | Annual, Wet Day, Emission Factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Operating Hours per Year | Surface material silt content[1] | Mean Vehicle Weight, tons | PM-30 | PM-10 | PM-2.5 | PM-30 | PM-10 | PM-2.5 | PM-30 | PM-10 | PM-2.5 | E PM-30 | E PM-10 | E PM-2.5 | E PM-30 | E PM-10 | E PM-2.5 | Wet Days |
| | | s | W | k | k | k | a | a | a | b | b | b | | | | | | | |
| Route | | % | tons | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | lb/VMT | |
| nsate trucks | 8760 | 2.7 | 26.58 | 4.9 | 1.5 | 0.15 | 0.7 | 0.9 | 0.9 | 0.45 | 0.45 | 0.45 | 4.60 | 1.05 | 0.10 | 3.85 | 0.87 | 0.087 | 60 |

**Unpaved Production Road Emissions**

| | | | | | | | Potential Emission Rate | | | | | | Potential to Emit | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Route | Segment Length | Trips per Segment | Trips per hour | Trips per day | Effective Segment Length | Average VMT/hr | PM-30 | | PM-10 | | PM-2.5 | | PM-30 | | PM-10 | | PM-2.5 | |
| | mi | | T | T | mi | mi/hr | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy | lb/hr | tpy |
| nsate trucks | 0.20 | 1 | 6.0 | 24.0 | 0.20 | 1.20 | 5.5 | 3.4 | 1.3 | 0.77 | 0.13 | 0.077 | 5.5 | 3.4 | 1.3 | 0.77 | 0.13 | 0.077 |
| | | | | | | **TOTAL** | **5.52** | **3.37** | **1.25** | **0.77** | **0.13** | **0.077** | **5.52** | **3.37** | **1.25** | **0.77** | **0.13** | **0.077** |

[1] Surface silt = % of 75 micron diameter and smaller particles
[2] E = k x (s/12)^a x (W/3)^b (AP-42 page 13.2.2-4 Equation 1a, November 2006)
E= Size Specific Emission Factor (lb/VMT)
s = surface material silt content (%), adjusted by 40% to account for gravel, rather than dirt roads
k, a, b = constants from AP-42 Table 13.2.2-2
W = Weighted Mean Vehicle Weight from Haul Road Inputs (tons)
[3] PM-30 emission factor in equation is assumed as a surrogate for TSP emissions
[4] VMT/hr = Vehicle Miles Travelled per hour= Trips per hour * Segment Length
[5] Wet Day Emission Factor = E * (365 - Wet Days)/365. Wet days value is the NM default allowed by NMED without additional justification.
[6] Controlled Emissions = Uncontrolled Emissions * (1 - Control Factor/100%)
Control Factor = 0%

Enterprise Field Services
Chaparral Gas Plant

| | |
|---|---|
| Unit(s): | FLARE |
| Description: | SSM/M1 flaring |

**Blowdown Rates**

| | | | |
|---|---|---|---|
| | 75369 | lb/hr | Design maximum |
| | 0.05267 | lb/cf | Nominal density |
| | 1,431,089 | scf/hr | Blowdown rate (lb/hr) / Density (lb/cf) |
| | 10,000,000 | scf/yr | Expected annual volume |
| | 1166 | Btu/scf | Flare gas sample (3/24/14) |
| | 1668.65 | MMBtu/hr | |
| | 11660.00 | MMBtu/yr | |
| Total | 1668.65 | MMBtu/hr | |

**Stack Parameters**

| | | | |
|---|---|---|---|
| 1000 | ˚C | Exhaust temperature | Per NMAQB modeling guidelines |
| 20 | m/sec | Exhaust velocity | Per NMAQB modeling guidelines |
| 100 | ft | Flare height | Design |
| 37.20 | g/mol | Flared gas molecular weight | Wtd. MW from pilot and steady-state |
| 116,805,474 | cal/sec | Heat release (q) | MMBtu/hr * $10^6$ * 252 cal/Btu ÷ 3600 sec/hr |
| 82,609,427 | | $q_n$ | $q_n = q(1-0.048(MW)^{1/2})$ |
| 9.0890 | m | Effective stack diameter (D) | $D = (10^{-6}q_n)^{1/2}$ |

**Emission Rates**

*SSM/M1*

| | $NO_x$ | CO | VOC | $H_2S$ | $SO_2$ | HAPs | Units | |
|---|---|---|---|---|---|---|---|---|
| | 0.1380 | 0.2755 | | | | | lb/MMBtu | TNRCC RG-109, high Btu gas, other |
| | | | 40.65% | 0.0004% | | 0.4510% | mol% | Nominal for facility |
| | | | 6.262 | 11.136 | | 6.262 | $ft^3/lb$ | specific volume |
| | | | 92895.19 | 0.5140 | | 1030.62 | lb/hr | vol. Gas * mole fraction / specific volume |
| | | | 649122.4 | 3.59 | | 7201.67 | lb/yr | vol. Gas * mole fraction / specific volume |
| | **230.3** | **459.7** | | | | | lb/hr | lb/MMBtu * MMBtu/hr |
| | | | **1857.9** | **1.0E-02** | **0.95** | **20.6** | lb/hr | 98% combustion; 100% conversion to $SO_2$ |
| | **0.80** | **1.6** | **6.49** | **3.6E-05** | **3.31E-03** | **0.072** | tpy | |
| **TOTAL** | **230.3** | **459.7** | **1857.9** | **0.010** | **0.9** | **20.6** | lb/hr | |
| | **0.80** | **1.6** | **6.49** | **3.6E-05** | **3.3E-03** | **0.072** | tpy | |
| | **10.0** | **10.0** | **10.0** | **0.045** | **4.2** | **10.0** | tpy (assume for all annual emissions) | |

**Flare Gas Composition: Combined waste streams associated the VRU and other sources**

| 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 | 1.93% | | | | | |
| Nitrogen | 28.01 | 0.42% | 0.4307% | 0.12064 | 0.33% | 13.547 | |
| $CO_2$ | 44.01 | 0.45% | 0.4579% | 0.20150 | 0.54% | 8.623 | |
| $H_2S$ | 34.08 | 0.00040% | 0.00041% | 0.00014 | 0.00038% | 11.136 | |
| Methane | 16.04 | 40.80% | 41.608% | 6.67397 | 18.01% | 23.65 | |
| Ethane | 30.07 | 15.74% | 16.0516% | 4.82671 | 13.03% | 12.62 | |
| Propane | 44.10 | 14.89% | 15.1835% | 6.69593 | 18.07% | 8.606 | 2.28420521 |
| Iso-butane | 58.12 | 2.97% | 3.0262% | 1.75883 | 4.75% | 6.529 | 0.45519154 |
| N-butane | 58.12 | 8.20% | 8.3631% | 4.86063 | 13.12% | 6.529 | 1.25794593 |
| Iso-pentane | 72.15 | 3.50% | 3.5686% | 2.57474 | 6.95% | 5.26 | 0.53683588 |
| N-pentane | 72.15 | 3.73% | 3.7987% | 2.74073 | 7.40% | 5.26 | 0.57144561 |
| Iso-Hexanes | 86.08 | 2.78% | 2.8312% | 2.43710 | 6.58% | 4.404 | 0.42544465 |
| *N-Hexane** | 86.18 | 1.20% | 1.2287% | 1.05891 | 2.86% | 4.404 | 0.1848535 |
| *Benzene** | 78.11 | 0.86% | 0.8767% | 0.68477 | 1.85% | 4.858 | 0.13186351 |
| Cyclohexane | 84.16 | 0.99% | 1.0112% | 0.85106 | 2.30% | 4.509 | 0.15211118 |
| Iso-heptanes | 100.20 | 1.10% | 1.1176% | 1.11986 | 3.02% | 4.404 | 0.19549447 |
| n-heptane | 100.21 | 0.0000% | 0.0000% | 0.00000 | 0.00% | 4.404 | 0.0000 |
| *Toluene** | 92.14 | 0.28% | 0.2896% | 0.26684 | 0.72% | 4.119 | 0.04356835 |
| iso-octanes | 114.23 | 0.12% | 0.1233% | 0.14082 | 0.38% | 3.322 | 0.01854367 |
| n-octane | 114.23 | 0.00% | 0.0000% | 0.00000 | 0.00% | 3.322 | 0.000000 |
| *Ethylbenzene** | 106.07 | 0.00% | 0.0000% | 0.00000 | 0.00% | 3.574 | 0 |
| *m,o & p xylene** | 106.16 | 0.021% | 0.0215% | 0.02279 | 0.06% | 3.574 | 0.00322874 |
| i-nonanes | 128.26 | 0.010% | 0.0106% | 0.01364 | 0.04% | 2.959 | 0.00160027 |
| n-nonanes | 128.20 | 0.00% | 0.0000% | 0.00000 | 0.00% | 2.959 | 0 |
| i-decanes | 142.29 | 0.00067% | 0.0007% | 0.00097 | 0.00% | 2.667 | 0.00010291 |
| n-decanes | 142.29 | 0.00% | 0.0000% | 0.00000 | 0.00% | 2.667 | 0 |
| i-undecanes + | 142.29 | 0.00% | 0.0000% | 0.00005 | 0.00% | 2.667 | 4.9004E-06 |
| Total | | 100.00% | 100.00% | 37.05 | 100% | | 6.262 |
| Dry total | | 98.07% | | *(mixture mol. wt)* | | | |
| | *NMEHC (VOC)* | *40.65%* | | | 68.09% | | |

**Greenhouse Gas Calculations**

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | | |
|---|---|---|---|---|---|
| 1 | 298 | 25 | | GWP | 40 CFR 98 Subpart A, Table A-1 |
| 1126.3 | 0.0014 | 1.7 | 1169.9 | tpy | 40 CFR 98 Equations W-19, W-20, W-21, and W-40 |

Enterprise Field Services
Chaparral Gas Plant

| | |
|---|---|
| Unit(s): | E-VRU-1 |
| Description: | CAT G3508 LE natural-gas fired engine |

**Engine Horsepower and RPM**

| | | | |
|---|---|---|---|
| Engine speed: | 1400 | rpm | Mfg data |
| Rating: | 515 | hp | |

**Fuel Consumption**

| | | | |
|---|---|---|---|
| BSFC: | 7510 | Btu/hp-hr | Mfg data |
| Fuel heat value: | 950 | Btu/scf | Pipeline specification |
| Heat input: | 3.9 | MMBtu/hr | BSFC * site hp |
| Fuel consumption: | 4.1 | Mscf/hr | Heat input / fuel heat value |
| Annual fuel usage: | 35.7 | MMscf/yr | 8760 hrs/yr operation |

**Uncontrolled Emission Calculations**

| $NO_x$ | CO | VOC | $SO_2$[1] | PM[2] | | |
|---|---|---|---|---|---|---|
| 2.0 | 2.00 | 0.70 | | | g/hp-hr | Mfg data |
| | | | 5 | | gr S/100 scf | Pipeline specification |
| | | | | 9.99E-03 | lb/MMBtu | AP-42 Table 3.2-2 (7/00) |
| **2.3** | **2.3** | **0.79** | **0.058** | **0.039** | lb/hr[5] | Hourly emission rate |
| **9.9** | **9.9** | **3.5** | **0.25** | **0.17** | tpy[6] | Annual emission rate (8760 hrs/yr) |

**Controlled Emission Calculations**

| $NO_x$ | CO | VOCs | $SO_2$[1] | PM[2] | | |
|---|---|---|---|---|---|---|
| 0% | 83% | 50% | 0% | 0% | %Control | |
| **2.3** | **0.39** | **0.40** | **0.058** | **0.039** | lb/hr[4] | Hourly emission rate |
| **9.9** | **1.7** | **1.7** | **0.25** | **0.17** | tpy[5] | Annual emission rate (8760 hrs/yr) |

**HAP Emissions Calculations**[3]

| HCOH | Acetaldehyde | Acrolein | Benzene | Toluene | e-Benzene | Xylenes | n-Hexane | Other HAPs | Total HAPs | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.14 | 0.019 | 0.0084 | 0.0040 | 0.0041 | 0.00037 | 0.0014 | 0.0037 | 0.011 | 0.20 | lb/hr |
| 0.63 | 0.081 | 0.037 | 0.017 | 0.018 | 0.0016 | 0.0063 | 0.016 | 0.047 | 0.86 | tpy |
| 83% | 83% | 83% | 83% | 83% | 83% | 83% | 83% | 83% | 83% | %Control |
| 0.024 | 0.003 | 0.0014 | 0.0007 | 0.0007 | 0.000 | 0.0002 | 0.0006 | 0.0018 | 0.042 | lb/hr |
| 0.11 | 0.014 | 0.006 | 0.003 | 0.003 | 0.0003 | 0.0011 | 0.003 | 0.0080 | 0.18 | tpy |

[1] $SO_2$ calculation assumes 100% converstion of fuel elemental sulfur to $SO_2$.
[2] TSP = PM10 = PM2.5 = AP-42 PM10(filterable) + PM Condensable
[3] HAPs calculated using GRI-HAPCalc
[5] $NO_x$, CO, and VOC lb/hr Emission Rate = EF * 1lb/453.592g * hp
SO2 lb/hr Emission Rate = (5 grains S/100 scf) * (1 lb/7000 grains) * Fuel Consumption (Mscf/hr) * ((64 g/mol SO2) / (32 g/mol S))
PM lb/hr Emission Rate = EF (lb/MMBtu) * Heat Input (MMBtu/hr)
[6] tpy = lb/hr * hours of operation * 1ton/2000lb

**Greenhouse Gas Calculations**[7]

| $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ | |
|---|---|---|---|---|
| 53.06 | 0.0001 | 0.001 | | kg/MMBtu |
| 1 | 298 | 25 | | GWP[8] |
| 452.4 | 0.0009 | 0.009 | 452.9 | lb/hr[9] |
| 1981.6 | 0.0037 | 0.037 | 1983.7 | tpy[6] |

[7] Greenhouse gas emission factors are from 40 CFR 98 Subpart C
[8] 40 CFR 98 Subpart A, Table A-1
[9] $CO_2$, $N_2O$, $CH_4$ lb/hr = EF (kg/MMBtu) * 2.20462lb/kg * Fuel consumption (MMBtu/hr) *
$CO_2e$ lb/hr = $CO_2$ lb/hr + ($CH_4$ lb/hr * GWP) + ($N_2O$ lb/hr * GWP)

**Exhaust Parameters**

| | | | |
|---|---|---|---|
| Exhaust temp (Tstk): | 1007 | °F | Mfg data |
| Stack height: | 18 | ft | Eng estimate |
| Stack diameter: | 0.67 | ft | Eng estimate |
| Exhaust flow: | 4086 | acfm | Mfg data |
| Exhaust velocity: | 195.1 | ft/sec | Exhaust flow ÷ stack area |

# 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.

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- **Compressor Engines (E-1000, E-2000, E-5000)**
  - CAT G3516LE manufacturer specification sheet
  - AP-42 Section 3.2
  - GRI-HAPCalc 3.01 output
  - EPA 40 CFR 98 Subpart C
- **Compressor Engines (E-3000 and E-4000)**
  - Waukesha L7042GL manufacturer's specification sheet
  - AP-42 Section 3.2
  - GRI-HAPCalc 3.01 output
  - EPA 40 CFR 98 Subpart C
- **Compressor Engine (E-6000)**
  - CAT G3516LE manufacturer specification sheet
  - AP-42 Section 3.2
  - GRI-HAPCalc 3.01 output
  - EPA 40 CFR 98 Subpart C
- **Compressor Engine (E-7000)**
  - CAT G3516LE Manufacturer specification sheet
  - AP-42 Section 3.2
  - GRI-HAPCalc 3.01 output
  - EPA 40 CFR 98 Subpart C
- **Amine Units (AMINE-1, AMINE-2)**
  - ProMax output
- **Dehydrator (DEHY-1)**
  - ProMax output
  - GRI-HAPCalc 3.01 output
- **Dehydrator (DEHY-2)**
  - Ap-42 Table 1.4-1 & 1.4-2
  - ProMax output
  - GRI-HAPCalc 3.01 output
  - EPA CFR 98 Subpart C

- **Molecular Sieve Regenerator Heater (MOLE-1)**
  - AP-42 Table 1.4-1 & 1.4-2
  - GRI-HAPCalc 3.02 output
  - EPA40 CFR 98 Subpart C
- **Condensate Tanks (TK-1 through TK-3)**
  - TANKS 4.0.9d output for working and breathing losses
- **Truck Loading (LOAD-1)**
  - AP-42 Section 5.2
- **Flare (Unit: FLARE)**
  - ProMax output
  - TNRCC RG-109
  - AP-42 Table 13.5-1
- **Enclosed Combustor (ECD-1)**
  - Manufacturer specification sheet
  - AP-42 Table 1.4-2 & 1.4-3
  - TNRCC RG-109
  - EPA 40 CFR 98 Subpart C
  - ProMax output
- **Facility Fugitives Emissions (FUG-1)**
  - GRI-HAPCalc 3.01 output
- **Facility Fugitives Emissions (FUG-2)**
  - GRI-HAPCalc 3.01 output
- **Haul Road Emissions (HAUL)**
  - AP-42 Section 13.2.2
- **VRU Compressor Engine (E-VRU-1)**
  - CAT G3508LE manufacturer specification sheet
  - GRI-HAPCalc 3.01 output
  - AP-42 Table 3.2-2
  - EPA 40 CFR 98 Subpart C

G3516

| | | | |
|---|---|---|---|
| Engine Speed (rpm) | 1200 | Fuel | NAT GAS |
| Compression Ratio | 8:1 | LHV of Fuel (Btu/SCF) | 920 |
| Aftercooler Inlet Temperature (°F) | 130 | Fuel System | HPG IMPCO |
| Jacket Water Outlet Temperature (°F) | 210 | | |
| Ignition System | EIS | Minimum Fuel Pressure (psig) | 35 |
| Exhaust Manifold | WATER COOLED | Methane Number at Conditions Shown | 80 |
| Combustion System Type | LOW EMISSION | Rated Altitude (ft) | 5000 |
| | | at 77°F Design Temperature | |

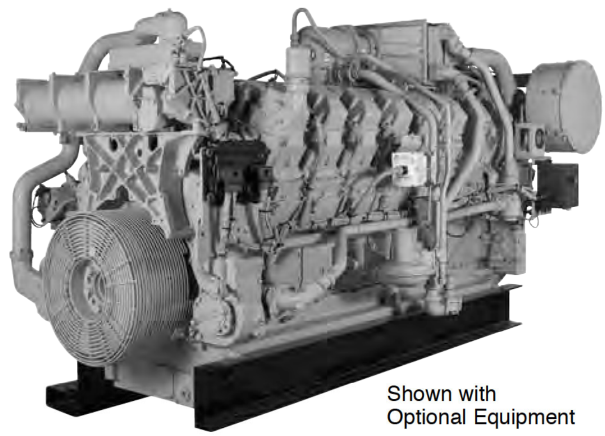
| Engine Rating Data | % Load | 100% | 75% | 50% |
|---|---|---|---|---|
| Engine Power (w/o fan) | bhp | 1151 | 863 | 575 |
| **Engine Data** | | | | |
| Specific Fuel Consumption (BSFC) (1) | Btu/bhp-hr | 7415 | 7594 | 8085 |
| Air Flow (Wet, @ 77°F, 28.8 in Hg) | SCFM | 2435 | 1866 | 1285 |
| Air Mass Flow (Wet) | lb/hr | 10796 | 8274 | 5697 |
| Compressor Out Pressure | in. HG (abs) | 74.2 | 69.4 | 52.3 |
| Compressor Out Temperature | °F | 306 | 283 | 209 |
| Inlet Manifold Pressure | in. HG (abs) | 66.7 | 52.6 | 37.1 |
| Inlet Manifold Temperature (10) | °F | 136 | 136 | 136 |
| Timing (11) | °BTDC | 33 | 33 | 33 |
| Exhaust Stack Temperature | °F | 840 | 817 | 808 |
| Exhaust Gas Flow (Wet, @ stack temperature, 29.7 in Hg) | CFM | 6415 | 4830 | 3306 |
| Exhaust Gas Mass Flow (Wet) | lb/hr | 11217 | 8600 | 5928 |
| **Engine Emissions Data** | | | | |
| Nitrous Oxides (NOx as NO2) (9) | g/bhp-hr | 1.5 | 1.5 | 1.5 |
| (Corr. 15% 02) | ppm | 110 | 106 | 104 |
| Carbon Monoxide (CO) (9) | g/bhp-hr | 1.8 | 1.8 | 2.0 |
| (Corr. 15% 02) | ppm | 212 | 213 | 217 |
| Total Hydrocarbons (THC) (9) | g/bhp-hr | 3.3 | 3.5 | 4.0 |
| (Corr. 15% 02) | ppm | 694 | 720 | 770 |
| Non-Methane Hydrocarbons (NMHC) (9) | g/bhp-hr | 0.49 | 0.53 | 0.60 |
| (Corr. 15% 02) | ppm | 49 | 50 | 52 |
| Exhaust Oxygen (9) | % | 8.2 | 8.0 | 7.7 |
| Lambda | | 1.58 | 1.57 | 1.52 |
| **Engine Heat Balance Data** | | | | |
| Input Energy LHV (1) | Btu/min | 142195 | 109220 | 77514 |
| Work Output | Btu/min | 48817 | 36613 | 24408 |
| Heat Rejection to Jacket (2) (6) | Btu/min | 41210 | 33828 | 27726 |
| Heat Rejection to Atmosphere (Radiated) (4) | Btu/min | 4554 | 3795 | 3037 |
| Heat Rejection to Lube Oil (5) | Btu/min | 0 | 0 | 0 |
| Total Heat Rejection to Exhaust (to 77°F) (2) | Btu/min | 40027 | 29869 | 20489 |
| Heat Rejection to Exhaust (LHV to 350°F) (2) | Btu/min | 24609 | 17954 | 12153 |
| Heat Rejection to Aftercooler (3) (7) (8) | Btu/min | 7587 | 5115 | 1853 |

CATERPILLAR®

# G3516 LE Gas Petroleum Engine

**858-999 bkW**
**1150-1340 bhp**
**1200-1400 rpm**

**2.0 g/bhp-hr NOx (NTE)**



Shown with Optional Equipment

## CAT® ENGINE SPECIFICATIONS

### V-16, 4-Stroke-Cycle

| | |
|---|---|
| Bore | 170 mm (6.7 in.) |
| Stroke | 190 mm (7.5 in.) |
| Displacement | 69 L (4210 cu. in.) |
| Aspiration | Turbocharged-Aftercooled |
| Digital Engine Management | |
| Governor and Protection | Electronic (ADEM™ A3) |
| Combustion | Low Emission (Lean Burn) |
| Engine Weight, net dry (approx) | 8015 kg (17,670 lb) |
| Power Density | 8 kg/kW (13.2 lb/bhp) |
| Power per Displacement | 19.3 bhp/L |
| Total Cooling System Capacity | 217.7 L (57.5 gal) |
| Jacket Water | 200.6 L (53 gal) |
| Aftercooler Circuit | 17 L (4.5 gal) |
| Lube Oil System (refill) | 424 L (112 gal) |
| Oil Change Interval | 1000 hours |
| Rotation (from flywheel end) | Counterclockwise |
| Flywheel and Flywheel Housing | SAE No. 00 |
| Flywheel Teeth | 183 |

## FEATURES

**Engine Design**
- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

**Emissions**
Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2007/8

**Lean Burn Engine Technology**
Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

**Advanced Digital Engine Management**
ADEM A3 control system providing integrated ignition, speed governing, protection, and controls, including detonation-sensitive variable ignition timing. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

**Ease of Operation**
Side covers on block allow for inspection of internal components

**Full Range of Attachments**
Large variety of factory-installed engine attachments reduces packaging time

**Testing**
Every engine is full-load tested to ensure proper engine performance.

**Gas Engine Rating Pro**
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

**Product Support Offered Through Global Cat Dealer Network**
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

**Over 80 Years of Engine Manufacturing Experience**
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

**Web Site**
For all your petroleum power requirements, visit www.catoilandgas.cat.com.

## STANDARD EQUIPMENT

**Air Inlet System**
Air cleaner — intermediate-duty with service indicator

**Control System**
A3 ECU
Air-fuel ratio control

**Cooling System**
Thermostats and housing
Jacket water pump
Aftercooler water pump
Aftercooler core for sea-air atmosphere
Aftercooler thermostats and housing

**Exhaust System**
Watercooled exhaust manifolds

**Flywheels & Flywheel Housings**
SAE No. 00 flywheel
SAE No. 00 flywheel housing
SAE standard rotation

**Fuel System**
Gas pressure regulator
Natural gas carburetor

**Ignition System**
A3 ECU

**Instrumentation**
PL1000 Advisor panel

**Lubrication System**
Crankcase breather — top mounted
Oil cooler
Oil filter — RH
Oil bypass filter
Oil pan — shallow
Oil sampling valve
Turbo oil accumulator

**Mounting System**
Rails, engine mounting — 254 mm (10 in)

**Protection System**
Electronic shutoff system
Gas shutoff valve

**General**
Paint — Cat yellow
Vibration damper and guard — dual 484 mm (23 in)

## OPTIONAL EQUIPMENT

**Air Inlet System**
Remote air inlet adapters
Precleaner

**Charging System**
Battery chargers
Charging alternators

**Cooling System**
Aftercooler core
Thermostatic valve
Temperature switch
Connections
Expansion and overflow tank
Water level switch gauge

**Exhaust System**
Flexible fittings
Elbows
Flange
Flange and exhaust expanders
Rain cap
Mufflers

**Fuel System**
Low pressure gas conversions
Propane gas valve and jet kits
Fuel filter

**Instrumentation**
PL1000 communications modules

**Lubrication System**
Oil bypass filter removal and oil pan accessories
Sump pump
Air prelube pump
Manual prelube pump
Lubricating oil

**Mounting System**
Rails
Vibration isolators

**Power Take-Offs**
Front accessory drives
Auxiliary drive shafts and pulleys
Front stub shaft
Pulleys

**Protection System**
Explosion relief valves, status control box interconnect wiring harness

**Starting System**
Air starting motor
Air pressure regulator
Air silencer
Electric air start controls
Electric starting motors — dual 24-volt
Starting aids
Battery sets (24-volt dry), cables, and rack

**General**
Flywheel intertia weight
Guard removal
Engine barring group
Premium 8:1 pistons
Premium cylinder heads

## TECHNICAL DATA

### G3516 LE Gas Petroleum Engine

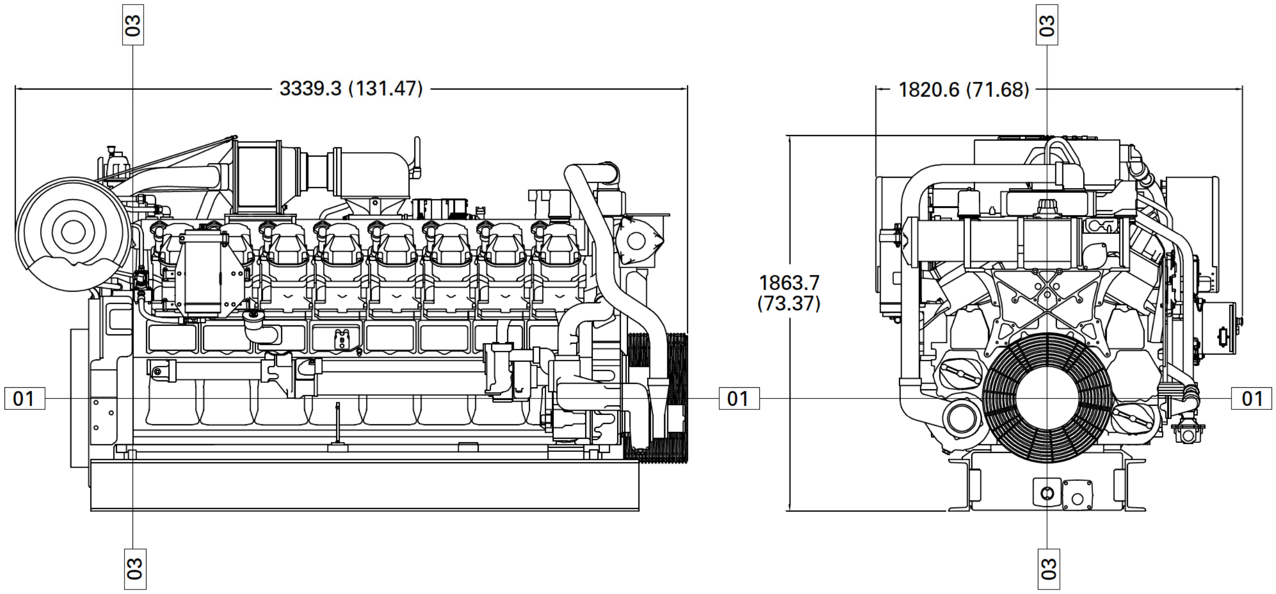
| **Fuel System** | | **2 g NOx NTE Rating DM8618-01** | **2 g NOx NTE Rating DM8620-01** |
|---|---|---|---|
| **Engine Power** | | | |
| @ 100% Load | bkW (bhp) | 999 (1340) | 858 (1150) |
| @ 75% Load | bkW (bhp) | 749 (1004) | 643 (862) |
| **Engine Speed** | rpm | **1400** | **1200** |
| Max Altitude @ Rated Torque and 38°C (100°F) | m (ft) | 304.8 (1000) | 1219.2 (4000) |
| Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F) | % | 25 | 9.2 |
| **SCAC Temperature** | °C (°F) | 54 (130) | 54 (130) |
| **Emissions*** | | | |
| NOx | g/bkW-hr (g/bhp-hr) | 2.68 (2) | 2.68 (2) |
| CO | g/bkW-hr (g/bhp-hr) | 2.49 (1.86) | 2.35 (1.75) |
| $CO_2$ | g/bkW-hr (g/bhp-hr) | 632 (471) | 624 (466) |
| VOC** | g/bkW-hr (g/bhp-hr) | 0.35 (0.26) | 0.4 (0.3) |
| **Fuel Consumption***** | | | |
| @ 100% Load | MJ/bkW-hr (Btu/bhp-hr) | 10.48 (7405) | 10.36 (7324) |
| @ 75% Load | MJ/bkW-hr (Btu/bhp-hr) | 10.79 (7628) | 10.76 (7605) |
| **Heat Balance** | | | |
| Heat Rejection to Jacket Water | | | |
| @ 100% Load | bkW (Btu/mn) | 741 (42,123) | 639 (36,343) |
| @ 75% Load | bkW (Btu/mn) | 616.7 (35,075) | 554 (31,480) |
| Heat Rejection to Aftercooler | | | |
| @ 100% Load | bkW (Btu/mn) | 167.8 (9546) | 131.9 (7509) |
| @ 75% Load | bkW (Btu/mn) | 108.6 (6179) | 72.2 (4108) |
| Heat Rejection to Exhaust | | | |
| @ 100% Load LHV to 25° C (77° F) | bkW (Btu/mn) | 837.8 (47,643) | 694.6 (39,536) |
| @ 75% Load LHV to 25° C (77° F) | bkW (Btu/mn) | 630.4 (35,848) | 524.1 (29,806) |
| **Exhaust System** | | | |
| Exhaust Gas Flow Rate | | | |
| @ 100% Load | $m^3$/min (cfm) | 217.0 (7663) | 182.9 (6460) |
| @ 75% Load | $m^3$/min (cfm) | 163.8 (5785) | 138.9 (4905) |
| Exhaust Stack Temperature | | | |
| @ 100% Load | °C (°F) | 467.22 (873) | 452.2 (846) |
| @ 75% Load | °C (°F) | 467.22 (873) | 450.5 (843) |
| **Intake System** | | | |
| Air Inlet Flow Rate | | | |
| @ 100% Load | $m^3$/min (scfm) | 80.6 (2847) | 69.5 (2453) |
| @ 75% Load | $m^3$/min (scfm) | 60.8 (2147) | 52.8 (1864) |
| **Gas Pressure** | kPag (psig) | 241.5-275.8 (35-40) | 241.5-275.8 (35-40) |

*at 100% load and speed, all values are listed as not to exceed

**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ

***ISO 3046/1

## GAS PETROLEUM ENGINE




| DIMENSIONS | | |
|---|---|---|
| Length | mm (in.) | 3339.3 (131.47) |
| Width | mm (in.) | 1820.6 (71.68) |
| Height | mm (in.) | 1863.7 (73.37) |
| Shipping Weight | kg (lb) | 8015 (17,670) |

**Note:** General configuration not to be used for installation. See general dimension drawings for detail (drawing #289-2971).

Dimensions are in mm (inches).

## RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

**Conditions:** Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.



Performance Numbers: DM8618-01, DM8620-01
LEHW0036-00 (11-09)
Supersedes LEHW6046-02

# GRI-HAPCalc ® 3.01
## Engines Report

| | | | |
|---|---|---|---|
| **Facility ID:** | **CHAPARRAL** | **Notes:** | **Caterpillar G3516 LE** |
| **Operation Type:** | **GAS PLANT** | | |
| **Facility Name:** | **CHAPARRAL** | | |
| **User Name:** | | | |
| **Units of Measure:** | **U.S. STANDARD** | | |

***Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero.***
***These emissions are indicated on the report with a "0".***
***Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".***

**Engine Unit**

Unit Name: G3516 LE Units 1000, 2000 and 5000

| | | |
|---|---|---|
| Hours of Operation: | 8,760 | Yearly |
| Rate Power: | 1,151 | hp |
| Fuel Type: | NATURAL GAS | |
| Engine Type: | 4-Stroke, Lean Burn | |
| Emission Factor Set: | EPA > FIELD > LITERATURE | |
| Additional EF Set: | -NONE- | |

## Calculated Emissions (ton/yr)

| Chemical Name | Emissions | Emission Factor | Emission Factor Set |
|---|---|---|---|
| **HAPs** | | | |
| Tetrachloroethane | 0.0001 | 0.00000820 g/bhp-hr | EPA |
| Formaldehyde | 1.9350 | 0.17425810 g/bhp-hr | EPA |
| Methanol | 0.0916 | 0.00825090 g/bhp-hr | EPA |
| Acetaldehyde | 0.3064 | 0.02759090 g/bhp-hr | EPA |
| 1,3-Butadiene | 0.0098 | 0.00088120 g/bhp-hr | EPA |
| Acrolein | 0.1884 | 0.01696380 g/bhp-hr | EPA |
| Benzene | 0.0161 | 0.00145220 g/bhp-hr | EPA |
| Toluene | 0.0150 | 0.00134650 g/bhp-hr | EPA |
| Ethylbenzene | 0.0015 | 0.00013100 g/bhp-hr | EPA |
| Xylenes(m,p,o) | 0.0067 | 0.00060730 g/bhp-hr | EPA |
| 2,2,4-Trimethylpentane | 0.0092 | 0.00082510 g/bhp-hr | EPA |
| n-Hexane | 0.0407 | 0.00366340 g/bhp-hr | EPA |
| Phenol | 0.0009 | 0.00007920 g/bhp-hr | EPA |
| Styrene | 0.0009 | 0.00007790 g/bhp-hr | EPA |
| Naphthalene | 0.0027 | 0.00024550 g/bhp-hr | EPA |
| 2-Methylnaphthalene | 0.0012 | 0.00010960 g/bhp-hr | EPA |
| Acenaphthylene | 0.0002 | 0.00001830 g/bhp-hr | EPA |
| Biphenyl | 0.0078 | 0.00069970 g/bhp-hr | EPA |
| Acenaphthene | 0.0000 | 0.00000410 g/bhp-hr | EPA |
| Fluorene | 0.0002 | 0.00001870 g/bhp-hr | EPA |
| Phenanthrene | 0.0004 | 0.00003430 g/bhp-hr | EPA |
| Ethylene Dibromide | 0.0016 | 0.00014620 g/bhp-hr | EPA |
| Fluoranthene | 0.0000 | 0.00000370 g/bhp-hr | EPA |
| Pyrene | 0.0000 | 0.00000450 g/bhp-hr | EPA |
| Chrysene | 0.0000 | 0.00000230 g/bhp-hr | EPA |

| | | | | |
|---|---|---|---|---|
| Benzo(b)fluoranthene | 0.0000 | 0.00000050 | g/bhp-hr | EPA |
| Benzo(e)pyrene | 0.0000 | 0.00000140 | g/bhp-hr | EPA |
| Benzo(g,h,i)perylene | 0.0000 | 0.00000140 | g/bhp-hr | EPA |
| Vinyl Chloride | 0.0005 | 0.00004920 | g/bhp-hr | EPA |
| Methylene Chloride | 0.0007 | 0.00006600 | g/bhp-hr | EPA |
| 1,1-Dichloroethane | 0.0009 | 0.00007790 | g/bhp-hr | EPA |
| 1,3-Dichloropropene | 0.0010 | 0.00008710 | g/bhp-hr | EPA |
| Chlorobenzene | 0.0011 | 0.00010030 | g/bhp-hr | EPA |
| Chloroform | 0.0010 | 0.00009410 | g/bhp-hr | EPA |
| 1,1,2-Trichloroethane | 0.0012 | 0.00010500 | g/bhp-hr | EPA |
| 1,1,2,2-Tetrachloroethane | 0.0015 | 0.00013200 | g/bhp-hr | EPA |
| Carbon Tetrachloride | 0.0013 | 0.00012110 | g/bhp-hr | EPA |
| **Total** | 2.6456 | | | |

## Criteria Pollutants

| | | | | |
|---|---|---|---|---|
| PM | 0.3660 | 0.03296090 | g/bhp-hr | EPA |
| CO | 11.6175 | 1.04620860 | g/bhp-hr | EPA |
| NMEHC | 4.3245 | 0.38944040 | g/bhp-hr | EPA |
| NOx | 149.5246 | 13.46539810 | g/bhp-hr | EPA |
| SO2 | 0.0215 | 0.00194060 | g/bhp-hr | EPA |

## Other Pollutants

| | | | | |
|---|---|---|---|---|
| Butryaldehyde | 0.0037 | 0.00033330 | g/bhp-hr | EPA |
| Chloroethane | 0.0001 | 0.00000620 | g/bhp-hr | EPA |
| Methane | 45.8102 | 4.12542830 | g/bhp-hr | EPA |
| Ethane | 3.8481 | 0.34653600 | g/bhp-hr | EPA |
| Propane | 1.5356 | 0.13828440 | g/bhp-hr | EPA |
| Butane | 0.0198 | 0.00178550 | g/bhp-hr | EPA |
| Cyclopentane | 0.0083 | 0.00074920 | g/bhp-hr | EPA |
| n-Pentane | 0.0953 | 0.00858090 | g/bhp-hr | EPA |
| Methylcyclohexane | 0.0451 | 0.00405940 | g/bhp-hr | EPA |
| 1,2-Dichloroethane | 0.0009 | 0.00007790 | g/bhp-hr | EPA |
| 1,2-Dichloropropane | 0.0010 | 0.00008880 | g/bhp-hr | EPA |
| n-Octane | 0.0129 | 0.00115840 | g/bhp-hr | EPA |
| 1,2,3-Trimethylbenzene | 0.0008 | 0.00007590 | g/bhp-hr | EPA |
| 1,2,4-Trimethylbenzene | 0.0005 | 0.00004720 | g/bhp-hr | EPA |
| 1,3,5-Trimethylbenzene | 0.0012 | 0.00011160 | g/bhp-hr | EPA |
| n-Nonane | 0.0040 | 0.00036300 | g/bhp-hr | EPA |
| CO2 | 4,031.3017 | 363.03769350 | g/bhp-hr | EPA |

Waukesha 7042GL

# ENVIRONMENTAL 9

## AT-GL EMISSION LEVELS‡

| MODEL | CARBURETOR SETTING | GRAMS/BHP-HR | | | | % OBSERVED DRY | | MASS AFR (2) | VOLUME AFR (2) | EXCESS AIR RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| | | NOx (1) | CO | NMHC (4) | THC | CO | $O_2$ | | | |
| AT25GL | Standard | 1.0 | 2.25 | 1.0 | 8.0 | 0.06 | 9.8 | 28.0:1 | 16.8:1 | 1.74 |
| AT27GL | Standard | 1.5 | 1.7 | 0.5 | 5.0 | 0.06 | 9.8 | 28.0:1 | 16.8:1 | 1.74 |
| | Ultra Lean | 1.25 | 1.5 | 0.4 | 3.5 | 0.05 | 11.2 | 32.0:1 | 19.2:1 | 2.00 |

‡ The AT-GL emission levels are based on 900 – 1000 rpm operation. For information at all other speeds contact Waukesha's Sales Engineering Department.

## VHP EMISSION LEVELS

| MODEL | CARBURETOR SETTING | GRAMS/BHP-HR | | | | % OBSERVED DRY | | MASS AFR (2) | VOLUME AFR (2) | EXCESS AIR RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| | | NOx (1) | CO | NMHC (4) | THC | CO | $O_2$ | | | |
| G, GSI | Lowest Manifold (Best Power) | 8.5 | 32.0 | 0.35 | 2.3 | 1.15 | 0.30 | 15.5:1 | 9.3:1 | 0.97 |
| | Equal NOx & CO | 12.0 | 12.0 | 0.35 | 2.3 | 0.45 | 0.30 | 15.9:1 | 9.6:1 | 0.99 |
| | Catalytic Conv. Input (3-way(3)) | 13.0 | 9.0 | 0.30 | 2.0 | 0.38 | 0.30 | 15.95:1 | 9.6:1 | 0.99 |
| | Standard (Best Economy) | 22.0 | 1.5 | 0.25 | 1.5 | 0.02 | 1.35 | 17.0:1 | 10.2:1 | 1.06 |
| F3524GSI, L7044GSI | Equal NOx & CO | 14.0 | 14.0 | 0.25 | 1.1 | 0.45 | 0.30 | 15.85:1 | 9.5:1 | 0.99 |
| | Catalytic Conv. Input (3-way(3)) | 15.0 | 13.0 | 0.20 | 1.0 | 0.38 | 0.30 | 15.95:1 | 9.6:1 | 0.99 |
| | Standard (Best Economy) | 23.0 | 2.0 | 0.20 | 0.8 | 0.02 | 1.35 | 17.0:1 | 10.2:1 | 1.06 |
| L5794GSI | Equal NOx & CO | 13.5 | 13.5 | 0.45 | 3.0 | 0.45 | 0.30 | 15.85:1 | 9.5:1 | 0.99 |
| | Catalytic Conv. Input (3-way(3)) | 14.5 | 11.0 | 0.45 | 2.9 | 0.38 | 0.30 | 15.95:1 | 9.6:1 | 0.99 |
| | Standard (Best Economy) | 22.0 | 3.0 | 0.35 | 2.4 | 0.02 | 1.35 | 17.0:1 | 10.2:1 | 1.06 |
| GL | Standard | 1.5 | 2.65 | 1.0 | 5.5 | 0.06 | 9.8 | 28.0:1 | 16.8:1 | 1.74 |
| L5774LT# | Standard | 2.6 | 2.0 | 0.60 | 4.0 | 0.04 | 8.0 | 24.7:1 | 14.8:1 | 1.54 |
| L5794LT# | Standard | 2.6 | 2.0 | 0.60 | 4.0 | 0.04 | 7.8 | 24.5:1 | 14.7:1 | 1.52 |

# L5774LT and L5794LT emission levels are based on 1000 – 1200 rpm operation. For information at all other speeds contact Waukesha's Sales Engineering Department.

NOTE: The above tables indicate emission levels that are valid for new engines for the duration of the standard warranty period and are attainable by an engine in good operating condition running on commercial quality natural gas of 900 BTU/ft$^3$ (35.38 MJ/m$^3$ [25, V(0; 101.325)]) SLHV, Waukesha Knock Index™ of 91 or higher, 93% methane content by volume, and at ISO standard conditions. Emissions are based on standard engine timing at 91 WKI™ with an absolute humidity of 42 grains/lb. Refer to engine specific WKI™ Power & Timing curves for standard timing. Unless otherwise noted these emission levels can be achieved across the continuous duty speed range and from 75% to 110% of the ISO Standard Power (continuous duty) rating. ***Contact your local Waukesha representative or Waukesha's Sales Engineering Department for emission values which can be obtained on a case-by-case basis for specific ratings, fuels, and site conditions.***

# L7042GL

VHP® Series Gas Engine Extender Series®
987 - 1480 BHP (736 - 1104 kWb)

## Specifications

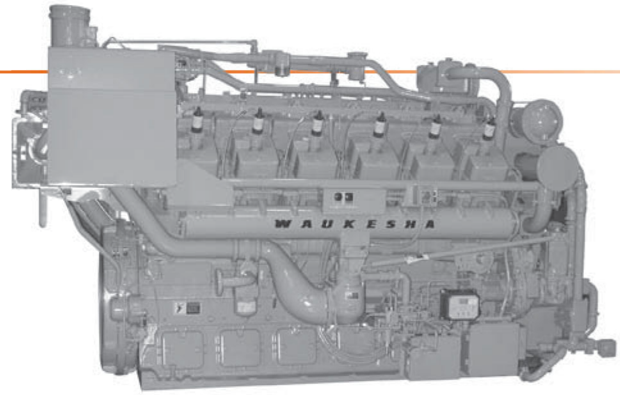



*Image may not be an accurate representation of this model*

**Cylinders:** V12
**Piston Displacement:** 7040 cu. in. (115 L)
**Bore & Stroke:** 9.375" x 8.5" (238 x 216 mm)
**Compression Ratio:** 10.5:1
**Jacket Water System Capacity:** 100 gal. (379 L)
**Lube Oil Capacity:** 190 gal. (719 L)
**Starting System:** 125 - 150 psi air/gas 24/32V electric
**Dry Weight:** 21,000 lb. (9525 kg)

## Standard Equipment

**AIR CLEANER** – Two, 3" dry type filter with hinged rain shield and service indicator.

**BARRING DEVICE** – Manual.

**BATTERY BOX** – Ship loose battery box designed to accommodate two series 31 12 VDC batteries. Includes power disconnect switch and 20 foot (6.1 m) cable for connection to ESM Power Distribution Box.

**BEARINGS** – Heavy duty, replaceable, precision type.

**BREATHER** – Self regulating, closed system.

**CONNECTING RODS** – Drop forged steel, rifle drilled.

**CONTROL SYSTEM** – Waukesha Engine System Manager (ESM) integrates spark timing control, speed governing, detonation detection, start-stop control, diagnostic tools, fault logging and engine safeties. Engine Control Unit (ECU) is central brain of the control system and main customer interface. Interface with ESM is through 25 foot (7.6 m) harness to local panel, through MODBUS RTU slave connection RS-485 multidrop hardware, and through the Electronic Service Program (ESP). Customer connections are only required to the local panel, fuel valve, and 24V DC power supply. Compatible with Woodward load sharing module. ESM meets Canadian Standards Association Class I, Division 2, Group A, B, C & D (Canada & US) hazardous location requirements. ESM controlled prechamber logic.

**CRANKCASE** – Integral crankcase and cylinder frame. Main bearing caps drilled and tapped for temperature sensors. Does not include sensors.

**CRANKSHAFT** – Counterweighted, forged steel, seven main bearings, and dynamically balanced.

**CYLINDERS** – Removable bainitic cast iron wet type cylinder liners, chrome plated on outer diameter.

**CYLINDER HEADS** – Twelve interchangeable. Two hard faced intake and two hard faced exhaust valves per cylinder. Hard faced intake and exhaust valve seat inserts. Roller valve lifters and hydraulic push rods. Includes prechamber and related fuel control valves.

**ELECTRONIC SERVICE PROGRAM (ESP)** – Microsoft® Windows-based program provided on CD-ROM for programming and interface to ESM. Includes E-Help for troubleshooting any ESM faults. Serial harness is provided for connection of a customer supplied laptop to the ECU RS-232 port.

**ENGINE ROTATION** – Counterclockwise when facing flywheel.

**ENGINE MONITORING DEVICES** – Factory mounted and wired sensors for lube oil pressure and temperature; intake manifold temperature and pressure; overspeed; and jacket water temperature; all accessible through ESM®. ESM continually monitors combustion performance through accelerometers to provide detonation protection. Dual magnetic pick-ups are used for accurate engine speed monitoring. ESM provides predictive spark plug diagnostics as well as advanced diagnostics of engine and all ESM sensors and logs any faults into non-volatile flash memory. Sensors meet Canadian Standards Association Class 1, Division 2, Group A, B, C, & D (Canada & US) hazardous location requirements.

**EXHAUST THERMOCOUPLES** – 14 K-type thermocouples. One for each individual cylinder and one pre-turbine for each bank and 25 foot (7.6 m) harness.

**EXHAUST OUTLET** – Single vertical at rear. Flexible stainless steel connection with 8" (203 mm) pipe flange.

**FLYWHEEL** – Approx. $WR^2$ = 155000 lb-in$^2$; with ring gear (208 teeth), machined to accept two drive adapters: 31.88" (810 mm) pilot bore, 30.25" (768 mm) bolt circle, (12) 0.75"–10 tapped holes; or 28.88" (734 mm) pilot bore, 27.25" (692 mm) bolt circle, (12) 0.625"–11 tapped holes and (12) 0.75"–10 tapped holes.

**FLYWHEEL HOUSING** – No. 00 SAE.

**FUEL SYSTEM** – Single 3" ANSI flange fuel inlet connection. Dual natural gas, 4" (102 mm) duplex updraft carburetors. Two mounted Fisher 99, 2" (51 mm) gas regulators, 43 – 60 psi (296 – 414 kPa) gas inlet pressure required. Prechamber fuel system and control logic. 10 foot (3 m) harness provided for ESM control of customer supplied fuel shutoff valve.

**GOVERNOR** – Electric throttle actuator controlled by ESM with throttle position feedback. Governor tuning is performed using ESP. ESM includes option of a load-coming feature to improve engine response to step loads.

**IGNITION SYSTEM** – Ignition Power Module (IPM) controlled by ESM, with spark timing optimized for any speed-load condition. Dual voltage energy levels automatically controlled by ESM to maximize spark plug life.

**INTERCOOLER** – Air–to–water.

**LEVELING BOLTS**

**LIFTING EYES** – Requires 9.5 ton Working Load Limit (W.L.L.) anchor shackles.

**LUBRICATION** – Full pressure, gear type pump. Engine mounted full flow lube oil micro-fiberglass filters with mounted differential pressure gauge. MICROSPIN® bypass filter, engine mounted. Air/gas motor driven prelube pump, requires final piping.

**MANIFOLDS** – Exhaust, (2) water cooled.

**OIL COOLER** – Shell and tube type, with thermostatic temperature controller and pressure regulating valve. Factory mounted.

**OIL PAN** – Deep sump type. 190 gallon (719 L) capacity including filter and cooler.

**PAINT** – Oilfield orange primer.

**PISTONS** – Aluminum with floating pin. Oil cooled.

**SHIPPING SKID** –For domestic truck or rail.

**TURBOCHARGERS** – Two, dry type. Wastegate controlled.

**VIBRATION DAMPER** – Two, viscous type. Guard included with remote mounted radiator or no radiator.

**WATER CIRCULATING SYSTEM, AUXILIARY CIRCUIT** – Belt driven water circulating high capacity pump for intercooler and lube oil cooler. See S6543-38 performance curve for use with standard 10" diameter crankshaft pulley. Includes thermostatic valve.

**WATER CIRCULATING SYSTEM, ENGINE JACKET** – Belt driven water circulating pump, cluster type thermostatic temperature regulating valve, full flow bypass type. Flange connections and mating flanges for (2) 4" (102 mm) inlets and (1) 5" (127 mm) outlet.

## POWER RATINGS: L7042GL VHP Series Gas Engines

| Model | C.R. | Bore & Stroke in. (mm) | Displ. cu. in. (litres) | Brake Horsepower (kWb Output) 130°F (54°C) I.C. Water Temperature | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1200 RPM | | 1000 RPM | | 900 RPM | | 800 RPM | |
| | | | | C | I | C | I | C | I | C | I |
| L7042GL | 10.5:1 | 9.375" x 8.5" (238 x 216) | 7040 (115) | 1480 | 1626 | 1233 | 1355 | 1110 | 1219 | 987 | 1084 |
| | | | | (1104) | (1213) | (920) | (1010) | (830) | (909) | (736) | (808) |

| | | 1200 rpm | | 1000 rpm | |
|---|---|---|---|---|---|
| | | C | I | C | I |
| | Power bhp (kWb) | 1480 (1104) | 1626 (1213) | 1233 (919) | 1355 (1010) |
| | BSFC (LHV) Btu/bhp-hr (kJ/kWh) | 7157 (10128) | 7031 (9948) | 7036 (9958) | 6759 (9567) |
| | Fuel Consumption Btu/hr x 1000 (kW) | 10592 (3106) | 11433 (3352) | 8675 (2542) | 9159 (2684) |
| Emissions | NOx g/bhp-hr (mg/nm³ @ 5% $O_2$) | 1.50 (607) | 1.50 (607) | 1.50 (607) | 1.50 (607) |
| Emissions | CO g/bhp-hr (mg/nm³ @ 5% $O_2$) | 2.70 (1073) | 2.70 (1073) | 2.70 (1073) | 2.70 (1073) |
| Emissions | THC g/bhp-hr (mg/nm³ @ 5% $O_2$) | 5.50 (2227) | 5.50 (2227) | 5.50 (2227) | 5.50 (2227) |
| Emissions | NMHC g/bhp-hr (mg/nm³ @ 5% $O_2$) | 1.00 (405) | 1.00 (405) | 1.00 (405) | 1.00 (405) |
| Heat Balance | Heat to Jacket Water Btu/hr x 1000 (kW) | 2834 (830) | 3010 (882) | 2351 (689) | 2400 (703) |
| Heat Balance | Heat to Lube Oil Btu/hr x 1000 (kW) | 432 (127) | 449 (132) | 355 (104) | 358 (105) |
| Heat Balance | Heat to Intercooler Btu/hr x 1000 (kW) | 547 (160) | 616 (181) | 451 (132) | 452 (132) |
| Heat Balance | Heat to Radiation Btu/hr x 1000 (kW) | 336 (99) | 332 (97) | 310 (91) | 308 (90) |
| Heat Balance | Total Exhaust Heat Btu/hr x 1000 (kW) | 3073 (901) | 3370 (988) | 2394 (702) | 2580 (756) |
| Intake/ Exhaust System | Induction Air Flow scfm (Nm³/hr) | 3699 (5685) | 3800 (6110) | 3029 (4656) | 3045 (4896) |
| Intake/ Exhaust System | Exhaust Flow lb/hr (kg/hr) | 16050 (7281) | 17200 (7802) | 13145 (5963) | 13825 (6271) |
| Intake/ Exhaust System | Exhaust Temperature °F (°C) | 710 (376) | 719 (382) | 669 (354) | 683 (362) |

Typical heat data is shown, however no guarantee is expressed or implied. Consult your Dresser Waukesha Application Engineering Department for system application assistance.

All natural gas engine ratings are based on a fuel of 900 Btu/ft³ (35.3 MJ/nm³) SLHV, with a 91 WKI®. For conditions or fuels other than standard, consult the Dresser Waukesha Application Engineering Department.

Data based on standard conditions of 77°F (25°C) ambient temperature, 29.53 inches Hg (100kPa) barometric pressure, 30% relative humidity (0.3 inches HG / 1 kPa water vapor pressure).

Fuel consumption based on ISO3046/1-1995 with a tolerance of +5% for commercial quality natural gas having a 900 BTU/ft³ (35.3 MJ/nm³) SLHV.

Heat data based on fuel consumption +2%.

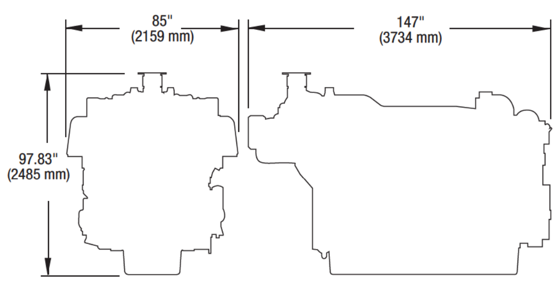
Heat rejection based on cooling exhaust temperature to 77°F (25°C).

**Rating Standard:** All models - Ratings are based on ISO 3046/1-1986 with mechanical efficiency of 90% and Tcra (clause 10.1) as specified above limited to ± 10° F (5° C). Ratings are also valid for SAE J1349, BS5514, DIN6271 and AP17B-11C standard atmospheric conditions.

**C = ISO Standard Power/Continuous Power Rating:** The highest load and speed which can be applied 24 hours per day, seven days per week, 365 days per year except for normal maintenance. It is permissible to operate the engine at up to 10% overload, or a maximum load indicated by the intermittent rating, whichever is lower, for two hours in every 24 hour period.

**I = Intermittent Service Rating:** The highest load and speed that can be applied in variable speed mechanical system application only. Operation at this rating is limited to a maximum of 3500 hours per year.

Consult your local Waukesha representative for system application assistance. The manufacturer reserves the right to change or modify without notice, the design or equipment specifications as herein set forth without incurring any obligation either with respect to equipment previously sold or in the process of construction except where otherwise specifically guaranteed by the manufacturer.

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DRESSER Waukesha

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GE Power & Water
Distributed Power

# Waukesha* gas engines


# power ratings summary

natural gas fueled continuous duty engine ratings for oilfield power generation, gas compression, and mechanical drives

## Gas compression & mechanical drives

| Lean- burn engines | | | | Rich-burn engines | | | |
|---|---|---|---|---|---|---|---|
| Model | RPM | BHP | kWb | Model | RPM | BHP | kWb |
| 16V275GL+ | 1000 | 4835 | 3605 | P9394GSI | 1200 | 2250 | 1678 |
| 12V275GL+ | 1000 | 3625 | 2703 | P9390GSI | 1200 | 1980 | 1476 |
| P9390GL | 1200 | 1980 | 1476 | L7044GSI | 1200 | 1680 | 1253 |
| L7042GL | 1200 | 1480 | 1104 | L7042GSI S4 | 1200 | 1480 | 1104 |
| L5794LT | 1200 | 1450 | 1081 | L7044G | 1200 | 920 | 686 |
| L5774LT | 1200 | 1280 | 954 | L5794GSI | 1200 | 1380 | 1029 |
| P48GL | 1800 | 1065 | 800 | F3524GSI | 1200 | 840 | 626 |
| L36GL | 1800 | 800 | 600 | F3514GSI | 1200 | 740 | 552 |
| H24GL | 1800 | 530 | 400 | F3524G | 1200 | 460 | 343 |
| F18GL | 1800 | 400 | 300 | P48GSI | 1800 | 1065 | 800 |
| | | | | L36GSI | 1800 | 800 | 600 |
| | | | | H24GSI | 1800 | 530 | 400 |
| | | | | F18GSI | 1800 | 400 | 300 |

## Oilfield power generation

| Model | Hz/RPM | kWe | Hz/RPM | kWe |
|---|---|---|---|---|
| **Lean- burn engines** | | | | |
| 16V275GL+ | 60/900 | 3110 | 50/1000 | 3480 |
| 12V275GL+ | 60/900 | 2330 | 50/1000 | 2600 |
| VHP9500GL | 60/1200 | 1400 | 50/1000 | 1175 |
| VHP7100GL | 60/1200 | 1050 | 50/1000 | 875 |
| VHP5904LT | 60/1200 | 1025 | 50/1000 | 900 |
| VGF48GL | 60/1800 | 830 | 50/1500 | 685 |
| VGF36GL | 60/1800 | 620 | 50/1500 | 515 |
| VGF24GL | 60/1800 | 415 | 50/1500 | 340 |
| VGF18GL | 60/1800 | 310 | 50/1500 | 250 |
| **Rich- burn engines** | | | | |
| VHP9504GSI | 60/1200 | 1600 | 50/1000 | 1460 |
| VHP9500GSI | 60/1200 | 1400 | 50/1000 | 1175 |
| VHP7104GSI | 60/1200 | 1200 | 50/1000 | 1100 |
| VHP7104GSI-EPA | 60/1200 | 1200 | — | — |
| VH7104GSI-MOB | — | — | 50/1000 | 1100 |
| VHP7100GSI S4 | 60/1200 | 1050 | 50/1000 | 875 |
| VHP5904GSI | 60/1200 | 980 | 50/1000 | 900 |
| VHP5904GSI-EPA | 60/1200 | 980 | — | — |
| VHP5904GSI-MOB | — | — | 50/1000 | 900 |
| VHP3604GSI | 60/1200 | 600 | 50/1000 | 540 |
| VGF48GSI | 60/1800 | 750 | 50/1500 | 625 |
| VGF36GSI | 60/1800 | 560 | 50/1500 | 475 |
| VGF24GSI | 60/1800 | 375 | 50/1500 | 310 |
| VGF18GSI | 60/1800 | 280 | 50/1500 | 230 |

GE Power & Water manufactures Waukesha spark ignited gaseous fueled engines and Enginator* systems for gas compression, electric power generation, cogeneration and mechanical drive applications — ranging in output from 400 to 4835 bhp (300 - 3605 kWb).

**Notes:**

- Additional Ratings at speeds not shown are available.
- Rating Standard: All models: Ratings conform to ISO 3046/1 (latest version) with a mechanical efficiency of 90% and auxiliary water temperature, Tcra, as specified in the Power Ratings 18900 (latest version) limited to ±10° F (±5.5° C). Ratings are also valid for SAE J1349, BS 5514, DIN 6271 and API 7B-11C standard atmospheric reference conditions.
- For intermittent, reduced speed, alternate fuel, and other site condition power ratings, see Power Ratings 18900 or consult GE Power & Water's Waukesha team.

* Trademark of General Electric Company

*Trademark of General Electric Company

## BASIC FORMULAS

$°F = (°C \times 1.8) + 32$

$°C = \dfrac{(°F - 32)}{1.8}$

$BMEP_{(psi)} = \dfrac{792{,}000 \times BHP}{\text{Displacement (cu.in.)} \times rpm}$

$BMEP_{(bar)} = \dfrac{kWb \times 1200}{\text{Displacement (litres)} \times rpm}$

## PREFIX DESIGNATIONS

Number of cylinders except 275GL* (which states actual number of cylinders).

P = 16 H = 8
L = 12 F = 6

## SUFFIX DESIGNATIONS

G = Naturally aspirated
GSI = Turbocharged intercooled
GSID = Turbocharged intercooled draw-thru
GL = Turbocharged intercooled lean burn
LT = Lean combustion turbulence
GLD = Turbocharged intercooled lean burn draw-thru
LTD = Lean combustion turbulence draw-thru
EPA = United States Environmental Protection Agency (EPA) certified
MOB = Mobile, non-certified, Non-North America

## DISPLACEMENT

| Model | Displacement cu. in. | Displacement litres |
|---|---|---|
| **275GL*** | | |
| 16V275GL+ | 17398 | 285 |
| 12V275GL+ | 13048 | 214 |
| **VHP*** | | |
| P9390/P9394 | 9388 | 154 |
| L7042/L7044 | 7040 | 116 |
| L5794 | 5788 | 95 |
| F3514/F3524 | 3520 | 58 |
| **VGF*** | | |
| P48 | 2924 | 48 |
| L36 | 2193 | 36 |
| H24 | 1462 | 24 |
| F18 | 1096 | 18 |

# Waukesha gas engines

# Built to perform reliably in mission-critical and demanding oil and gas applications

With more than a century of innovation and engine-building expertise, Waukesha gas engines are designed and built to perform reliably in isolated, mission-critical, demanding applications in oil and gas fields the world over.

Waukesha natural gas-fired engines drive compressors and electrical generators featuring extended maintenance intervals, fuel flexibility, and rich-burn, lean-burn alternatives for optimal fuel efficiency at varying emissions compliance levels.

### Reliable

- Able to keep running on varying fuel quality
- More power at high altitudes/ambients

### Low Emissions

- Both rich-burn and lean-burn models available to better match project requirements

### Increased Uptime

- Extended oil change intervals
- Longer periods between servicing
- Simple controls and communications


GE Power & Water
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**www.ge-distributedpower.com**



GEA-19144 1114

# GRI-HAPCalc ® 3.01
## Engines Report

| | | |
|---|---|---|
| **Facility ID:** | **UNIT 3000 & 4000** | **Notes:** |
| **Operation Type:** | **PRODUCTION** | |
| **Facility Name:** | | |
| **User Name:** | | |
| **Units of Measure:** | **U.S. STANDARD** | |

***Note:** Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero.*
*These emissions are indicated on the report with a "0".*
*Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".*

**Engine Unit**

Unit Name: 3000/4000

Hours of Operation: 8,760 Yearly
Rate Power: 1,547 hp
Fuel Type: NATURAL GAS
Engine Type: 4-Stroke, Rich Burn
Emission Factor Set: GRI LITERATURE DATA
Additional EF Set: -NONE-

## Calculated Emissions (ton/yr)

| Chemical Name | Emissions | Emission Factor | Emission Factor Set |
|---|---|---|---|
| **HAPs** | | | |
| Formaldehyde | 0.9298 | 0.06230000 g/bhp-hr | GRI Literature |
| Acetaldehyde | 0.0582 | 0.00390000 g/bhp-hr | GRI Literature |
| Acrolein | 0.0507 | 0.00340000 g/bhp-hr | GRI Literature |
| Benzene | 0.0687 | 0.00460000 g/bhp-hr | GRI Literature |
| Toluene | 0.0239 | 0.00160000 g/bhp-hr | GRI Literature |
| Xylenes(m,p,o) | 0.0209 | 0.00140000 g/bhp-hr | GRI Literature |
| **Total** | 1.1522 | | |

# GRI-HAPCalc ® 3.01
## Engines Report

| | | | |
|---|---|---|---|
| **Facility ID:** | **CHAPARRAL** | **Notes:** | **Waukesha** |
| **Operation Type:** | **GAS PLANT** | | |
| **Facility Name:** | **CHAPARRAL** | | |
| **User Name:** | | | |
| **Units of Measure:** | **U.S. STANDARD** | | |

***Note:** Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero.*
*These emissions are indicated on the report with a "0".*
*Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".*

**Engine Unit**

Unit Name: L7042 GL Units 3000 and 4000

Hours of Operation: 8,760 Yearly

Rate Power: 1,547 hp

Fuel Type: NATURAL GAS

Engine Type: 4-Stroke, Lean Burn

Emission Factor Set: EPA > FIELD > LITERATURE

Additional EF Set: -NONE-

## Calculated Emissions (ton/yr)

| Chemical Name | Emissions | Emission Factor | Emission Factor Set |
|---|---|---|---|
| **HAPs** | | | |
| Tetrachloroethane | 0.0001 | 0.00000820 g/bhp-hr | EPA |
| Formaldehyde | 2.6008 | 0.17425810 g/bhp-hr | EPA |
| Methanol | 0.1231 | 0.00825090 g/bhp-hr | EPA |
| Acetaldehyde | 0.4118 | 0.02759090 g/bhp-hr | EPA |
| 1,3-Butadiene | 0.0132 | 0.00088120 g/bhp-hr | EPA |
| Acrolein | 0.2532 | 0.01696380 g/bhp-hr | EPA |
| Benzene | 0.0217 | 0.00145220 g/bhp-hr | EPA |
| Toluene | 0.0201 | 0.00134650 g/bhp-hr | EPA |
| Ethylbenzene | 0.0020 | 0.00013100 g/bhp-hr | EPA |
| Xylenes(m,p,o) | 0.0091 | 0.00060730 g/bhp-hr | EPA |
| 2,2,4-Trimethylpentane | 0.0123 | 0.00082510 g/bhp-hr | EPA |
| n-Hexane | 0.0547 | 0.00366340 g/bhp-hr | EPA |
| Phenol | 0.0012 | 0.00007920 g/bhp-hr | EPA |
| Styrene | 0.0012 | 0.00007790 g/bhp-hr | EPA |
| Naphthalene | 0.0037 | 0.00024550 g/bhp-hr | EPA |
| 2-Methylnaphthalene | 0.0016 | 0.00010960 g/bhp-hr | EPA |
| Acenaphthylene | 0.0003 | 0.00001830 g/bhp-hr | EPA |
| Biphenyl | 0.0104 | 0.00069970 g/bhp-hr | EPA |
| Acenaphthene | 0.0001 | 0.00000410 g/bhp-hr | EPA |
| Fluorene | 0.0003 | 0.00001870 g/bhp-hr | EPA |
| Phenanthrene | 0.0005 | 0.00003430 g/bhp-hr | EPA |
| Ethylene Dibromide | 0.0022 | 0.00014620 g/bhp-hr | EPA |
| Fluoranthene | 0.0001 | 0.00000370 g/bhp-hr | EPA |
| Pyrene | 0.0001 | 0.00000450 g/bhp-hr | EPA |
| Chrysene | 0.0000 | 0.00000230 g/bhp-hr | EPA |

| | | | | |
|---|---|---|---|---|
| Benzo(b)fluoranthene | 0.0000 | 0.00000050 | g/bhp-hr | EPA |
| Benzo(e)pyrene | 0.0000 | 0.00000140 | g/bhp-hr | EPA |
| Benzo(g,h,i)perylene | 0.0000 | 0.00000140 | g/bhp-hr | EPA |
| Vinyl Chloride | 0.0007 | 0.00004920 | g/bhp-hr | EPA |
| Methylene Chloride | 0.0010 | 0.00006600 | g/bhp-hr | EPA |
| 1,1-Dichloroethane | 0.0012 | 0.00007790 | g/bhp-hr | EPA |
| 1,3-Dichloropropene | 0.0013 | 0.00008710 | g/bhp-hr | EPA |
| Chlorobenzene | 0.0015 | 0.00010030 | g/bhp-hr | EPA |
| Chloroform | 0.0014 | 0.00009410 | g/bhp-hr | EPA |
| 1,1,2-Trichloroethane | 0.0016 | 0.00010500 | g/bhp-hr | EPA |
| 1,1,2,2-Tetrachloroethane | 0.0020 | 0.00013200 | g/bhp-hr | EPA |
| Carbon Tetrachloride | 0.0018 | 0.00012110 | g/bhp-hr | EPA |
| **Total** | 3.5563 | | | |

## Criteria Pollutants

| | | | | |
|---|---|---|---|---|
| PM | 0.4919 | 0.03296090 | g/bhp-hr | EPA |
| CO | 15.6145 | 1.04620860 | g/bhp-hr | EPA |
| NMEHC | 5.8123 | 0.38944040 | g/bhp-hr | EPA |
| NOx | 200.9684 | 13.46539810 | g/bhp-hr | EPA |
| SO2 | 0.0290 | 0.00194060 | g/bhp-hr | EPA |

## Other Pollutants

| | | | | |
|---|---|---|---|---|
| Butryaldehyde | 0.0050 | 0.00033330 | g/bhp-hr | EPA |
| Chloroethane | 0.0001 | 0.00000620 | g/bhp-hr | EPA |
| Methane | 61.5712 | 4.12542830 | g/bhp-hr | EPA |
| Ethane | 5.1720 | 0.34653600 | g/bhp-hr | EPA |
| Propane | 2.0639 | 0.13828440 | g/bhp-hr | EPA |
| Butane | 0.0266 | 0.00178550 | g/bhp-hr | EPA |
| Cyclopentane | 0.0112 | 0.00074920 | g/bhp-hr | EPA |
| n-Pentane | 0.1281 | 0.00858090 | g/bhp-hr | EPA |
| Methylcyclohexane | 0.0606 | 0.00405940 | g/bhp-hr | EPA |
| 1,2-Dichloroethane | 0.0012 | 0.00007790 | g/bhp-hr | EPA |
| 1,2-Dichloropropane | 0.0013 | 0.00008880 | g/bhp-hr | EPA |
| n-Octane | 0.0173 | 0.00115840 | g/bhp-hr | EPA |
| 1,2,3-Trimethylbenzene | 0.0011 | 0.00007590 | g/bhp-hr | EPA |
| 1,2,4-Trimethylbenzene | 0.0007 | 0.00004720 | g/bhp-hr | EPA |
| 1,3,5-Trimethylbenzene | 0.0017 | 0.00011160 | g/bhp-hr | EPA |
| n-Nonane | 0.0054 | 0.00036300 | g/bhp-hr | EPA |
| CO2 | 5,418.2656 | 363.03769350 | g/bhp-hr | EPA |

Bryan Research & Engineering, Inc.

# ProMax® 4.0



## Simulation Report

**Project: Amine & TEG System - Permitting - with H2S 7.18.17.pmx**

**Licensed to EPCO Holdings, Inc. and Affiliates**

**Client Name:** Enterprise Products
**Location:** Chaparral
**Job:** Amine & TEG Environmental Models Updated 7.18.17

**ProMax Filename:** O:\EPCO\Process Technology\Jenessa Duncan\Chaparral Environmental\Models\Permitting\Rev. 3\Amine & TEG System - Permitting - with H2S 7.18.17.pmx
**ProMax Version:** 4.0.16071.0
**Simulation Initiated:** 7/18/2017 12:36:15 PM

**Bryan Research & Engineering, Inc.**
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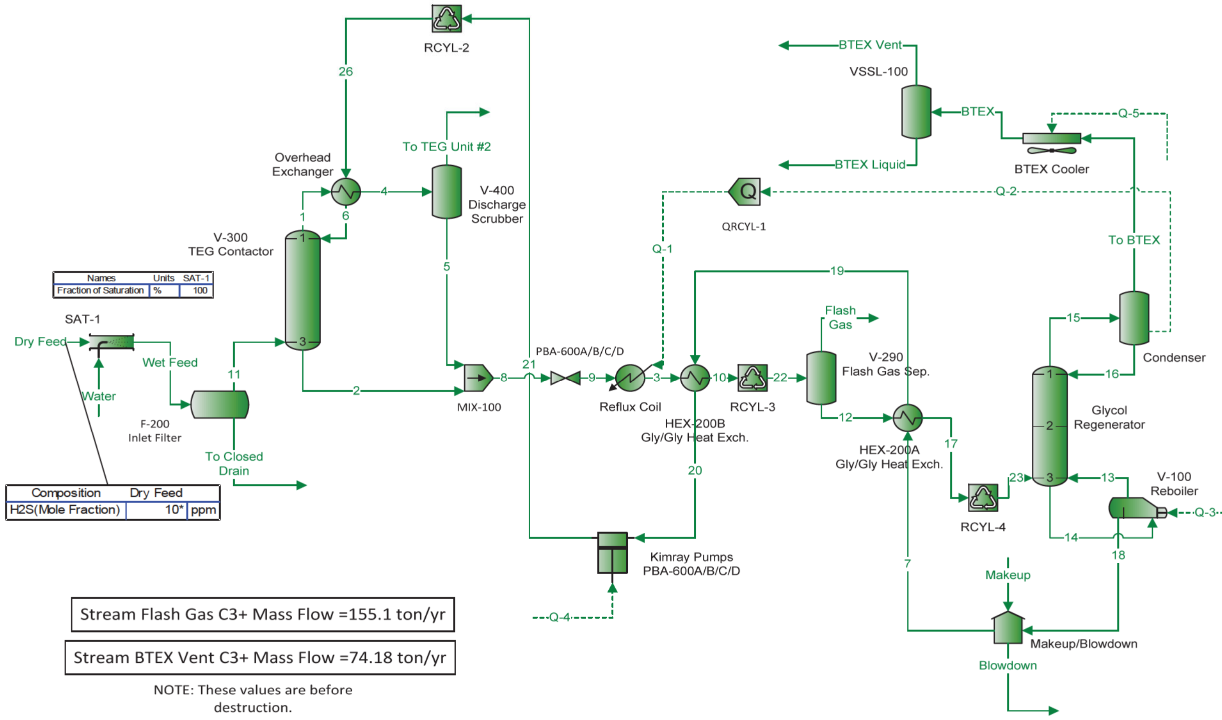
mailto:sales@bre.com
http://www.bre.com/

Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.

# Chaparral TEG Unit 1




Stream Flash Gas C3+ Mass Flow =155.1 ton/yr

Stream BTEX Vent C3+ Mass Flow =74.18 ton/yr

NOTE: These values are before destruction.

| Process Streams | | BTEX Vent |
|---|---|---|
| **Composition** | **Status:** | **Solved** |
| Phase: **Total** | **From Block:** | **VSSL-100** |
| | **To Block:** | -- |
| **Mass Flow** | | **lb/h** |
| H2S | | 0.0158832 |
| N2 | | 0.00270781 |
| CO2 | | 0.931430 |
| C1 | | 0.834886 |
| C2 | | 1.75485 |
| C3 | | 3.09919 |
| iC4 | | 0.500457 |
| nC4 | | 1.97263 |
| 2,2-Dimethylpropane | | 0.00612728 |
| iC5 | | 0.842995 |
| nC5 | | 1.01250 |
| 2,2-Dimethylbutane | | 0.0157939 |
| Cyclopentane | | 0 |
| 2,3-Dimethylbutane | | 0.143811 |
| 2-Methylpentane | | 0.297938 |
| 3-Methylpentane | | 0.203849 |
| nC6 | | 0.366447 |
| Methylcyclopentane | | 0.938352 |
| Benzene | | 4.37398 |
| Cyclohexane | | 0.807924 |
| 2-Methylhexane | | 0.0475313 |
| 3-Methylhexane | | 0.0606760 |
| 2,2,4-Trimethylpentane | | 0 |
| nC7 | | 0.223874 |
| Methylcyclohexane | | 0.384600 |
| Toluene | | 1.43367 |
| nC8 | | 0.0744679 |
| Ethylbenzene | | 0 |
| m-Xylene | | 0.0419108 |
| p-Xylene | | 0.0396539 |
| o-Xylene | | 0.0381730 |
| n-C9 | | 0.0105773 |
| n-Decane | | 0 |
| H2O | | 0.880706 |
| TEG | | 3.80709E-08 |

# GRI-HAPCalc ® 3.01
## External Combustion Devices Report

| | | |
|---|---|---|
| **Facility ID:** | **CHAPARRAL GP** | **Notes:** |
| **Operation Type:** | **GAS PLANT** | |
| **Facility Name:** | **CHAPARRAL GAS PLANT** | |
| **User Name:** | | |
| **Units of Measure:** | **U.S. STANDARD** | |

***Note: Emissions less than 5.00E-09 tons (or tonnes) per year are considered insignificant and are treated as zero.***
***These emissions are indicated on the report with a "0".***
***Emissions between 5.00E-09 and 5.00E-05 tons (or tonnes) per year are represented on the report with "0.0000".***

**External Combustion Devices**

Unit Name: DEHY-1

Hours of Operation: 8,760 Yearly
Heat Input: 2.0 MMBtu/hr
Fuel Type: NATURAL GAS
Device Type: HEATER
Emission Factor Set: FIELD > EPA > LITERATURE
Additional EF Set: -NONE-

### Calculated Emissions (ton/yr)

| Chemical Name | Emissions | Emission Factor | Emission Factor Set |
|---|---|---|---|
| **HAPs** | | | |
| 3-Methylcholanthrene | 0.0000 | 0.0000000018 lb/MMBtu | EPA |
| 7,12-Dimethylbenz(a)anthracene | 0.0000 | 0.0000000157 lb/MMBtu | EPA |
| Formaldehyde | 0.0074 | 0.0008440090 lb/MMBtu | GRI Field |
| Methanol | 0.0084 | 0.0009636360 lb/MMBtu | GRI Field |
| Acetaldehyde | 0.0065 | 0.0007375920 lb/MMBtu | GRI Field |
| 1,3-Butadiene | 0.0030 | 0.0003423350 lb/MMBtu | GRI Field |
| Benzene | 0.0066 | 0.0007480470 lb/MMBtu | GRI Field |
| Toluene | 0.0089 | 0.0010163310 lb/MMBtu | GRI Field |
| Ethylbenzene | 0.0185 | 0.0021128220 lb/MMBtu | GRI Field |
| Xylenes(m,p,o) | 0.0116 | 0.0013205140 lb/MMBtu | GRI Field |
| 2,2,4-Trimethylpentane | 0.0249 | 0.0028417580 lb/MMBtu | GRI Field |
| n-Hexane | 0.0123 | 0.0014070660 lb/MMBtu | GRI Field |
| Phenol | 0.0000 | 0.0000001070 lb/MMBtu | GRI Field |
| Styrene | 0.0182 | 0.0020788960 lb/MMBtu | GRI Field |
| Naphthalene | 0.0000 | 0.0000005100 lb/MMBtu | GRI Field |
| 2-Methylnaphthalene | 0.0000 | 0.0000001470 lb/MMBtu | GRI Field |
| Acenaphthylene | 0.0000 | 0.0000000670 lb/MMBtu | GRI Field |
| Biphenyl | 0.0000 | 0.0000004730 lb/MMBtu | GRI Field |
| Acenaphthene | 0.0000 | 0.0000000900 lb/MMBtu | GRI Field |
| Fluorene | 0.0000 | 0.0000000800 lb/MMBtu | GRI Field |
| Anthracene | 0.0000 | 0.0000000870 lb/MMBtu | GRI Field |
| Phenanthrene | 0.0000 | 0.0000000600 lb/MMBtu | GRI Field |
| Fluoranthene | 0.0000 | 0.0000000900 lb/MMBtu | GRI Field |
| Pyrene | 0.0000 | 0.0000000830 lb/MMBtu | GRI Field |
| Benz(a)anthracene | 0.0000 | 0.0000000870 lb/MMBtu | GRI Field |

| | | | | |
|---|---|---|---|---|
| Chrysene | 0.0000 | 0.0000001170 | lb/MMBtu | GRI Field |
| Benzo(a)pyrene | 0.0000 | 0.0000000700 | lb/MMBtu | GRI Field |
| Benzo(b)fluoranthene | 0.0000 | 0.0000001500 | lb/MMBtu | GRI Field |
| Benzo(k)fluoranthene | 0.0000 | 0.0000007600 | lb/MMBtu | GRI Field |
| Benzo(g,h,i)perylene | 0.0000 | 0.0000002600 | lb/MMBtu | GRI Field |
| Indeno(1,2,3-c,d)pyrene | 0.0000 | 0.0000001200 | lb/MMBtu | GRI Field |
| Dibenz(a,h)anthracene | 0.0000 | 0.0000001030 | lb/MMBtu | GRI Field |
| Lead | 0.0000 | 0.0000004902 | lb/MMBtu | EPA |
| **Total** | 0.1263 | | | |

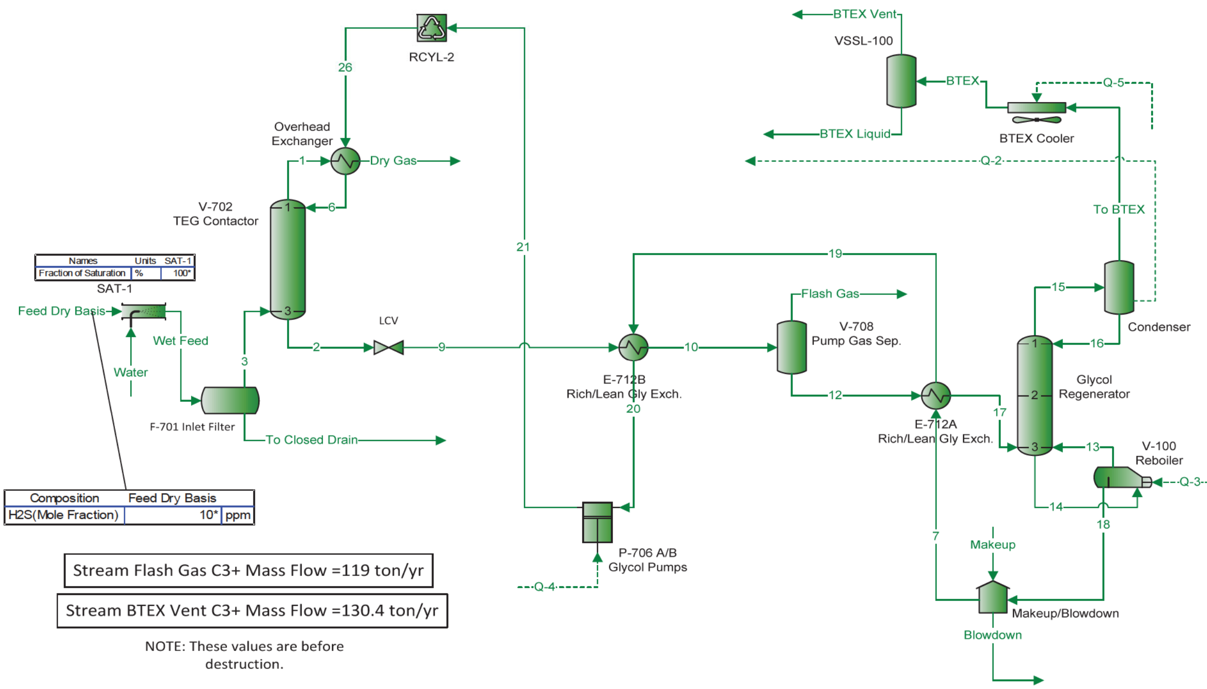
## Criteria Pollutants

| | | | | |
|---|---|---|---|---|
| VOC | 0.0472 | 0.0053921569 | lb/MMBtu | EPA |
| PM | 0.0653 | 0.0074509804 | lb/MMBtu | EPA |
| PM, Condensible | 0.0490 | 0.0055882353 | lb/MMBtu | EPA |
| PM, Filterable | 0.0163 | 0.0018627451 | lb/MMBtu | EPA |
| CO | 0.2835 | 0.0323636360 | lb/MMBtu | GRI Field |
| NMHC | 0.0747 | 0.0085294118 | lb/MMBtu | EPA |
| NOx | 0.8499 | 0.0970167730 | lb/MMBtu | GRI Field |
| SO2 | 0.0052 | 0.0005880000 | lb/MMBtu | EPA |

## Other Pollutants

| | | | | |
|---|---|---|---|---|
| Dichlorobenzene | 0.0000 | 0.0000011765 | lb/MMBtu | EPA |
| Methane | 0.0922 | 0.0105212610 | lb/MMBtu | GRI Field |
| Acetylene | 0.1226 | 0.0140000000 | lb/MMBtu | GRI Field |
| Ethylene | 0.0083 | 0.0009476310 | lb/MMBtu | GRI Field |
| Ethane | 0.0230 | 0.0026312210 | lb/MMBtu | GRI Field |
| Propylene | 0.0205 | 0.0023454550 | lb/MMBtu | GRI Field |
| Propane | 0.0094 | 0.0010686280 | lb/MMBtu | GRI Field |
| Isobutane | 0.0128 | 0.0014640770 | lb/MMBtu | GRI Field |
| Butane | 0.0121 | 0.0013766990 | lb/MMBtu | GRI Field |
| Cyclopentane | 0.0099 | 0.0011304940 | lb/MMBtu | GRI Field |
| Pentane | 0.0304 | 0.0034671850 | lb/MMBtu | GRI Field |
| n-Pentane | 0.0125 | 0.0014221310 | lb/MMBtu | GRI Field |
| Cyclohexane | 0.0080 | 0.0009183830 | lb/MMBtu | GRI Field |
| Methylcyclohexane | 0.0193 | 0.0022011420 | lb/MMBtu | GRI Field |
| n-Octane | 0.0250 | 0.0028538830 | lb/MMBtu | GRI Field |
| 1,2,3-Trimethylbenzene | 0.0300 | 0.0034224540 | lb/MMBtu | GRI Field |
| 1,2,4-Trimethylbenzene | 0.0300 | 0.0034224540 | lb/MMBtu | GRI Field |
| 1,3,5-Trimethylbenzene | 0.0300 | 0.0034224540 | lb/MMBtu | GRI Field |
| n-Nonane | 0.0321 | 0.0036604170 | lb/MMBtu | GRI Field |
| CO2 | 1,030.5882 | 117.6470588235 | lb/MMBtu | EPA |

# Chaparral TEG Unit 2




Stream Flash Gas C3+ Mass Flow =119 ton/yr

Stream BTEX Vent C3+ Mass Flow =130.4 ton/yr

NOTE: These values are before destruction.

| Process Streams | | BTEX Vent |
|---|---|---|
| **Composition** | Status: | Solved |
| Phase: Total | From Block: | VSSL-100 |
| | To Block: | -- |
| **Mass Flow** | | lb/h |
| H2S | | 0.0258602 |
| N2 | | 0.00352548 |
| CO2 | | 1.84064 |
| C1 | | 1.33067 |
| C2 | | 3.14414 |
| C3 | | 5.83906 |
| iC4 | | 0.993505 |
| nC4 | | 3.98885 |
| 2,2-Dimethylpropane | | 0.0126449 |
| iC5 | | 1.67900 |
| nC5 | | 1.96386 |
| 2,2-Dimethylbutane | | 0.0268380 |
| Cyclopentane | | 0 |
| 2,3-Dimethylbutane | | 0.262883 |
| 2-Methylpentane | | 0.534667 |
| 3-Methylpentane | | 0.347326 |
| nC6 | | 0.652842 |
| Methylcyclopentane | | 1.47358 |
| Benzene | | 6.97916 |
| Cyclohexane | | 1.21388 |
| 2-Methylhexane | | 0.0762048 |
| 3-Methylhexane | | 0.102331 |
| 2,2,4-Trimethylpentane | | 0 |
| nC7 | | 0.370390 |
| Methylcyclohexane | | 0.568406 |
| Toluene | | 1.94454 |
| nC8 | | 0.0959663 |
| Ethylbenzene | | 0.0569326 |
| m-Xylene | | 0.301506 |
| p-Xylene | | 0.287396 |
| o-Xylene | | 0 |
| n-C9 | | 0.00854626 |
| n-Decane | | 0 |
| H2O | | 1.56091 |
| TEG | | 1.81690E-07 |

Unit Name: DEHY-2

Hours of Operation: 8,760 Yearly

Heat Input: 1.0 MMBtu/hr

Fuel Type: NATURAL GAS

Device Type: HEATER

Emission Factor Set: FIELD > EPA > LITERATURE

Additional EF Set: -NONE-

## Calculated Emissions (ton/yr)

| Chemical Name | Emissions | Emission Factor | Emission Factor Set |
|---|---|---|---|
| **HAPs** | | | |
| 3-Methylcholanthrene | 0.0000 | 0.0000000018 lb/MMBtu | EPA |
| 7,12-Dimethylbenz(a)anthracene | 0.0000 | 0.0000000157 lb/MMBtu | EPA |
| Formaldehyde | 0.0037 | 0.0008440090 lb/MMBtu | GRI Field |
| Methanol | 0.0042 | 0.0009636360 lb/MMBtu | GRI Field |
| Acetaldehyde | 0.0032 | 0.0007375920 lb/MMBtu | GRI Field |
| 1,3-Butadiene | 0.0015 | 0.0003423350 lb/MMBtu | GRI Field |
| Benzene | 0.0033 | 0.0007480470 lb/MMBtu | GRI Field |
| Toluene | 0.0045 | 0.0010163310 lb/MMBtu | GRI Field |
| Ethylbenzene | 0.0093 | 0.0021128220 lb/MMBtu | GRI Field |
| Xylenes(m,p,o) | 0.0058 | 0.0013205140 lb/MMBtu | GRI Field |
| 2,2,4-Trimethylpentane | 0.0124 | 0.0028417580 lb/MMBtu | GRI Field |
| n-Hexane | 0.0062 | 0.0014070660 lb/MMBtu | GRI Field |
| Phenol | 0.0000 | 0.0000001070 lb/MMBtu | GRI Field |
| Styrene | 0.0091 | 0.0020788960 lb/MMBtu | GRI Field |
| Naphthalene | 0.0000 | 0.0000005100 lb/MMBtu | GRI Field |
| 2-Methylnaphthalene | 0.0000 | 0.0000001470 lb/MMBtu | GRI Field |
| Acenaphthylene | 0.0000 | 0.0000000670 lb/MMBtu | GRI Field |
| Biphenyl | 0.0000 | 0.0000004730 lb/MMBtu | GRI Field |
| Acenaphthene | 0.0000 | 0.0000000900 lb/MMBtu | GRI Field |
| Fluorene | 0.0000 | 0.0000000800 lb/MMBtu | GRI Field |
| Anthracene | 0.0000 | 0.0000000870 lb/MMBtu | GRI Field |
| Phenanthrene | 0.0000 | 0.0000000600 lb/MMBtu | GRI Field |
| Fluoranthene | 0.0000 | 0.0000000900 lb/MMBtu | GRI Field |
| Pyrene | 0.0000 | 0.0000000830 lb/MMBtu | GRI Field |
| Benz(a)anthracene | 0.0000 | 0.0000000870 lb/MMBtu | GRI Field |
| Chrysene | 0.0000 | 0.0000001170 lb/MMBtu | GRI Field |
| Benzo(a)pyrene | 0.0000 | 0.0000000700 lb/MMBtu | GRI Field |
| Benzo(b)fluoranthene | 0.0000 | 0.0000001500 lb/MMBtu | GRI Field |
| Benzo(k)fluoranthene | 0.0000 | 0.0000007600 lb/MMBtu | GRI Field |
| Benzo(g,h,i)perylene | 0.0000 | 0.0000002600 lb/MMBtu | GRI Field |
| Indeno(1,2,3-c,d)pyrene | 0.0000 | 0.0000001200 lb/MMBtu | GRI Field |
| Dibenz(a,h)anthracene | 0.0000 | 0.0000001030 lb/MMBtu | GRI Field |
| Lead | 0.0000 | 0.0000004902 lb/MMBtu | EPA |
| **Total** | 0.0632 | | |
| **Criteria Pollutants** | | | |
| VOC | 0.0236 | 0.0053921569 lb/MMBtu | EPA |
| PM | 0.0326 | 0.0074509804 lb/MMBtu | EPA |
| PM, Condensible | 0.0245 | 0.0055882353 lb/MMBtu | EPA |
| PM, Filterable | 0.0082 | 0.0018627451 lb/MMBtu | EPA |
| CO | 0.1418 | 0.0323636360 lb/MMBtu | GRI Field |

| | | | | |
|---|---|---|---|---|
| NMHC | 0.0374 | 0.0085294118 | lb/MMBtu | EPA |
| NOx | 0.4249 | 0.0970167730 | lb/MMBtu | GRI Field |
| SO2 | 0.0026 | 0.0005880000 | lb/MMBtu | EPA |

## Other Pollutants

| | | | | |
|---|---|---|---|---|
| Dichlorobenzene | 0.0000 | 0.0000011765 | lb/MMBtu | EPA |
| Methane | 0.0461 | 0.0105212610 | lb/MMBtu | GRI Field |
| Acetylene | 0.0613 | 0.0140000000 | lb/MMBtu | GRI Field |
| Ethylene | 0.0042 | 0.0009476310 | lb/MMBtu | GRI Field |
| Ethane | 0.0115 | 0.0026312210 | lb/MMBtu | GRI Field |
| Propylene | 0.0103 | 0.0023454550 | lb/MMBtu | GRI Field |
| Propane | 0.0047 | 0.0010686280 | lb/MMBtu | GRI Field |
| Isobutane | 0.0064 | 0.0014640770 | lb/MMBtu | GRI Field |
| Butane | 0.0060 | 0.0013766990 | lb/MMBtu | GRI Field |
| Cyclopentane | 0.0050 | 0.0011304940 | lb/MMBtu | GRI Field |
| Pentane | 0.0152 | 0.0034671850 | lb/MMBtu | GRI Field |
| n-Pentane | 0.0062 | 0.0014221310 | lb/MMBtu | GRI Field |
| Cyclohexane | 0.0040 | 0.0009183830 | lb/MMBtu | GRI Field |
| Methylcyclohexane | 0.0096 | 0.0022011420 | lb/MMBtu | GRI Field |
| n-Octane | 0.0125 | 0.0028538830 | lb/MMBtu | GRI Field |
| 1,2,3-Trimethylbenzene | 0.0150 | 0.0034224540 | lb/MMBtu | GRI Field |
| 1,2,4-Trimethylbenzene | 0.0150 | 0.0034224540 | lb/MMBtu | GRI Field |
| 1,3,5-Trimethylbenzene | 0.0150 | 0.0034224540 | lb/MMBtu | GRI Field |
| n-Nonane | 0.0160 | 0.0036604170 | lb/MMBtu | GRI Field |
| CO2 | 515.2941 | 117.6470588235 | lb/MMBtu | EPA |

Unit Name: MOLE-1

| | | |
|---|---|---|
| Hours of Operation: | 8,760 | Yearly |
| Heat Input: | 2.80 | MMBtu/hr |
| Fuel Type: | NATURAL GAS | |
| Device Type: | HEATER | |
| Emission Factor Set: | FIELD > EPA > LITERATURE | |
| Additional EF Set: | -NONE- | |

## Calculated Emissions (ton/yr)

| Chemical Name | Emissions | Emission Factor | | Emission Factor Set |
|---|---|---|---|---|
| **HAPs** | | | | |
| 3-Methylcholanthrene | 0.0000 | 0.0000000018 | lb/MMBtu | EPA |
| 7,12-Dimethylbenz(a)anthracene | 0.0000 | 0.0000000157 | lb/MMBtu | EPA |
| Formaldehyde | 0.0104 | 0.0008440090 | lb/MMBtu | GRI Field |
| Methanol | 0.0118 | 0.0009636360 | lb/MMBtu | GRI Field |
| Acetaldehyde | 0.0090 | 0.0007375920 | lb/MMBtu | GRI Field |
| 1,3-Butadiene | 0.0042 | 0.0003423350 | lb/MMBtu | GRI Field |
| Benzene | 0.0092 | 0.0007480470 | lb/MMBtu | GRI Field |
| Toluene | 0.0125 | 0.0010163310 | lb/MMBtu | GRI Field |
| Ethylbenzene | 0.0259 | 0.0021128220 | lb/MMBtu | GRI Field |
| Xylenes(m,p,o) | 0.0162 | 0.0013205140 | lb/MMBtu | GRI Field |
| 2,2,4-Trimethylpentane | 0.0349 | 0.0028417580 | lb/MMBtu | GRI Field |
| n-Hexane | 0.0173 | 0.0014070660 | lb/MMBtu | GRI Field |
| Phenol | 0.0000 | 0.0000001070 | lb/MMBtu | GRI Field |
| Styrene | 0.0255 | 0.0020788960 | lb/MMBtu | GRI Field |
| Naphthalene | 0.0000 | 0.0000005100 | lb/MMBtu | GRI Field |
| 2-Methylnaphthalene | 0.0000 | 0.0000001470 | lb/MMBtu | GRI Field |
| Acenaphthylene | 0.0000 | 0.0000000670 | lb/MMBtu | GRI Field |
| Biphenyl | 0.0000 | 0.0000004730 | lb/MMBtu | GRI Field |
| Acenaphthene | 0.0000 | 0.0000000900 | lb/MMBtu | GRI Field |
| Fluorene | 0.0000 | 0.0000000800 | lb/MMBtu | GRI Field |
| Anthracene | 0.0000 | 0.0000000870 | lb/MMBtu | GRI Field |
| Phenanthrene | 0.0000 | 0.0000000600 | lb/MMBtu | GRI Field |
| Fluoranthene | 0.0000 | 0.0000000900 | lb/MMBtu | GRI Field |
| Pyrene | 0.0000 | 0.0000000830 | lb/MMBtu | GRI Field |
| Benz(a)anthracene | 0.0000 | 0.0000000870 | lb/MMBtu | GRI Field |
| Chrysene | 0.0000 | 0.0000001170 | lb/MMBtu | GRI Field |
| Benzo(a)pyrene | 0.0000 | 0.0000000700 | lb/MMBtu | GRI Field |
| Benzo(b)fluoranthene | 0.0000 | 0.0000001500 | lb/MMBtu | GRI Field |
| Benzo(k)fluoranthene | 0.0000 | 0.0000007600 | lb/MMBtu | GRI Field |
| Benzo(g,h,i)perylene | 0.0000 | 0.0000002600 | lb/MMBtu | GRI Field |
| Indeno(1,2,3-c,d)pyrene | 0.0000 | 0.0000001200 | lb/MMBtu | GRI Field |
| Dibenz(a,h)anthracene | 0.0000 | 0.0000001030 | lb/MMBtu | GRI Field |
| Lead | 0.0000 | 0.0000004902 | lb/MMBtu | EPA |
| **Total** | 0.1769 | | | |
| **Criteria Pollutants** | | | | |
| VOC | 0.0661 | 0.0053921569 | lb/MMBtu | EPA |
| PM | 0.0914 | 0.0074509804 | lb/MMBtu | EPA |
| PM, Condensible | 0.0685 | 0.0055882353 | lb/MMBtu | EPA |

| | | | | |
|---|---|---|---|---|
| PM, Filterable | 0.0228 | 0.0018627451 | lb/MMBtu | EPA |
| CO | 0.3969 | 0.0323636360 | lb/MMBtu | GRI Field |
| NMHC | 0.1046 | 0.0085294118 | lb/MMBtu | EPA |
| NOx | 1.1898 | 0.0970167730 | lb/MMBtu | GRI Field |
| SO2 | 0.0072 | 0.0005880000 | lb/MMBtu | EPA |

## Other Pollutants

| | | | | |
|---|---|---|---|---|
| Dichlorobenzene | 0.0000 | 0.0000011765 | lb/MMBtu | EPA |
| Methane | 0.1290 | 0.0105212610 | lb/MMBtu | GRI Field |
| Acetylene | 0.1717 | 0.0140000000 | lb/MMBtu | GRI Field |
| Ethylene | 0.0116 | 0.0009476310 | lb/MMBtu | GRI Field |
| Ethane | 0.0323 | 0.0026312210 | lb/MMBtu | GRI Field |
| Propylene | 0.0288 | 0.0023454550 | lb/MMBtu | GRI Field |
| Propane | 0.0131 | 0.0010686280 | lb/MMBtu | GRI Field |
| Isobutane | 0.0180 | 0.0014640770 | lb/MMBtu | GRI Field |
| Butane | 0.0169 | 0.0013766990 | lb/MMBtu | GRI Field |
| Cyclopentane | 0.0139 | 0.0011304940 | lb/MMBtu | GRI Field |
| Pentane | 0.0425 | 0.0034671850 | lb/MMBtu | GRI Field |
| n-Pentane | 0.0174 | 0.0014221310 | lb/MMBtu | GRI Field |
| Cyclohexane | 0.0113 | 0.0009183830 | lb/MMBtu | GRI Field |
| Methylcyclohexane | 0.0270 | 0.0022011420 | lb/MMBtu | GRI Field |
| n-Octane | 0.0350 | 0.0028538830 | lb/MMBtu | GRI Field |
| 1,2,3-Trimethylbenzene | 0.0420 | 0.0034224540 | lb/MMBtu | GRI Field |
| 1,2,4-Trimethylbenzene | 0.0420 | 0.0034224540 | lb/MMBtu | GRI Field |
| 1,3,5-Trimethylbenzene | 0.0420 | 0.0034224540 | lb/MMBtu | GRI Field |
| n-Nonane | 0.0449 | 0.0036604170 | lb/MMBtu | GRI Field |
| CO2 | 1,442.8235 | 117.6470588235 | lb/MMBtu | EPA |

# TANKS 4.0.9d
## Emissions Report - Detail Format
## Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Chaparral Gas Plant |
| City: | |
| State: | New Mexico |
| Company: | Enterprise |
| Type of Tank: | Vertical Fixed Roof Tank |
| Description: | 30,000 barrels per year throughput for entire facility Three tanks, TK-1, TK-2 and TK-3 |

**Tank Dimensions**

| | |
|---|---|
| Shell Height (ft): | 15.00 |
| Diameter (ft): | 12.00 |
| Liquid Height (ft) : | 14.89 |
| Avg. Liquid Height (ft): | 7.45 |
| Volume (gallons): | 12,597.38 |
| Turnovers: | 33.34 |
| Net Throughput(gal/yr): | 420,000.00 |
| Is Tank Heated (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | Red/Primer |
| Shell Condition | Poor |
| Roof Color/Shade: | Red/Primer |
| Roof Condition: | Poor |

**Roof Characteristics**

| | |
|---|---|
| Type: | Cone |
| Height (ft) | 0.00 |
| Slope (ft/ft) (Cone Roof) | 0.06 |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Roswell, New Mexico (Avg Atmospheric Pressure = 12.73 psia)

# TANKS 4.0.9d
# Emissions Report - Detail Format
# Liquid Contents of Storage Tank

### Chaparral Gas Plant - Vertical Fixed Roof Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gasoline (RVP 9) | All | 76.33 | 59.43 | 93.23 | 65.28 | 6.2966 | 4.5594 | 8.5259 | 67.0000 | | | 92.00 | Option 4: RVP=9, ASTM Slope=3 |
| 1,2,4-Trimethylbenzene | | | | | | 0.0383 | 0.0200 | 0.0699 | 120.1900 | 0.0033 | 0.0000 | 120.19 | Option 2: A=7.04383, B=1573.267, C=208.56 |
| Benzene | | | | | | 1.8062 | 1.1494 | 2.7453 | 78.1100 | 0.0060 | 0.0024 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Cyclohexane | | | | | | 1.8549 | 1.1927 | 2.7929 | 84.1600 | 0.0070 | 0.0028 | 84.16 | Option 2: A=6.841, B=1201.53, C=222.65 |
| Ethylbenzene | | | | | | 0.1875 | 0.1064 | 0.3165 | 106.1700 | 0.0040 | 0.0002 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 2.8812 | 1.8851 | 4.2700 | 86.1700 | 0.0040 | 0.0025 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Isooctane | | | | | | | | | 114.2200 | 0.0010 | 0.0000 | 114.22 | |
| Isopropyl benzene | | | | | | 0.0866 | 0.0471 | 0.1519 | 120.2000 | 0.0010 | 0.0000 | 120.20 | Option 2: A=6.93666, B=1460.793, C=207.78 |
| Toluene | | | | | | 0.5386 | 0.3243 | 0.8617 | 92.1300 | 0.0100 | 0.0012 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Unidentified Components | | | | | | 6.5690 | 6.5332 | 6.5428 | 66.8616 | 0.9497 | 0.9904 | 91.84 | |
| Xylene (-m) | | | | | | 0.1570 | 0.0886 | 0.2665 | 106.1700 | 0.0140 | 0.0005 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Detail Format
# Detail Calculations (AP-42)

## Chaparral Gas Plant - Vertical Fixed Roof Tank

| Annual Emission Calcaulations | |
|---|---|
| Standing Losses (lb): | 4,784.6697 |
| Vapor Space Volume (cu ft): | 868.0220 |
| Vapor Density (lb/cu ft): | 0.0733 |
| Vapor Space Expansion Factor: | 0.7333 |
| Vented Vapor Saturation Factor: | 0.2808 |
| | |
| Tank Vapor Space Volume: | |
| Vapor Space Volume (cu ft): | 868.0220 |
| Tank Diameter (ft): | 12.0000 |
| Vapor Space Outage (ft): | 7.6750 |
| Tank Shell Height (ft): | 15.0000 |
| Average Liquid Height (ft): | 7.4500 |
| Roof Outage (ft): | 0.1250 |
| | |
| Roof Outage (Cone Roof) | |
| Roof Outage (ft): | 0.1250 |
| Roof Height (ft): | 0.0000 |
| Roof Slope (ft/ft): | 0.0625 |
| Shell Radius (ft): | 6.0000 |
| | |
| Vapor Density | |
| Vapor Density (lb/cu ft): | 0.0733 |
| Vapor Molecular Weight (lb/lb-mole): | 67.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 6.2966 |
| Daily Avg. Liquid Surface Temp. (deg. R): | 535.9964 |
| Daily Average Ambient Temp. (deg. F): | 60.8167 |
| Ideal Gas Constant R (psia cuft / (lb-mol-deg R)): | 10.731 |
| Liquid Bulk Temperature (deg. R): | 524.9467 |
| Tank Paint Solar Absorptance (Shell): | 0.9100 |
| Tank Paint Solar Absorptance (Roof): | 0.9100 |
| Daily Total Solar Insulation Factor (Btu/sqft day): | 1,810.0000 |
| | |
| Vapor Space Expansion Factor | |
| Vapor Space Expansion Factor: | 0.7333 |
| Daily Vapor Temperature Range (deg. R): | 67.5988 |
| Daily Vapor Pressure Range (psia): | 3.9666 |
| Breather Vent Press. Setting Range(psia): | 0.0600 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 6.2966 |
| Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia): | 4.5594 |
| Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia): | 8.5259 |
| Daily Avg. Liquid Surface Temp. (deg R): | 535.9964 |
| Daily Min. Liquid Surface Temp. (deg R): | 519.0967 |
| Daily Max. Liquid Surface Temp. (deg R): | 552.8961 |
| Daily Ambient Temp. Range (deg. R): | 29.8333 |
| | |
| Vented Vapor Saturation Factor | |
| Vented Vapor Saturation Factor: | 0.2808 |
| Vapor Pressure at Daily Average Liquid: Surface Temperature (psia): | 6.2966 |
| Vapor Space Outage (ft): | 7.6750 |
| | |
| Working Losses (lb): | 4,218.7440 |
| Vapor Molecular Weight (lb/lb-mole): | 67.0000 |
| Vapor Pressure at Daily Average Liquid Surface Temperature (psia): | 6.2966 |
| Annual Net Throughput (gal/yr.): | 420,000.0000 |
| Annual Turnovers: | 33.3403 |
| Turnover Factor: | 1.0000 |
| Maximum Liquid Volume (gal): | 12,597.3811 |
| Maximum Liquid Height (ft): | 14.8900 |
| Tank Diameter (ft): | 12.0000 |
| Working Loss Product Factor: | 1.0000 |
| | |
| Total Losses (lb): | 9,003.4137 |

**TANKS 4.0.9d**
**Emissions Report - Detail Format**
**Individual Tank Emission Totals**

## Emissions Report for: Annual

**Chaparral Gas Plant - Vertical Fixed Roof Tank**

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Gasoline (RVP 9) | 4,218.74 | 4,784.67 | 9,003.41 |
| Hexane (-n) | 10.60 | 12.02 | 22.63 |
| Benzene | 9.97 | 11.31 | 21.28 |
| Isooctane | 0.00 | 0.00 | 0.00 |
| Toluene | 4.96 | 5.62 | 10.58 |
| Ethylbenzene | 0.69 | 0.78 | 1.47 |
| Xylene (-m) | 2.02 | 2.29 | 4.32 |
| Isopropyl benzene | 0.08 | 0.09 | 0.17 |
| 1,2,4-Trimethylbenzene | 0.12 | 0.13 | 0.25 |
| Cyclohexane | 11.95 | 13.55 | 25.49 |
| Unidentified Components | 4,178.36 | 4,738.87 | 8,917.23 |

**Chaparral Flare Summary**

| | Flare Collection System Summary | | | | | |
|---|---|---|---|---|---|---|
| | Total Dump to Flare Drum | | Flow to Flare | | Flow to Condensate Tanks | |
| | Mass Frac | Mass Flow, lb/hr | Mass Frac | Mass Flow, lb/hr | Mass Frac | Mass Flow, lb/hr |
| H2S | 0.000 | 0.024 | 0.0000 | 0.034 | 0.0000 | 0.000 |
| CO2 | 0.004 | 8.440 | 0.0063 | 11.885 | 0.0000 | 0.004 |
| Nitrogen | 0.002 | 4.641 | 0.0034 | 6.552 | 0.0000 | 0.000 |
| Methane | 0.128 | 258.370 | 0.1919 | 364.497 | 0.0003 | 0.036 |
| Ethane | 0.093 | 187.359 | 0.1385 | 263.091 | 0.0015 | 0.183 |
| Propane | 0.130 | 262.041 | 0.1905 | 361.834 | 0.0085 | 1.043 |
| i-Butane | 0.035 | 70.344 | 0.0491 | 93.210 | 0.0064 | 0.784 |
| n-Butane | 0.098 | 198.547 | 0.1343 | 255.111 | 0.0264 | 3.236 |
| i-Pentane | 0.057 | 115.202 | 0.0675 | 128.230 | 0.0360 | 4.419 |
| n-Pentane | 0.064 | 129.297 | 0.0700 | 132.948 | 0.0519 | 6.368 |
| 22-Mpropane | 0.001 | 2.664 | 0.0018 | 3.329 | 0.0005 | 0.056 |
| 22-Mbutane | 0.001 | 2.801 | 0.0012 | 2.296 | 0.0017 | 0.213 |
| 23-Mbutane | 0.008 | 17.051 | 0.0069 | 13.086 | 0.0115 | 1.411 |
| 2-Mpentane | 0.016 | 31.691 | 0.0121 | 23.073 | 0.0227 | 2.782 |
| 3-Mpentane | 0.026 | 53.443 | 0.0191 | 36.180 | 0.0411 | 5.042 |
| n-Hexane | 0.037 | 73.980 | 0.0231 | 43.790 | 0.0635 | 7.788 |
| Mcyclopentan | 0.024 | 48.747 | 0.0143 | 27.092 | 0.0437 | 5.358 |
| Benzene | 0.029 | 57.875 | 0.0160 | 30.373 | 0.0537 | 6.591 |
| Cyclohexane | 0.035 | 71.660 | 0.0178 | 33.766 | 0.0705 | 8.654 |
| 2-Mhexane | 0.011 | 22.529 | 0.0038 | 7.270 | 0.0257 | 3.150 |
| 3-Mhexane | 0.009 | 18.897 | 0.0031 | 5.846 | 0.0218 | 2.675 |
| n-Heptane | 0.018 | 36.325 | 0.0047 | 8.911 | 0.0443 | 5.440 |
| Mcyclohexane | 0.035 | 70.059 | 0.0096 | 18.142 | 0.0845 | 10.370 |
| Toluene | 0.026 | 51.876 | 0.0052 | 9.782 | 0.0664 | 8.147 |
| n-Octane | 0.026 | 53.356 | 0.0023 | 4.422 | 0.0742 | 9.104 |
| E-Benzene | 0.001 | 1.700 | 0.0001 | 0.105 | 0.0024 | 0.295 |
| m-Xylene | 0.004 | 7.093 | 0.0002 | 0.359 | 0.0101 | 1.240 |
| p-Xylene | 0.003 | 6.832 | 0.0002 | 0.352 | 0.0097 | 1.193 |
| o-Xylene | 0.001 | 1.986 | 0.0000 | 0.093 | 0.0028 | 0.348 |
| n-Nonane | 0.007 | 15.116 | 0.0002 | 0.403 | 0.0219 | 2.688 |
| n-Decane | 0.001 | 3.018 | 0.0000 | 0.027 | 0.0044 | 0.544 |
| n-C11 | 0.000 | 0.387 | 0.0000 | 0.001 | 0.0006 | 0.070 |
| n-C12 | 0.000 | 0.029 | 0.0000 | 0.000 | 0.0000 | 0.005 |
| n-C13 | 0.000 | 0.003 | 0.0000 | 0.000 | 0.0000 | 0.001 |
| n-C14 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 |
| n-C15 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 |
| H2O | 0.069 | 138.563 | 0.0068 | 12.909 | 0.1912 | 23.459 |
| TEG | 0.000 | 0.038 | 0.0000 | 0.005 | 0.0001 | 0.006 |
| **Total Flow, lb/hr** | | 2022.0 | | 1899.0 | | 122.7 |
| | | | Mole Wt | 37.20 | | |
| | | | Flow | 19,375 SCFH | | |
| | | | LHV | 1816 Btu/SCF | | |
| | | | HHV | 1964 Btu/SCF | | |

**Chaparral Flare Summary**

| | Flare Collection System Summary | | | | | |
|---|---|---|---|---|---|---|
| | Total Dump to Flare Drum | | Flow to Flare | | Flow to Condensate Tanks | |
| | Mass Frac | Mass Flow, lb/hr | Mass Frac | Mass Flow, lb/hr | Mass Frac | Mass Flow, lb/hr |
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| CO2 | 0.004 | 8.440 | 0.0063 | 11.885 | 0.0000 | 0.004 |
| Nitrogen | 0.002 | 4.641 | 0.0034 | 6.552 | 0.0000 | 0.000 |
| Methane | 0.128 | 258.370 | 0.1919 | 364.497 | 0.0003 | 0.036 |
| Ethane | 0.093 | 187.359 | 0.1385 | 263.091 | 0.0015 | 0.183 |
| Propane | 0.130 | 262.041 | 0.1905 | 361.834 | 0.0085 | 1.043 |
| i-Butane | 0.035 | 70.344 | 0.0491 | 93.210 | 0.0064 | 0.784 |
| n-Butane | 0.098 | 198.547 | 0.1343 | 255.111 | 0.0264 | 3.236 |
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| 22-Mbutane | 0.001 | 2.801 | 0.0012 | 2.296 | 0.0017 | 0.213 |
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| n-Octane | 0.026 | 53.356 | 0.0023 | 4.422 | 0.0742 | 9.104 |
| E-Benzene | 0.001 | 1.700 | 0.0001 | 0.105 | 0.0024 | 0.295 |
| m-Xylene | 0.004 | 7.093 | 0.0002 | 0.359 | 0.0101 | 1.240 |
| p-Xylene | 0.003 | 6.832 | 0.0002 | 0.352 | 0.0097 | 1.193 |
| o-Xylene | 0.001 | 1.986 | 0.0000 | 0.093 | 0.0028 | 0.348 |
| n-Nonane | 0.007 | 15.116 | 0.0002 | 0.403 | 0.0219 | 2.688 |
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| n-C11 | 0.000 | 0.387 | 0.0000 | 0.001 | 0.0006 | 0.070 |
| n-C12 | 0.000 | 0.029 | 0.0000 | 0.000 | 0.0000 | 0.005 |
| n-C13 | 0.000 | 0.003 | 0.0000 | 0.000 | 0.0000 | 0.001 |
| n-C14 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 |
| n-C15 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.0000 | 0.000 |
| H2O | 0.069 | 138.563 | 0.0068 | 12.909 | 0.1912 | 23.459 |
| TEG | 0.000 | 0.038 | 0.0000 | 0.005 | 0.0001 | 0.006 |
| **Total Flow, lb/hr** | | 2022.0 | | 1899.0 | | 122.7 |
| | | | Mole Wt | 37.20 | | |
| | | | Flow | 19,375 SCFH | | |
| | | | LHV | 1816 Btu/SCF | | |
| | | | HHV | 1964 Btu/SCF | | |

October 2000
RG-109 (Draft)

TNRCC

Air Permit Technical Guidance for Chemical Sources:

# Flares and Vapor Oxidizers



Air Permits Division

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

TNRCC

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## Technical Disclaimer

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

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

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

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

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

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## Tables

**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 exception 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.

SpiralX

# Combustor Catalog

24”, 30”, 48”, 60”, 80” Bodies

Documenting Control
Efficiencies of:
95%
≤ 98%, and
≤ 99%

## 2 | SIZING

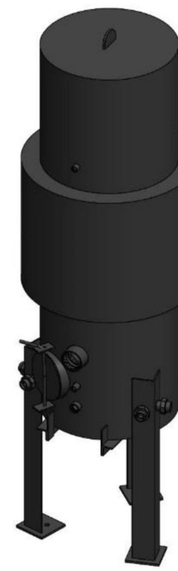
SpiralX LLC combustors are made from A36 structural steel and come in 24”, 30”, 48”, 60” or 80” diameter bodies, depending on the amount of BTEX destruction required. These bodies are surrounded by a steel grate to protect objects from coming is direct contact with the combustion section during operation. The sizes are listed below with their respective dimensions. Note that the on-site dimensions can change depending on the type of skid utilized for the combustor.

### 2.1 | 24” Combustor

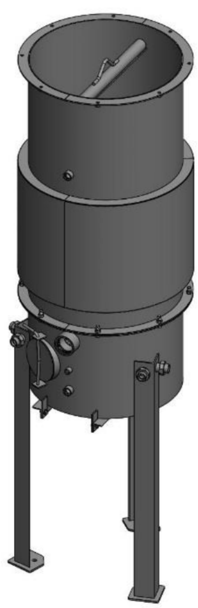
HEIGHT: 97”

WEIGHT: 900 LBS. w/ internals & rain cap

DIAMETER: 28” with grate. 32.17” max with legs.



### 2.2 | 30” Combustor



HEIGHT: 113.00”

WEIGHT: 980 LBS. w/ internals & rain cap

DIAMETER: 34.125” with grate. 37.86” max with legs.

## APPENDIX A

*Table 1: Flare Requirements*

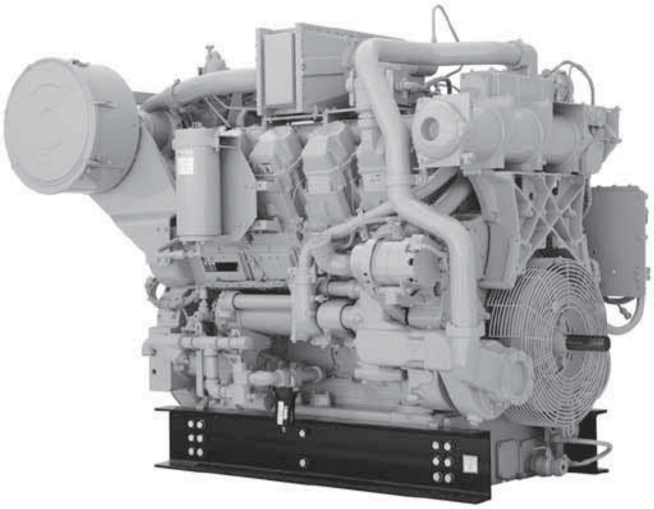
| Acceptable Control Efficiency | Requirements |
|---|---|
| destruction efficiencies of:<br><br>≤ 98% for VOCs and $H_2S$, and<br><br>≤ 99% for compounds containing only carbon, hydrogen, and oxygen with no more than three carbon atoms | The flare must:<br><br>• meet 40 CFR §60.18 requirements for minimum heating value of waste gas and maximum flare tip velocity<br>• have supplemental fuel gas added to any flared streams if needed to ensure gases are sufficiently combustible<br>• be fueled by sweet gas or liquid petroleum gas except where only field gas is available and it is not sweetened at the site<br>• be designed for and operated with no visible emissions, except for periods not to exceed a total of five minutes during any two consecutive hours (acid gas flares which must comply with opacity limits and records of 30 TAC §111.111(a)(4) are exempt from this)<br>• be lit at all times when gas streams are present by having a continuous pilot flame or an automatic ignition system<br>    • if a continuous pilot is utilized, the presence of a flame must be continuously monitored with a thermocouple or other equivalent device (such as an infrared monitor) as specified in 40 CFR §60.18<br>    • if an automatic ignition system is utilized, it must ensure ignition when waste gas is present<br>Notes:<br><br>• the time, date, and duration of any loss of flare pilot flame, or auto-ignition must be recorded<br>• monitors must be accurate to and calibrated at a frequency in accordance with manufacturer specifications<br>• a temporary, portable, or backup flare used less than 480 hours per year is not required to be monitored<br>• emergency/upset emissions are not authorized; the only emissions authorized from an emergency flare are the pilot emissions; the pilot is subject to monitoring as described above |

# CATERPILLAR®

# G3508 LE Gas Petroleum Engine

**500 bkW (670 bhp)**
**1400 rpm**

## 2.0 g/bhp-hr NOx (NTE)



Shown with Optional Equipment

## CAT® ENGINE SPECIFICATIONS

**V-8, 4-Stroke-Cycle**

| | |
|---|---|
| Bore | 170 mm (6.7 in.) |
| Stroke | 190 mm (7.5 in.) |
| Displacement | 34.5 L (2105 cu. in.) |
| Aspiration | Turbocharged-Aftercooled |
| Digital Engine Management | |
| Governor and Protection | Electronic (ADEM™ A3) |
| Combustion | Low Emission (Lean Burn) |
| Engine Weight, net dry (approx) | 5420 kg (11,950 lb) |
| Power Density | 10.9 kg/kW (17.8 lb/bhp) |
| Power per Displacement | 19.4 bhp/L |
| Total Cooling System Capacity | 124.9 L (33 gal) |
| Jacket Water | 113.6 L (30 gal) |
| SCAC | 11.4 L (3 gal) |
| Lube Oil System (refill) | 230.9 L (61 gal) |
| Oil Change Interval | 1000 hours |
| Rotation (from flywheel end) | Counterclockwise |
| Flywheel and Flywheel Housing | SAE No. 00 |
| Flywheel Teeth | 183 |

## FEATURES

**Engine Design**
- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

**Emissions**
Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2007/8

**Advanced Digital Engine Management**
ADEM A3 control system providing integrated ignition, speed governing, protection, and controls, including detonation-sensitive variable ignition timing. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

**Lean Burn Engine Technology**
Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

**Ease of Operation**
Side covers on block allow for inspection of internal components

**Full Range of Attachments**
Large variety of factory-installed engine attachments reduces packaging time

**Testing**
Every engine is full-load tested to ensure proper engine performance.

**Gas Engine Rating Pro**
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

**Product Support Offered Through Global Cat Dealer Network**
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

**Over 80 Years of Engine Manufacturing Experience**
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

**Web Site**
For all your petroleum power requirements, visit www.catoilandgas.cat.com.

## STANDARD EQUIPMENT

**Air Inlet System**
Remote air inlet adapters

**Charging System**
Battery chargers

**Cooling System**
Jacket water thermostats and housing — full open temperature 98°C (208°F)
Jacket water pump — gear driven, centrifugal, non-self-priming
Aftercooler water pump — gear driven, centrifugal, non-self-priming
Aftercooler core for sea-air atmosphere
Aftercooler thermostats and housing — full open temperature 35°C (95°F)
Aftercooler — raw water, cleanable

**Exhaust System**
Exhaust manifolds — watercooled

**Flywheels & Flywheel Housings**
SAE No. 00 flywheel
SAE No. 00 flywheel housing
SAE standard rotation

**Fuel System**
Gas pressure regulator
Natural gas carburetor
Fuel gas shut-off valve (24V DC)

**Instrumentation**
Advisor panel
Advisor interconnect harness

**Lubrication System**
Crankcase breathers — top mounted
Oil cooler
Oil filter — RH
Oil pan — shallow
Oil sampling valve
Turbo oil accumulator

**Mounting System**
Rails, engine mounting

**Power Take-Offs**
Front housing — two-sided
Front lower LH accessory drive

**Protection System**
Electronic shutoff system
Gas shutoff valve

**General**
Paint — Cat yellow
Vibration damper and guard

## OPTIONAL EQUIPMENT

**Air Inlet System**
Remote air inlet adapters

**Charging System**
Battery chargers

**Cooling System**
Aftercooler core
Thermostatic valves
Connections
Expansion and overflow tank
Water level switch gauge

**European Certifications**
European Union certifications

**Exhaust System**
Flexible fittings
Elbows
Flanges
Flange and exhaust expanders
Mufflers

**Fuel System**
Fuel filter

**Instrumentation**
Customer communication modules

**Lubrication System**
Oil filters — duplex
Oil pan drain
Oil level regulator
Sump pumps
Lubricating oil

**Mounting System**
Rails
Vibration isolators

**Power Take-Offs**
Auxiliary drive shaft
Auxiliary drive pulleys
Front stub shaft
Pulleys

**Protection System**
Gas valve
Explosion relief valves

**Starting System**
Air pressure regulator
Air silencer
JW heaters
Battery sets (24-volt dry)
Battery accessories

**General**
Flywheel guard removal
Engine barring group
Premium 8:1 pistons

CATERPILLAR®

# G3508 LE GAS PETROLEUM ENGINE

**500 bkW (670 bhp)**

## TECHNICAL DATA

### G3508 LE Gas Petroleum Engine — 1400 rpm

| | | 2 g NOx NTE Rating<br>DM8621-2 |
|---|---|---|
| **Engine Power** | | |
| @ 100% Load | bkW (bhp) | 500 (670) |
| @ 75% Load | bkW (bhp) | 375 (502) |
| **Engine Speed** | rpm | 1400 |
| Max Altitude @ Rated Torque and 38°C (100°F) | m (ft) | 609.6 (2000) |
| Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F) | % | 25 |
| **SCAC Temperature** | °C (°F) | 54 (130) |
| **Emissions*** | | |
| NOx | g/bkW-hr (g/bhp-hr) | 2.68 (2) |
| CO | g/bkW-hr (g/bhp-hr) | 2.47 (1.84) |
| $CO_2$ | g/bkW-hr (g/bhp-hr) | 627 (468) |
| VOC** | g/bkW-hr (g/bhp-hr) | 0.41 (0.3) |
| **Fuel Consumption***** | | |
| @ 100% Load | MJ/bkW-hr (Btu/bhp-hr) | 10.63 (7510) |
| @ 75% Load | MJ/bkW-hr (Btu/bhp-hr) | 11.22 (7936) |
| **Heat Balance** | | |
| Heat Rejection to Jacket Water | | |
| @ 100% Load | bkW (Btu/min) | 319.8 (18,204) |
| @ 75% Load | bkW (Btu/min) | 282 (16,013) |
| Heat Rejection to Aftercooler | | |
| @ 100% Load | bkW (Btu/min) | 80 (4555) |
| @ 75% Load | bkW (Btu/min) | 56.1 (3191) |
| Heat Rejection to Exhaust | | |
| @ 100% Load (LHV to 77° F / 25° C) | bkW (Btu/mn) | 481.9 (27,406) |
| @ 75% Load (LHV to 77°) (LHV to 77° F / 25° C) | bkW (Btu/mn) | 372.8 (21,203) |
| **Exhaust System** | | |
| Exhaust Gas Flow Rate (@ stack temp.,14.5 psig) | | |
| @ 100% Load | $m^3$/min (cfm) | 115.7 (4086) |
| @ 75% Load | $m^3$/min (cfm) | 89.57 (3163) |
| Exhaust Stack Temperature | | |
| @ 100% Load | °C (°F) | 529 (985) |
| @ 75% Load | °C (°F) | 525 (977) |
| **Intake System** | | |
| Air Inlet Flow Rate | | |
| @ 100% Load | $m^3$/min (scfm) | 39.53 (1396) |
| @ 75% Load | $m^3$/min (scfm) | 30.72 (1085) |
| **Gas Pressure** | kPag (psig) | 242-276 (35-40) |

*at 100% load and speed, all values are listed as not to exceed

**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ

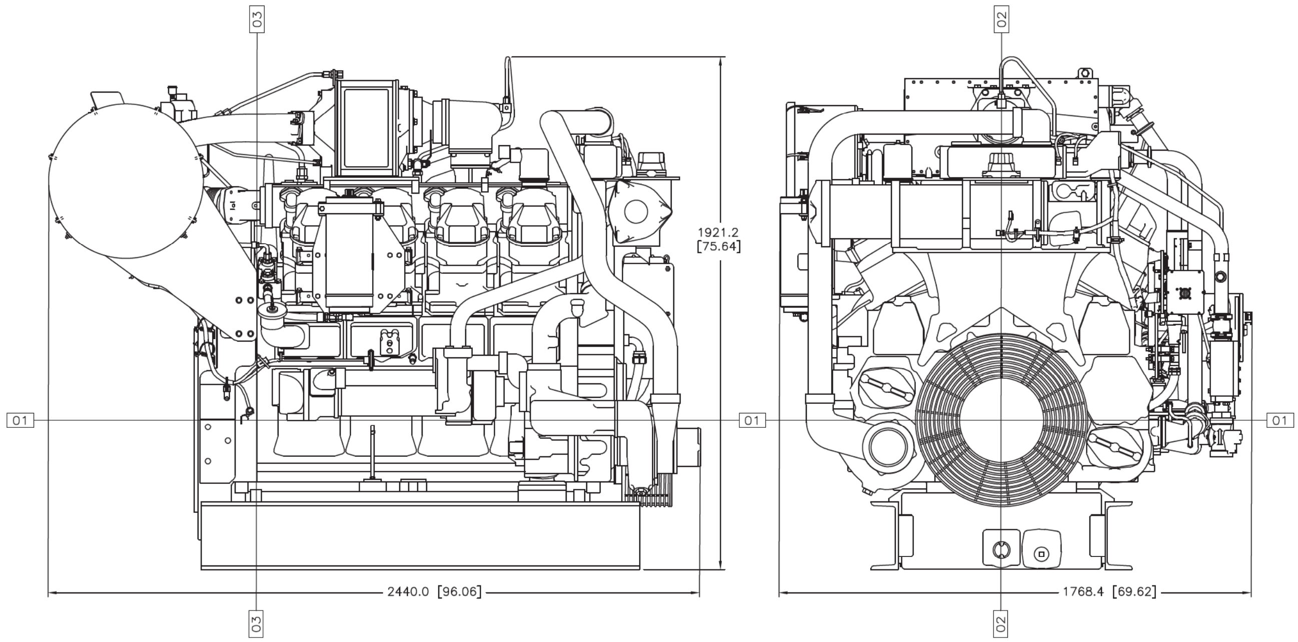
***ISO 3046/1

# CATERPILLAR

# G3508 LE GAS PETROLEUM ENGINE

**500 bkW (670 bhp)**

## GAS PETROLEUM ENGINE




| DIMENSIONS | | |
|---|---|---|
| Length | mm (in) | 2440.0 (96.06) |
| Width | mm (in) | 1768.4 (69.62) |
| Height | mm (in) | 1921.2 (75.64) |
| Shipping Weight | kg (lb) | 5420 (11,950) |

**Note:** General configuration not to be used for installation. See general dimension drawings for detail (drawing #315-3136).

Dimensions are in mm (inches).

## RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

**Conditions:** Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

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 3.2-2. 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 ($\mu$m) 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/$10^6$scf.

[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 $\mu$m 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.

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

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

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

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

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

Emissions from loading petroleum liquid can be estimated (with a probable error of ±30 percent)[4] using the following expression:

$$L_L = 12.46 \frac{SPM}{T} \tag{1}$$

where:

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

S = a saturation factor (see Table 5.2-1)
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia) (see Section 7.1, "Organic Liquid Storage Tanks")
M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Section 7.1, "Organic Liquid Storage Tanks")
T = temperature of bulk liquid loaded, °R (°F + 460)

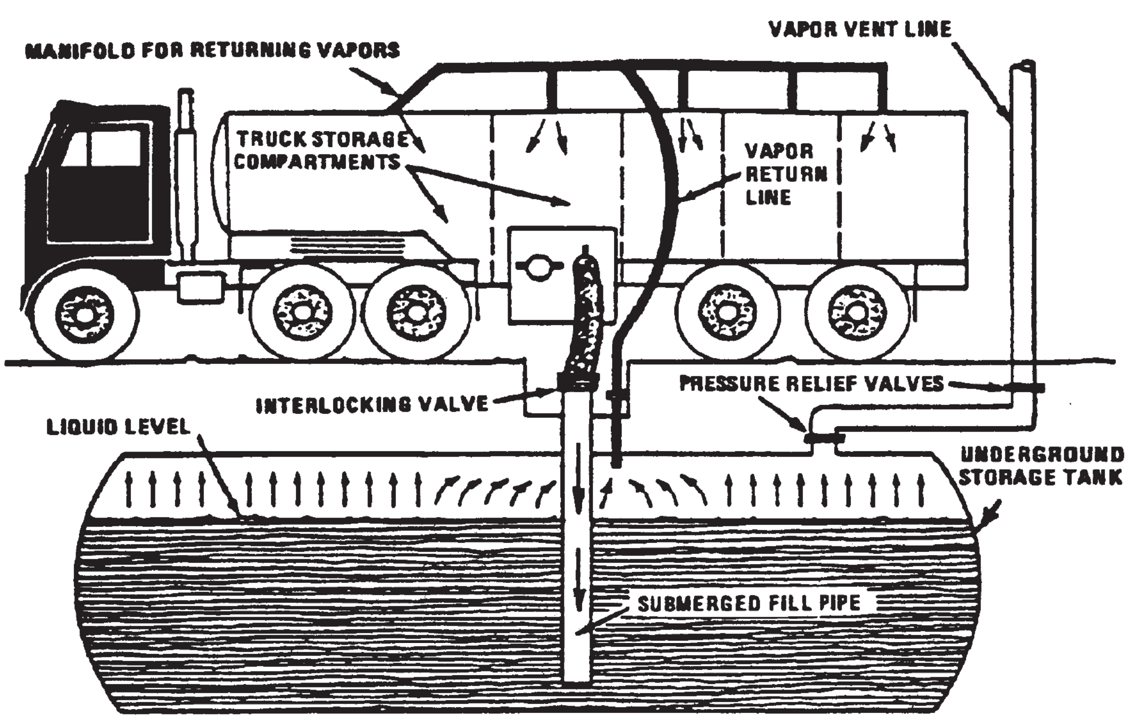



Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

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

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

[a] For products other than gasoline and crude oil. For marine loading of gasoline, use factors from Table 5.2-2. For marine loading of crude oil, use Equations 2 and 3 and Table 5.2-3.

The saturation factor, S, represents the expelled vapor's fractional approach to saturation, and it accounts for the variations observed in emission rates from the different unloading and loading methods. Table 5.2-1 lists suggested saturation factors.

Emissions from controlled loading operations can be calculated by multiplying the uncontrolled emission rate calculated in Equation 1 by an overall reduction efficiency term:

$$\left(1 - \frac{\text{eff}}{100}\right)$$

The overall reduction efficiency should account for the capture efficiency of the collection system as well as both the control efficiency and any downtime of the control device. Measures to reduce loading emissions include selection of alternate loading methods and application of vapor recovery equipment. The latter captures organic vapors displaced during loading operations and recovers the vapors by the use of refrigeration, absorption, adsorption, and/or compression. The recovered product is piped back to storage. Vapors can also be controlled through combustion in a thermal oxidation unit, with no product recovery. Figure 5.2-6 demonstrates the recovery of gasoline vapors from tank trucks during loading operations at bulk terminals. Control efficiencies for the recovery units range from 90 to over 99 percent, depending on both the nature of the vapors and the type of control equipment used.[5-6] However, not all of the displaced vapors reach the control device, because of leakage from both the tank truck and collection system. The collection efficiency should be assumed to be 99.2 percent for tanker trucks passing the MACT-level annual leak test (not more than 1 inch water column pressure change in 5 minutes after pressurizing to 18 inches water followed by pulling a vacuum of 6 inches water).[7] A collection efficiency of 98.7 percent (a 1.3 percent leakage rate) should be assumed for trucks passing the NSPS-level annual test (3 inches pressure change) A collection efficiency of 70 percent should be assumed for trucks not passing one of these annual leak tests[6].

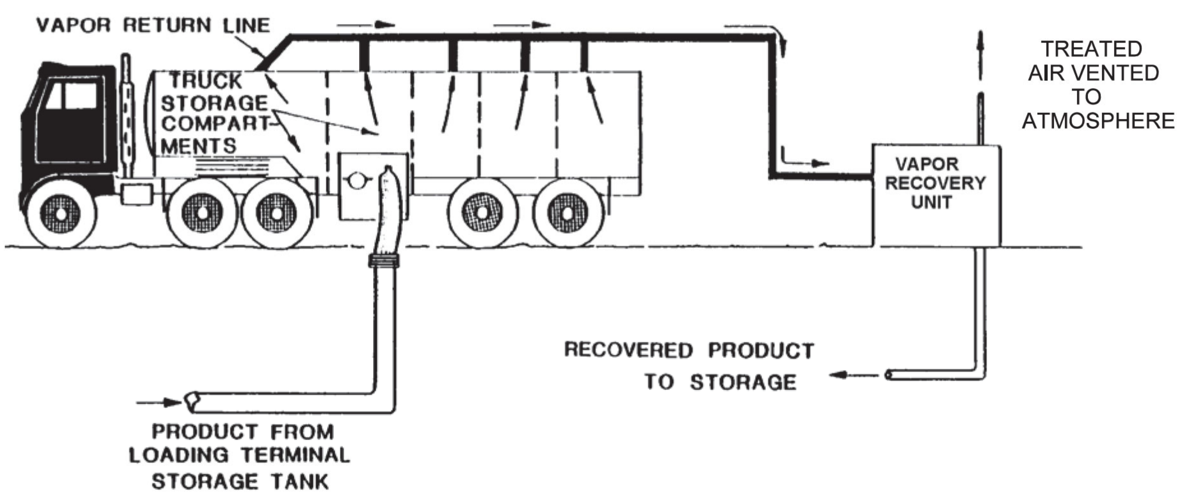



Figure 5.2-6. Tank truck loading with vapor recovery.

Sample Calculation -

Loading losses ($L_L$) from a gasoline tank truck in dedicated vapor balance service and practicing vapor recovery would be calculated as follows, using Equation 1:

Design basis -

Cargo tank volume is 8000 gal
Gasoline Reid vapor pressure (RVP) is 9 psia
Product temperature is 80°F
Vapor recovery efficiency is 95 percent
Vapor collection efficiency is 98.7 percent (NSPS-level annual leak test)

Loading loss equation -

$$L_L = 12.46 \frac{SPM}{T} \left(1 - \frac{eff}{100}\right)$$

where:

S = saturation factor (see Table 5.2-1) - 1.00
P = true vapor pressure of gasoline = 6.6 psia
M = molecular weight of gasoline vapors = 66
T = temperature of gasoline = 540°R
eff = overall reduction efficiency (95 percent control x 98.7 percent collection) = 94 percent

$$L_L = 12.46 \frac{(1.00)(6.6)(66)}{540} \left(1 - \frac{94}{100}\right)$$

$$= 0.60 \ \text{lb}/10^3 \text{gal}$$

Total loading losses are:

$$(0.60 \ \text{lb}/10^3 \ \text{gal})(8.0 \times 10^3 \ \text{gal}) = 4.8 \ \text{pounds (lb)}$$

Measurements of gasoline loading losses from ships and barges have led to the development of emission factors for these specific loading operations.[8] These factors are presented in Table 5.2-2 and should be used instead of Equation 1 for gasoline loading operations at marine terminals. Factors are expressed in units of milligrams per liter (mg/L) and pounds per 1000 gallons (lb/$10^3$ gal).

Table 5.2-2 (Metric And English Units). VOLATILE ORGANIC COMPOUND (VOC) EMISSION FACTORS FOR GASOLINE LOADING OPERATIONS AT MARINE TERMINALS[a]

| Vessel Tank Condition | Previous Cargo | Ships/Ocean Barges[b] | | Barges[b] | |
|---|---|---|---|---|---|
| | | mg/L Transferred | $lb/10^3$ gal Transferred | mg/L Transferred | $lb/10^3$ gal Transferred |
| Uncleaned | Volatile[c] | 315 | 2.6 | 465 | 3.9 |
| Ballasted | Volatile | 205 | 1.7 | —[d] | —[d] |
| Cleaned | Volatile | 180 | 1.5 | ND | ND |
| Gas-freed | Volatile | 85 | 0.7 | ND | ND |
| Any condition | Nonvolatile | 85 | 0.7 | ND | ND |
| Gas-freed | Any cargo | ND | ND | 245 | 2.0 |
| Typical overall situation[e] | Any cargo | 215 | 1.8 | 410 | 3.4 |

[a] References 2,9. Factors are for both VOC emissions (which excludes methane and ethane) and total organic emissions, because methane and ethane have been found to constitute a negligible weight fraction of the evaporative emissions from gasoline. ND = no data.
[b] Ocean barges (tank compartment depth about 12.2 m [40 ft]) exhibit emission levels similar to tank ships. Shallow draft barges (compartment depth 3.0 to 3.7 m [10 to 12 ft]) exhibit higher emission levels.
[c] Volatile cargoes are those with a true vapor pressure greater than 10 kilopascals (kPa) (1.5 psia).
[d] Barges are usually not ballasted.
[e] Based on observation that 41% of tested ship compartments were uncleaned, 11% ballasted, 24% cleaned, and 24% gas-freed. For barges, 76% were uncleaned.

In addition to Equation 1, which estimates emissions from the loading of petroleum liquids, Equation 2 has been developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges:

$$C_L = C_A + C_G \tag{2}$$

where:

$C_L$ = total loading loss, $lb/10^3$ gal of crude oil loaded
$C_A$ = arrival emission factor, contributed by vapors in the empty tank compartment before loading, $lb/10^3$ gal loaded (see Note below)
$C_G$ = generated emission factor, contributed by evaporation during loading, $lb/10^3$ gal loaded

Note: Values of $C_A$ for various cargo tank conditions are listed in Table 5.2-3.

5.2-3 (English Units). AVERAGE ARRIVAL EMISSION FACTORS, $C_A$, FOR CRUDE OIL LOADING EMISSION EQUATION[a]

| Ship/Ocean Barge Tank Condition | Previous Cargo | Arrival Emission Factor, $lb/10^3$ gal |
|---|---|---|
| Uncleaned | Volatile[b] | 0.86 |
| Ballasted | Volatile | 0.46 |
| Cleaned or gas-freed | Volatile | 0.33 |
| Any condition | Nonvolatile | 0.33 |

[a] Arrival emission factors ($C_A$) to be added to generated emission factors ($C_G$) calculated in Equation 3 to produce total crude oil loading loss ($C_L$). Factors are for total organic compounds; VOC emission factors average about 15% lower, because VOC does not include methane or ethane.
[b] Volatile cargoes are those with a true vapor pressure greater than 10 kPa (1.5 psia).

This equation was developed empirically from test measurements of several vessel compartments.[8] The quantity $C_G$ can be calculated using Equation 3:

$$C_G = 1.84\ (0.44\ P - 0.42)\ \frac{M\,G}{T} \tag{3}$$

where:

P = true vapor pressure of loaded crude oil, psia
M = molecular weight of vapors, lb/lb-mole
G = vapor growth factor = 1.02 (dimensionless)
T = temperature of vapors, °R (°F + 460)

Emission factors derived from Equation 3 and Table 5.2-3 represent total organic compounds. Volatile organic compound (VOC) emission factors (which exclude methane and ethane because they are exempted from the regulatory definition of "VOC") for crude oil vapors have been found to range from approximately 55 to 100 weight percent of these total organic factors. When specific vapor composition information is not available, the VOC emission factor can be estimated by taking 85 percent of the total organic factor.[3]

5.2.2.1.2 Ballasting Losses -

Ballasting operations are a major source of evaporative emissions associated with the unloading of petroleum liquids at marine terminals. It is common practice to load several cargo tank compartments with sea water after the cargo has been unloaded. This water, termed "ballast", improves the stability of the empty tanker during the subsequent voyage. Although ballasting practices vary, individual cargo tanks are ballasted typically about 80 percent, and the total vessel 15 to 40 percent, of capacity. Ballasting emissions occur as vapor-laden air in the "empty" cargo tank is displaced to the atmosphere by ballast water being pumped into the tank. Upon arrival at a loading port, the ballast water is pumped from the cargo tanks before the new cargo is loaded. The ballasting of cargo tanks reduces the quantity of vapors returning in the empty tank, thereby reducing the quantity of vapors emitted during subsequent tanker loading. Regulations administered by the U. S. Coast Guard require that, at marine terminals located in ozone nonattainment areas, large tankers with crude oil washing systems contain the organic vapors from ballasting.[10] This is accomplished principally by displacing the vapors during ballasting into a cargo tank being simultaneously unloaded. In other areas, marine vessels emit organic vapors directly to the atmosphere.

Equation 4 has been developed from test data to calculate the ballasting emissions from crude oil ships and ocean barges[8]:

$$L_B = 0.31 + 0.20\ P + 0.01\ PU_A \tag{4}$$

where:

$L_B$ = ballasting emission factor, lb/$10^3$ gal of ballast water
P = true vapor pressure of discharged crude oil, psia
$U_A$ = arrival cargo true ullage, before dockside discharge, measured from the deck, feet; (the term "ullage" here refers to the distance between the cargo surface level and the deck level)

Table 5.2-4 lists average total organic emission factors for ballasting into uncleaned crude oil cargo compartments. The first category applies to "full" compartments wherein the crude oil true ullage just before cargo discharge is less than 1.5 meters (m) (5 ft). The second category applies to lightered, or short-loaded, compartments (part of cargo previously discharged, or original load a partial fill), with an arrival true ullage greater than 1.5 m (5 ft). It should be remembered that these tabulated emission factors are examples only, based on average conditions, to be used when crude oil vapor pressure is unknown. Equation 4 should be used when information about crude oil vapor pressure and cargo compartment condition is available. The following sample calculation illustrates the use of Equation 4.

5.2-4 (Metric And English Units). TOTAL ORGANIC EMISSION FACTORS FOR CRUDE OIL BALLASTING[a]

| Compartment Condition Before Cargo Discharge | Average Emission Factors | | | |
|---|---|---|---|---|
| | By Category | | Typical Overall[b] | |
| | mg/L Ballast Water | lb/$10^3$ gal Ballast Water | mg/L Ballast Water | lb/$10^3$ gal Ballast Water |
| Fully loaded[c] | 111 | 0.9 | 129 | 1.1 |
| Lightered or previously short loaded[d] | 171 | 1.4 | | |

[a] Assumes crude oil temperature of 16°C (60°F) and RVP of 34 kPa (5 psia). VOC emission factors average about 85% of these total organic factors, because VOCs do not include methane or ethane.
[b] Based on observation that 70% of tested compartments had been fully loaded before ballasting. May not represent average vessel practices.
[c] Assumed typical arrival ullage of 0.6 m (2 ft).
[d] Assumed typical arrival ullage of 6.1 m (20 ft).

Sample Calculation -

Ballasting emissions from a crude oil cargo ship would be calculated as follows, using Equation 4:

Design basis -

Vessel and cargo description: 80,000 dead-weight-ton tanker, crude oil capacity 500,000 barrels (bbl); 20 percent of the cargo capacity is filled with ballast water after cargo discharge. The crude oil has an RVP of 6 psia and is discharged at 75°F.

Compartment conditions: 70 percent of the ballast water is loaded into compartments that had been fully loaded to 2 ft ullage, and 30 percent is loaded into compartments that had been lightered to 15 ft ullage before arrival at dockside.

Ballasting emission equation -

$$L_B = 0.31 + 0.20\ P + 0.01\ PU_A$$

where:

$P$ = true vapor pressure of crude oil
= 4.6 psia
$U_A$ = true cargo ullage for the full compartments = 2 ft, and true cargo ullage for the lightered compartments = 15 ft

$$\begin{aligned} L_B &= 0.70\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (2)] \\ &\quad + 0.30\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (15)] \\ &= 1.5\ \text{lb}/10^3\ \text{gal} \end{aligned}$$

Total ballasting emissions are:

$$(1.5\ \text{lb}/10^3\ \text{gal})\ (0.20)\ (500{,}000\ \text{bbl})\ (42\ \text{gal/bbl}) = 6{,}300\ \text{lb}$$

Since VOC emissions average about 85 percent of these total organic emissions, emissions of VOCs are about: (0.85)(6,300 lb) = 5,360 lb

5.2.2.1.3 Transit Losses -

In addition to loading and ballasting losses, losses occur while the cargo is in transit. Transit losses are similar in many ways to breathing losses associated with petroleum storage (see Section 7.1, "Organic Liquid Storage Tanks"). Experimental tests on ships and barges[4] have indicated that transit losses can be calculated using Equation 5:

$$L_T = 0.1\ PW \tag{5}$$

where:

$L_T$ = transit loss from ships and barges, lb/week-$10^3$ gal transported
P = true vapor pressure of the transported liquid, psia
W = density of the condensed vapors, lb/gal

Emissions from gasoline truck cargo tanks during transit have been studied by a combination of theoretical and experimental techniques, and typical emission values are presented in Table 5.2-5.[11-12] Emissions depend on the extent of venting from the cargo tank during transit, which in turn depends on the vapor tightness of the tank, the pressure relief valve settings, the pressure in the tank at the start of the trip, the vapor pressure of the fuel being transported, and the degree of fuel vapor saturation of the space in the tank. The emissions are not directly proportional to the time spent in transit. If the vapor leakage rate of the tank increases, emissions increase up to a point, and then the rate changes as other determining factors take over. Truck tanks in dedicated vapor balance service usually contain saturated vapors, and this leads to lower emissions during transit because no additional fuel evaporates to raise the pressure in the tank to cause venting. Table 5.2-5 lists "typical" values for transit emissions and "extreme" values that could occur in the unlikely event that all determining factors combined to cause maximum emissions.

Table 5.2-5 (Metric And English Units). TOTAL UNCONTROLLED ORGANIC EMISSION FACTORS FOR PETROLEUM LIQUID RAIL TANK CARS AND TANK TRUCKS

| Emission Source | Gasoline[a] | Crude Oil[b] | Jet Naphtha (JP-4) | Jet Kerosene | Distillate Oil No. 2 | Residual Oil No. 6 |
|---|---|---|---|---|---|---|
| Loading operations[c] | | | | | | |
| Submerged loading - Dedicated normal service[d] | | | | | | |
| mg/L transferred | 590 | 240 | 180 | 1.9 | 1.7 | 0.01 |
| lb/$10^3$ gal transferred | 5 | 2 | 1.5 | 0.016 | 0.014 | 0.0001 |
| Submerged loading - Vapor balance service[d] | | | | | | |
| mg/L transferred | 980 | 400 | 300 | —[e] | —[e] | —[e] |
| lb/$10^3$ gal transferred | 8 | 3 | 2.5 | —[e] | —[e] | —[e] |
| Splash loading - Dedicated normal service | | | | | | |
| mg/L transferred | 1,430 | 580 | 430 | 5 | 4 | 0.03 |
| lb/$10^3$ gal transferred | 12 | 5 | 4 | 0.04 | 0.03 | 0.0003 |
| Splash loading - Vapor balance service | | | | | | |
| mg/L transferred | 980 | 400 | 300 | —[e] | —[e] | —[e] |
| lb/$10^3$ gal transferred | 8 | 3 | 2.5 | —[e] | —[e] | —[e] |

Table 5.2-5 (cont.).

| Emission Source | Gasoline[a] | Crude Oil[b] | Jet Naphtha (JP-4) | Jet Kerosene | Distillate Oil No. 2 | Residual Oil No. 6 |
|---|---|---|---|---|---|---|
| Transit losses | | | | | | |
| Loaded with product | | | | | | |
| mg/L transported | | | | | | |
| Typical | 0 - 1.0 | ND | ND | ND | ND | ND |
| Extreme | 0 - 9.0 | ND | ND | ND | ND | ND |
| lb/$10^3$ gal transported | | | | | | |
| Typical | 0 - 0.01 | ND | ND | ND | ND | ND |
| Extreme | 0 - 0.08 | ND | ND | ND | ND | ND |
| Return with vapor | | | | | | |
| mg/L transported | | | | | | |
| Typical | 0 - 13.0 | ND | ND | ND | ND | ND |
| Extreme | 0 - 44.0 | ND | ND | ND | ND | ND |
| lb/$10^3$ gal transported | | | | | | |
| Typical | 0 - 0.11 | ND | ND | ND | ND | ND |
| Extreme | 0 - 0.37 | ND | ND | ND | ND | ND |

[a] Reference 2. Gasoline factors represent emissions of VOC as well as total organics, because methane and ethane constitute a negligible weight fraction of the evaporative emissions from gasoline. VOC factors for crude oil can be assumed to be 15% lower than the total organic factors, to account for the methane and ethane content of crude oil evaporative emissions. All other products should be assumed to have VOC factors equal to total organics. The example gasoline has an RVP of 69 kPa (10 psia). ND = no data.
[b] The example crude oil has an RVP of 34 kPa (5 psia).
[c] Loading emission factors are calculated using Equation 1 for a dispensed product temperature of 16°C (60°F).
[d] Reference 2.
[e] Not normally used.

In the absence of specific inputs for Equations 1 through 5, the typical evaporative emission factors presented in Tables 5.2-5 and 5.2-6 should be used. It should be noted that, although the crude oil used to calculate the emission values presented in these tables has an RVP of 5, the RVP of crude oils can range from less than 1 up to 10. Similarly, the RVP of gasolines ranges from 7 to 13. In areas where loading and transportation sources are major factors affecting air quality, it is advisable to obtain the necessary parameters and to calculate emission estimates using Equations 1 through 5.

5.2.2.2 Service Stations -

Another major source of evaporative emissions is the filling of underground gasoline storage tanks at service stations. Gasoline is usually delivered to service stations in 30,000-liter (8,000-gal) tank trucks or smaller account trucks. Emissions are generated when gasoline vapors in the underground storage tank are displaced to the atmosphere by the gasoline being loaded into the tank. As with other loading losses, the quantity of loss in service station tank filling depends on several variables, including the method and rate of filling, the tank configuration, and the gasoline temperature, vapor pressure and composition. An average emission rate for submerged filling is 880 mg/L (7.3 lb/1000 gal) of transferred gasoline, and the rate for splash filling is 1380 mg/L (11.5 lb/1000 gal) transferred gasoline (see Table 5.2-7).[5]

Table 5.2-6 (Metric And English Units). TOTAL ORGANIC EMISSION FACTORS FOR PETROLEUM MARINE VESSEL SOURCES[a]

| Emission Source | Gasoline[b] | Crude Oil[c] | Jet Naphtha (JP-4) | Jet Kerosene | Distillate Oil No. 2 | Residual Oil No. 6 |
|---|---|---|---|---|---|---|
| Loading operations | | | | | | |
| Ships/ocean barges | | | | | | |
| mg/L transferred | —[d] | 73 | 60 | 0.63 | 0.55 | 0.004 |
| lb/$10^3$ gal transferred | —[d] | 0.61 | 0.50 | 0.005 | 0.005 | 0.00004 |
| Barges | | | | | | |
| mg/L transferred | —[d] | 120 | 150 | 1.60 | 1.40 | 0.011 |
| lb/$10^3$ gal transferred | —[d] | 1.0 | 1.2 | 0.013 | 0.012 | 0.00009 |
| Tanker ballasting | | | | | | |
| mg/L ballast water | 100 | —[e] | ND | ND | ND | ND |
| lb/$10^3$ gal ballast water | 0.8 | —[e] | ND | ND | ND | ND |
| Transit | | | | | | |
| mg/week-L transported | 320 | 150 | 84 | 0.60 | 0.54 | 0.003 |
| lb/week-$10^3$ gal transported | 2.7 | 1.3 | 0.7 | 0.005 | 0.005 | 0.00003 |

[a] Factors are for a dispensed product of 16°C (60°F). ND = no data.
[b] Factors represent VOC as well as total organic emissions, because methane and ethane constitute a negligible fraction of gasoline evaporative emissions. All products other than crude oil can be assumed to have VOC factors equal to total organic factors. The example gasoline has an RVP of 69 kPa (10 psia).
[c] VOC emission factors for a typical crude oil are 15% lower than the total organic factors shown, in order to account for methane and ethane. The example crude oil has an RVP of 34 kPa (5 psia).
[d] See Table 5.2-2 for these factors.
[e] See Table 5.2-4 for these factors.

Emissions from underground tank filling operations at service stations can be reduced by the use of a vapor balance system such as in Figure 5.2-5 (termed Stage I vapor control). The vapor balance system employs a hose that returns gasoline vapors displaced from the underground tank to the tank truck cargo compartments being emptied. The control efficiency of the balance system ranges from 93 to 100 percent. Organic emissions from underground tank filling operations at a service station employing a vapor balance system and submerged filling are not expected to exceed 40 mg/L (0.3 lb/1000 gal) of transferred gasoline.

Table 5.2-7 (Metric And English Units). EVAPORATIVE EMISSIONS FROM GASOLINE SERVICE STATION OPERATIONS[a]

| Emission Source | Emission Rate | |
|---|---|---|
| | mg/L Throughput | lb/$10^3$ gal Throughput |
| Filling underground tank (Stage I) | | |
| Submerged filling | 880 | 7.3 |
| Splash filling | 1,380 | 11.5 |
| Balanced submerged filling | 40 | 0.3 |
| Underground tank breathing and emptying[b] | 120 | 1.0 |
| Vehicle refueling operations (Stage II) | | |
| Displacement losses (uncontrolled)[c] | 1,320 | 11.0 |
| Displacement losses (controlled) | 132 | 1.1 |
| Spillage | 80 | 0.7 |

[a] Factors are for VOC as well as total organic emissions, because of the methane and ethane content of gasoline evaporative emissions is negligible.
[b] Includes any vapor loss between underground tank and gas pump.
[c] Based on Equation 6, using average conditions.

A second source of vapor emissions from service stations is underground tank breathing. Breathing losses occur daily and are attributable to gasoline evaporation and barometric pressure changes. The frequency with which gasoline is withdrawn from the tank, allowing fresh air to enter to enhance evaporation, also has a major effect on the quantity of these emissions. An average breathing emission rate is 120 mg/L (1.0 lb/1000 gal) of throughput.

5.2.2.3 Motor Vehicle Refueling -

Service station vehicle refueling activity also produces evaporative emissions. Vehicle refueling emissions come from vapors displaced from the automobile tank by dispensed gasoline and from spillage. The quantity of displaced vapors depends on gasoline temperature, auto tank temperature, gasoline RVP, and dispensing rate. Equation 6 can be used to estimate uncontrolled displacement losses from vehicle refueling for a particular set of conditions.[14]

$$E_R = 264.2\ [(-5.909) - 0.0949\ (\Delta T) + 0.0884\ (T_D) + 0.485\ (RVP)] \tag{6}$$

where:

$E_R$ = refueling emissions, mg/L
$\Delta T$ = difference between temperature of fuel in vehicle tank and temperature of dispensed fuel, °F
$T_D$ = temperature of dispensed fuel, °F
RVP = Reid vapor pressure, psia

Note that this equation and the spillage loss factor are incorporated into the *MOBILE* model. The *MOBILE* model allows for disabling of this calculation if it is desired to include these emissions in the stationary area source portion of an inventory rather than in the mobile source portion. It is estimated that the uncontrolled emissions from vapors displaced during vehicle refueling average 1320 mg/L (11.0 lb/1000 gal) of dispensed gasoline.[5,13]

Spillage loss is made up of contributions from prefill and postfill nozzle drip and from spit-back and overflow from the vehicles's fuel tank filler pipe during filling. The amount of spillage loss can depend on several variables, including service station business characteristics, tank configuration, and operator techniques. An average spillage loss is 80 mg/L (0.7 lb/1000 gal) of dispensed gasoline.[5,13]

Control methods for vehicle refueling emissions are based on conveying the vapors displaced from the vehicle fuel tank to the underground storage tank vapor space through the use of a special hose and nozzle, as depicted in Figure 5.2-7 (termed Stage II vapor control). In "balance" vapor control systems, the vapors are conveyed by natural pressure differentials established during refueling. In "vacuum assist" systems, the conveyance of vapors from the auto fuel tank to the underground storage tank is assisted by a vacuum pump. Tests on a few systems have indicated overall systems control efficiencies in the range of 88 to 92 percent.[5,13] When inventorying these emissions as an area source, rule penetration and rule effectiveness should also be taken into account. *Procedures For Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA-450/4-81-026d, provides more detail on this.

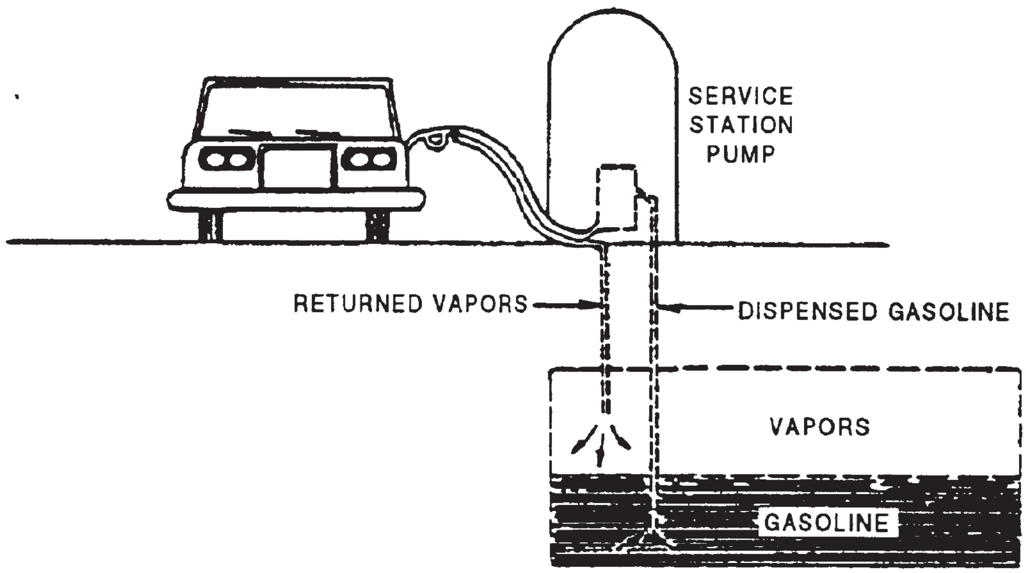



Figure 5.2-7. Automobile refueling vapor recovery system.

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## 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:

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

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

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

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:

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

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.

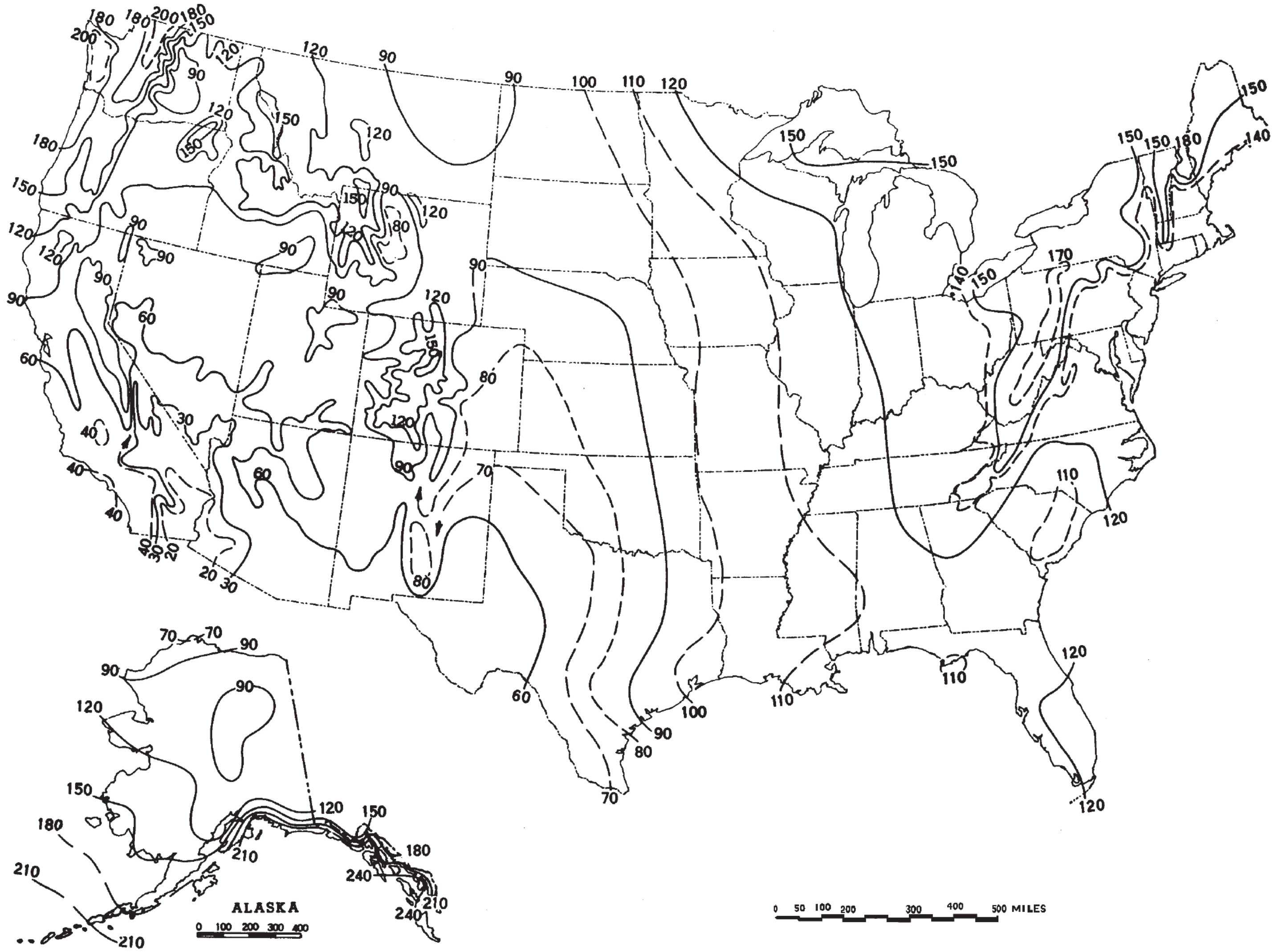


Figure 13.2.2-1. Mean number of days with 0.01 inch or more of precipitation in United States.

(26) High heat value of each solid fuel (mmBtu/tons) (Equation C–8).

(27) High heat value of each liquid fuel (mmBtu/gallon) (Equation C–8).

(28) High heat value of each gaseous fuel (mmBtu/scf) (Equation C–8).

(29) Cumulative annual heat input from combustion of each fuel (mmBtu) (Equation C–10 of § 98.33).

(30) Total quantity of each solid fossil fuel combusted in the reporting year, as defined in § 98.6 (pounds) (Equation C–13 of § 98.33).

(31) Total quantity of each liquid fossil fuel combusted in the reporting year, as defined in § 98.6 (gallons) (Equation C–13).

(32) Total quantity of each gaseous fossil fuel combusted in the reporting year, as defined in § 98.6 (scf) (Equation C–13).

(33) High heat value of the each solid fossil fuel (Btu/lb) (Equation C–13).

(34) High heat value of the each liquid fossil fuel (Btu/gallons) (Equation C–13).

(35) High heat value of the each gaseous fossil fuel (Btu/scf) (Equation C–13).

(36) Fuel-specific carbon based F-factor per fuel (scf $CO_2$/mmBtu) (Equation C–13).

(37) Moisture content used to calculate the wood and wood residuals wet basis HHV (percent), if applicable (Equations C–1 and C–8 of this subpart).

[79 FR 63783, Oct. 24, 2014, as amended at 81 FR 89252, Dec. 9, 2016]

### § 98.38 Definitions.

All terms used in this subpart have the same meaning given in the Clean Air Act and subpart A of this part.

TABLE C–1 TO SUBPART C OF PART 98—DEFAULT $CO_2$ EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL

DEFAULT $CO_2$ EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL

| Fuel type | Default high heat value | Default $CO_2$ emission factor |
|---|---|---|
| Coal and coke | mmBtu/short ton | kg $CO_2$/mmBtu |
| Anthracite | 25.09 | 103.69 |
| Bituminous | 24.93 | 93.28 |
| Subbituminous | 17.25 | 97.17 |
| Lignite | 14.21 | 97.72 |
| Coal Coke | 24.80 | 113.67 |
| Mixed (Commercial sector) | 21.39 | 94.27 |
| Mixed (Industrial coking) | 26.28 | 93.90 |
| Mixed (Industrial sector) | 22.35 | 94.67 |
| Mixed (Electric Power sector) | 19.73 | 95.52 |
| Natural gas | mmBtu/scf | kg $CO_2$/mmBtu |
| (Weighted U.S. Average) | $1.026 \times 10^{-3}$ | 53.06 |
| Petroleum products—liquid | mmBtu/gallon | kg $CO_2$/mmBtu |
| Distillate Fuel Oil No. 1 | 0.139 | 73.25 |
| Distillate Fuel Oil No. 2 | 0.138 | 73.96 |
| Distillate Fuel Oil No. 4 | 0.146 | 75.04 |
| Residual Fuel Oil No. 5 | 0.140 | 72.93 |
| Residual Fuel Oil No. 6 | 0.150 | 75.10 |
| Used Oil | 0.138 | 74.00 |
| Kerosene | 0.135 | 75.20 |
| Liquefied petroleum gases (LPG) [1] | 0.092 | 61.71 |
| Propane [1] | 0.091 | 62.87 |
| Propylene [2] | 0.091 | 67.77 |
| Ethane [1] | 0.068 | 59.60 |
| Ethanol | 0.084 | 68.44 |
| Ethylene [2] | 0.058 | 65.96 |
| Isobutane [1] | 0.099 | 64.94 |
| Isobutylene [1] | 0.103 | 68.86 |
| Butane [1] | 0.103 | 64.77 |
| Butylene [1] | 0.105 | 68.72 |
| Naphtha (<401 deg F) | 0.125 | 68.02 |

DEFAULT $CO_2$ EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL—Continued

| Fuel type | Default high heat value | Default $CO_2$ emission factor |
|---|---|---|
| Natural Gasoline | 0.110 | 66.88 |
| Other Oil (>401 deg F) | 0.139 | 76.22 |
| Pentanes Plus | 0.110 | 70.02 |
| Petrochemical Feedstocks | 0.125 | 71.02 |
| Special Naphtha | 0.125 | 72.34 |
| Unfinished Oils | 0.139 | 74.54 |
| Heavy Gas Oils | 0.148 | 74.92 |
| Lubricants | 0.144 | 74.27 |
| Motor Gasoline | 0.125 | 70.22 |
| Aviation Gasoline | 0.120 | 69.25 |
| Kerosene-Type Jet Fuel | 0.135 | 72.22 |
| Asphalt and Road Oil | 0.158 | 75.36 |
| Crude Oil | 0.138 | 74.54 |
| Petroleum products—solid | mmBtu/short ton | kg $CO_2$/mmBtu. |
| Petroleum Coke | 30.00 | 102.41. |
| Petroleum products—gaseous | mmBtu/scf | kg $CO_2$/mmBtu. |
| Propane Gas | $2.516 \times 10^{-3}$ | 61.46. |
| Other fuels—solid | mmBtu/short ton | kg $CO_2$/mmBtu |
| Municipal Solid Waste | 9.95 [3] | 90.7 |
| Tires | 28.00 | 85.97 |
| Plastics | 38.00 | 75.00 |
| Other fuels—gaseous | mmBtu/scf | kg $CO_2$/mmBtu |
| Blast Furnace Gas | $0.092 \times 10^{-3}$ | 274.32 |
| Coke Oven Gas | $0.599 \times 10^{-3}$ | 46.85 |
| Fuel Gas [4] | $1.388 \times 10^{-3}$ | 59.00 |
| Biomass fuels—solid | mmBtu/short ton | kg $CO_2$/mmBtu |
| Wood and Wood Residuals (dry basis) [5] | 17.48 | 93.80 |
| Agricultural Byproducts | 8.25 | 118.17 |
| Peat | 8.00 | 111.84 |
| Solid Byproducts | 10.39 | 105.51 |
| Biomass fuels—gaseous | mmBtu/scf | kg $CO_2$/mmBtu |
| Landfill Gas | $0.485 \times 10^{-3}$ | 52.07 |
| Other Biomass Gases | $0.655 \times 10^{-3}$ | 52.07 |
| Biomass Fuels—Liquid | mmBtu/gallon | kg $CO_2$/mmBtu |
| Ethanol | 0.084 | 68.44 |
| Biodiesel (100%) | 0.128 | 73.84 |
| Rendered Animal Fat | 0.125 | 71.06 |
| Vegetable Oil | 0.120 | 81.55 |

[1] The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.
[2] Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.
[3] Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.
[4] Reporters subject to subpart X of this part that are complying with § 98.243(d) or subpart Y of this part may only use the default HHV and the default $CO_2$ emission factor for fuel gas combustion under the conditions prescribed in § 98.243(d)(2)(i) and (d)(2)(ii) and § 98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C–5) or Tier 4.
[5] Use the following formula to calculate a wet basis HHV for use in Equation C–1: $HHV_w = ((100 - M)/100)*HHV_d$ where $HHV_w$ = wet basis HHV, M = moisture content (percent) and $HHV_d$ = dry basis HHV from Table C–1.

[78 FR 71950, Nov. 29, 2013, as amended at 81 FR 89252, Dec. 9, 2016]

## TABLE C–2 TO SUBPART C OF PART 98—DEFAULT $CH_4$ AND $N_2O$ EMISSION FACTORS FOR VARIOUS TYPES OF FUEL

| Fuel type | Default $CH_4$ emission factor (kg $CH_4$/mmBtu) | Default $N_2O$ emission factor (kg $N_2O$/mmBtu) |
|---|---|---|
| Coal and Coke (All fuel types in Table C–1) | $1.1 \times 10^{-02}$ | $1.6 \times 10^{-03}$ |

| Fuel type | Default $CH_4$ emission factor (kg $CH_4$/mmBtu) | Default $N_2O$ emission factor (kg $N_2O$/mmBtu) |
|---|---|---|
| Natural Gas | $1.0 \times 10^{-03}$ | $1.0 \times 10^{-04}$ |
| Petroleum Products (All fuel types in Table C–1) | $3.0 \times 10^{-03}$ | $6.0 \times 10^{-04}$ |
| Fuel Gas | $3.0 \times 10^{-03}$ | $6.0 \times 10^{-04}$ |
| Other Fuels—Solid | $3.2 \times 10^{-02}$ | $4.2 \times 10^{-03}$ |
| Blast Furnace Gas | $2.2 \times 10^{-05}$ | $1.0 \times 10^{-04}$ |
| Coke Oven Gas | $4.8 \times 10^{-04}$ | $1.0 \times 10^{-04}$ |
| Biomass Fuels—Solid (All fuel types in Table C–1, except wood and wood residuals). | $3.2 \times 10^{-02}$ | $4.2 \times 10^{-03}$ |
| Wood and wood residuals | $7.2 \times 10^{-03}$ | $3.6 \times 10^{-03}$ |
| Biomass Fuels—Gaseous (All fuel types in Table C–1) | $3.2 \times 10^{-03}$ | $6.3 \times 10^{-04}$ |
| Biomass Fuels—Liquid (All fuel types in Table C–1) | $1.1 \times 10^{-03}$ | $1.1 \times 10^{-04}$ |

Note: Those employing this table are assumed to fall under the IPCC definitions of the "Energy Industry" or "Manufacturing Industries and Construction". In all fuels except for coal the values for these two categories are identical. For coal combustion, those who fall within the IPCC "Energy Industry" category may employ a value of 1g of $CH_4$/mmBtu.

[78 FR 71952, Nov. 29, 2013, as amended at 81 FR 89252, Dec. 9, 2016]

## Subpart D—Electricity Generation

### § 98.40 Definition of the source category.

(a) The electricity generation source category comprises electricity generating units that are subject to the requirements of the Acid Rain Program and any other electricity generating units that are required to monitor and report to EPA $CO_2$ mass emissions year-round according to 40 CFR part 75.

(b) This source category does not include portable equipment, emergency equipment, or emergency generators, as defined in § 98.6.

[74 FR 56374, Oct. 30, 2009, as amended at 75 FR 79155, Dec. 17, 2010]

### § 98.41 Reporting threshold.

You must report GHG emissions under this subpart if your facility contains one or more electricity generating units and the facility meets the requirements of § 98.2(a)(1).

### § 98.42 GHGs to report.

(a) For each electricity generating unit that is subject to the requirements of the Acid Rain Program or is otherwise required to monitor and report to EPA $CO_2$ emissions year-round according to 40 CFR part 75, you must report under this subpart the annual mass emissions of $CO_2$, $N_2O$, and $CH_4$ by following the requirements of this subpart.

(b) For each electricity generating unit that is not subject to the Acid Rain Program or otherwise required to monitor and report to EPA $CO_2$ emissions year-round according to 40 CFR part 75, you must report under subpart C of this part (General Stationary Fuel Combustion Sources) the emissions of $CO_2$, $CH_4$, and $N_2O$ by following the requirements of subpart C.

(c) For each stationary fuel combustion unit that does not generate electricity, you must report under subpart C of this part (General Stationary Fuel Combustion Sources) the emissions of $CO_2$, $CH_4$, and $N_2O$ by following the requirements of subpart C of this part.

### § 98.43 Calculating GHG emissions.

(a) Except as provided in paragraph (b) of this section, continue to monitor and report $CO_2$ mass emissions as required under § 75.13 or section 2.3 of appendix G to 40 CFR part 75, and § 75.64. Calculate $CO_2$, $CH_4$, and $N_2O$ emissions as follows:

(1) Convert the cumulative annual $CO_2$ mass emissions reported in the fourth quarter electronic data report required under § 75.64 from units of short tons to metric tons. To convert tons to metric tons, divide by 1.1023.

(2) Calculate and report annual $CH_4$ and $N_2O$ mass emissions under this subpart by following the applicable method specified in § 98.33(c).

(b) Calculate and report biogenic $CO_2$ emissions under this subpart by following the applicable methods specified in § 98.33(e). The $CO_2$ emissions (excluding biogenic $CO_2$) for units subject to this subpart that are reported under §§ 98.3(c)(4)(i) and (c)(4)(iii)(B) shall be calculated by subtracting the biogenic

# Section 8

## Map(s)

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

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

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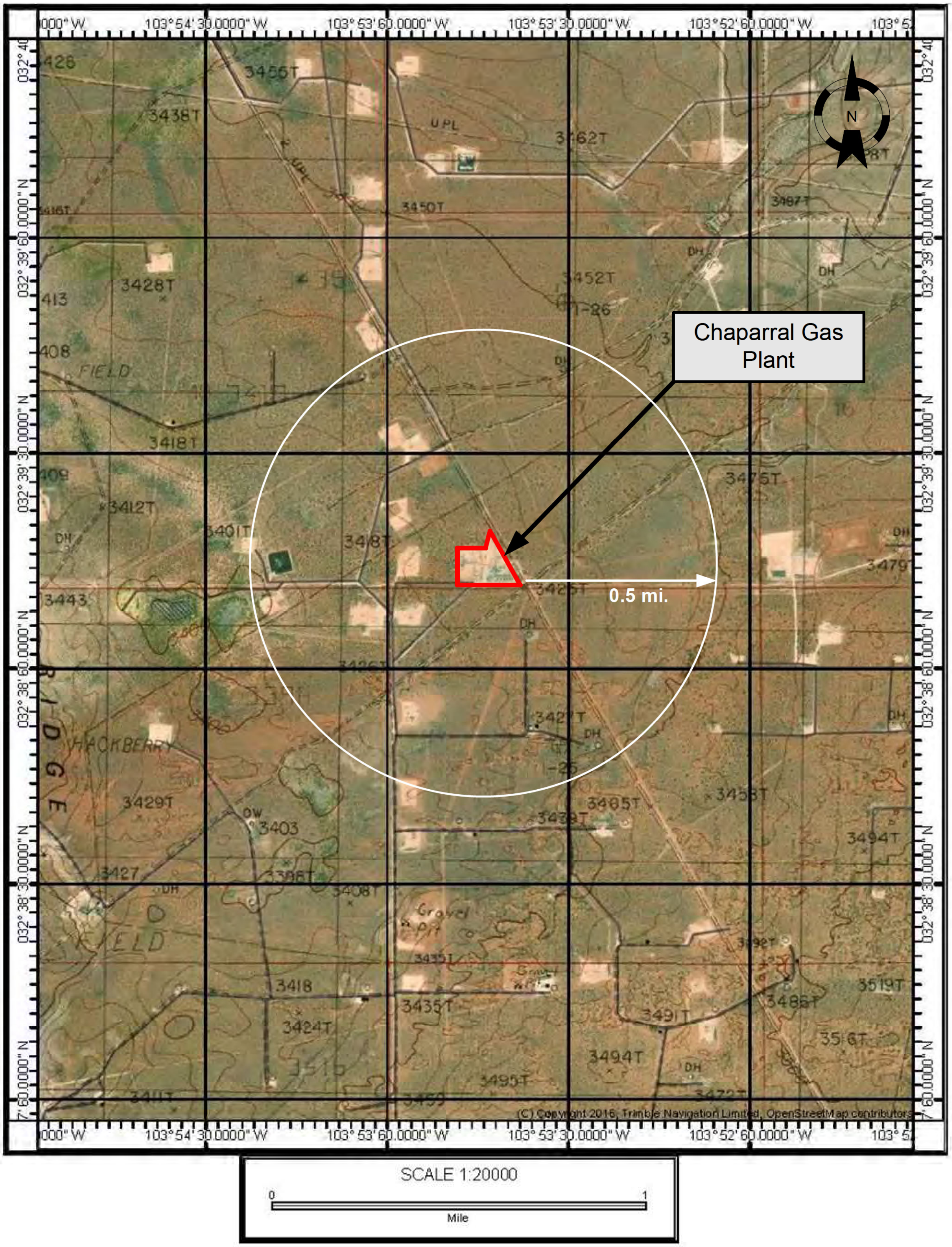
An area map is attached.




| | | | | | |
|---|---|---|---|---|---|
| ALLIANT ENVIRONMENTAL, LLC | | Area Map | Enterprise Field Services LLC | | |
| Scale: 1:20,000 | Drawn by: MDF / Chk'd by: | Date: 12/29/2021 / Date: | **Chaparral Gas Plant**<br>N 32° 39' 15.06" Latitude<br>W 103° 53' 41.54" Longitude | Project No.: 066-037 | File Name: **Chaparral GP Maps** | Figure: Section 8 |

# Section 9

## Proof of Public Notice

(for NSR applications submitting under 20.2.72 or 20.2.74 NMAC)
(This proof is required by: 20.2.72.203.A.14 NMAC "Documentary Proof of applicant's public notice")

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☐ **I have read the AQB "Guidelines for Public Notification for Air Quality Permit Applications"**
This document provides detailed instructions about public notice requirements for various permitting actions. It also provides public notice examples and certification forms. Material mistakes in the public notice will require a re-notice before issuance of the permit.

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

**New Permit** and **Significant Permit Revision** public notices must include all items in this list.

**Technical Revision** public notices require only items 1, 5, 9, and 10.

Per the Guidelines for Public Notification document mentioned above, include:

1. ☐ A copy of the certified letter receipts with post marks (20.2.72.203.B NMAC)
2. ☐ A list of the places where the public notice has been posted in at least four publicly accessible and conspicuous places, including the proposed or existing facility entrance. (e.g: post office, library, grocery, etc.)
3. ☐ A copy of the property tax record (20.2.72.203.B NMAC).
4. ☐ A sample of the letters sent to the owners of record.
5. ☐ A sample of the letters sent to counties, municipalities, and Indian tribes.
6. ☐ A sample of the public notice posted and a verification of the local postings.
7. ☐ A table of the noticed citizens, counties, municipalities and tribes and to whom the notices were sent in each group.
8. ☐ A copy of the public service announcement (PSA) sent to a local radio station and documentary proof of submittal.
9. ☐ A copy of the classified or legal ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
10. ☐ A copy of the display ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
11. ☐ A map with a graphic scale showing the facility boundary and the surrounding area in which owners of record were notified by mail. This is necessary for verification that the correct facility boundary was used in determining distance for notifying land owners of record.

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Not Applicable.

# Section 10

## Written Description of the Routine Operations of the Facility

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**A written description of the routine operations of the facility**. Include a description of how each piece of equipment will be operated, how controls will be used, and the fate of both the products and waste generated. For modifications and/or revisions, explain how the changes will affect the existing process. In a separate paragraph describe the major process bottlenecks that limit production. The purpose of this description is to provide sufficient information about plant operations for the permit writer to determine appropriate emission sources.

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A mixture of natural gas, condensate, and water enters the facility via pipeline and is sent through a three-phase inlet separator. Condensate liquids are sent to 300-bbl condensate tanks (TK-1, TK-2). The natural gas is then compressed by the inlet compressor(s). One lean burn engine (unit 6000) drives compression for a low-pressure field natural gas stream and is a dedicated inlet compression unit. The other 5 engines (units 1000- 5000 and 7000) drive compressors with the capability to operate as either inlet or residue gas compressors.

The natural gas is sent through a tri-ethylene glycol (TEG) dehydrator (Unit DEHY-1) where moisture is removed from the gas. The dehydrator is equipped with a BTEX Buster control device that routes all non-condensable vapor to either the reboiler firebox, the glowplug, or the flare. The gas is further dried using a mole sieve dehydrator (unit MOLE-1). The gas is then thermally processed in a cryogenic unit (unit CRYO) to remove hydrocarbon liquids. The hydrocarbon liquids are treated in an amine unit for removal of $CO_2$. The resulting residue gas is compressed for transport via pipeline by the residue gas compressor(s). The Y-grade natural gas liquids are removed from the facility by pipeline. Condensate from the 300-bbl condensate tanks is removed from the facility by truck. The flare is used as a control device during normal operation; for SSM emissions from facility-wide blow down and compressor blowdowns; and during upset events.

Gas will be sent to the TEG dehydrator (unit DEHY-2) to remove water. After the water has been removed, the gas will be sent to the mechanical refrigeration unit (unit MRU) where Y-grade liquids will be removed from the gas. The Y-grade liquids will be sent to the stabilizer. Gas off the stabilizer will be captured by VRU-1 and routed back to the inlet. The gas off of the MRU will either tie into the existing residue gas line or route back to the inlet of the exiting cryogenic unit, where it will be further treated. The Y-grade liquids from the MRU will tie into the existing facility pipeline and for removal from the facility.

# Section 11

## Source Determination

Source submitting under 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC

Sources applying for a construction permit, PSD permit, or operating permit shall evaluate surrounding and/or associated sources (including those sources directly connected to this source for business reasons) and complete this section. Responses to the following questions shall be consistent with the Air Quality Bureau's permitting guidance, Single Source Determination Guidance, which may be found on the Applications Page in the Permitting Section of the Air Quality Bureau website.

Typically, buildings, structures, installations, or facilities that have the same SIC code, that are under common ownership or control, and that are contiguous or adjacent constitute a single stationary source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes. Submission of your analysis of these factors in support of the responses below is optional, unless requested by NMED.

**A. Identify the emission sources evaluated in this section** (list and describe)**: Refer to Table 2-A.**

**B. Apply the 3 criteria for determining a single source:**

**SIC Code:** Surrounding or associated sources belong to the same 2-digit industrial grouping (2-digit SIC code) as this facility, OR surrounding or associated sources that belong to different 2-digit SIC codes are support facilities for this source.

☑ **Yes** ☐ **No**

**Common Ownership or Control:** Surrounding or associated sources are under common ownership or control as this source.

☑ **Yes** ☐ **No**

**Contiguous or Adjacent:** Surrounding or associated sources are contiguous or adjacent with this source.

☑ **Yes** ☐ **No**

**C. Make a determination:**

☑ The source, as described in this application, constitutes the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes. If in "A" above you evaluated only the source that is the subject of this application, all "**YES**" boxes should be checked. If in "A" above you evaluated other sources as well, you must check **AT LEAST ONE** of the boxes "**NO**" to conclude that the source, as described in the application, is the entire source for 20.2.70, 20.2.72, 20.2.73, and 20.2.74 NMAC applicability purposes.

☐ The source, as described in this application, **does not** constitute the entire source for 20.2.70, 20.2.72, 20.2.73, or 20.2.74 NMAC applicability purposes (A permit may be issued for a portion of a source). The entire source consists of the following facilities or emissions sources (list and describe):

# Section 12

## Section 12.A
# PSD Applicability Determination for All Sources

(Submitting under 20.2.72, 20.2.74 NMAC)

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**A PSD applicability determination for all sources**. For sources applying for a significant permit revision, apply the applicable requirements of 20.2.74.AG and 20.2.74.200 NMAC and to determine whether this facility is a major or minor PSD source, and whether this modification is a major or a minor PSD modification. It may be helpful to refer to the procedures for Determining the Net Emissions Change at a Source as specified by Table A-5 (Page A.45) of the EPA New Source Review Workshop Manual to determine if the revision is subject to PSD review.

A. This facility is:

- ☑ **a minor PSD source before and after this modification.**
- ☐ **a major PSD source before this modification. This modification will make this a PSD minor source.**
- ☐ **an existing PSD Major Source that has never had a major modification requiring a BACT analysis.**
- ☐ **an existing PSD Major Source that has had a major modification requiring a BACT analysis**
- ☐ **a new PSD Major Source after this modification.**

B. **This facility is not one of the listed 20.2.74.501 Table I – PSD Source Categories. The "project" emissions** for this modification are **not significant as the emissions changing with this application do not eceed major stationary source threshold by itself. The "project" emissions listed below do only result from changes described in this permit application, thus no emissions from other to this facility. Also, specifically discuss whether this project results in "de-bottlenecking", or other associated emissions resulting in higher emissions. The project emissions (before netting) for this project are as follows [see Table 2 in 20.2.74.502 NMAC for a complete list of significance levels]:**

a. **NOx: 8.13 TPY**
b. **CO: 7.14 TPY**
c. **VOC: 2.35 TPY**
d. **SOx: 0.27 TPY**
e. **PM: 0.18 TPY**
f. **PM10: 0.18 TPY**
g. **PM2.5: 0.18 TPY**
h. **Fluorides: N/A**
i. **Lead: N/A**
j. **Sulfur compounds (listed in Table 2): 0 TPY**
k. **GHG: 2,466.80 TPY**

Note: There is no de-bottlenecking associated with this project. The site will continue to operate at its currently permitted throughputs.

C. If this is an existing PSD major source, or any facility with emissions greater than 250 TPY (or 100 TPY for 20.2.74.501 Table 1 – PSD Source Categories), determine whether any permit modifications are related, or could be considered a single project with this action, and provide an explanation for your determination whether a PSD modification is triggered.
**This site is not an existing PSD source, and this project does not constitute a major stationary source by itself.**

# Section 13

## Determination of State & Federal Air Quality Regulations

**<u>This section lists each state and federal air quality regulation that may apply to your facility and/or equipment that are stationary sources of regulated air pollutants.</u>**

Not all state and federal air quality regulations are included in this list. Go to the Code of Federal Regulations (CFR) or to the Air Quality Bureau's regulation page to see the full set of air quality regulations.

**Required Information for Specific Equipment:**
For regulations that apply to specific source types, in the 'Justification' column **provide any information needed to determine if the regulation does or does not apply**. **For example**, to determine if emissions standards at 40 CFR 60, Subpart IIII apply to your three identical stationary engines, we need to know the construction date as defined in that regulation; the manufacturer date; the date of reconstruction or modification, if any; if they are or are not fire pump engines; if they are or are not emergency engines as defined in that regulation; their site ratings; and the cylinder displacement.

**Required Information for Regulations that Apply to the Entire Facility:**
See instructions in the 'Justification' column for the information that is needed to determine if an 'Entire Facility' type of regulation applies (e.g. 20.2.70 or 20.2.73 NMAC).

**Regulatory Citations for Regulations That Do Not, but Could Apply:**
If there is a state or federal air quality regulation that does not apply, but you have a piece of equipment in a source category for which a regulation has been promulgated, you must **provide the low level regulatory citation showing why your piece of equipment is not subject to or exempt from the regulation. For example** if you have a stationary internal combustion engine that is not subject to 40 CFR 63, Subpart ZZZZ because it is an existing 2 stroke lean burn stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions, your citation would be 40 CFR 63.6590(b)(3)(i). **We don't want a discussion of every non-applicable regulation, but if it is possible a regulation could apply, explain why it does not. For example,** if your facility is a power plant, you do not need to include a citation to show that 40 CFR 60, Subpart OOO does not apply to your non-existent rock crusher.

**Regulatory Citations for Emission Standards:**
**For each unit that is subject to an emission standard in a source specific regulation, such as 40 CFR 60, Subpart OOO or 40 CFR 63, Subpart HH, include the low level regulatory citation of that emission standard.** Emission standards can be numerical emission limits, work practice standards, or other requirements such as maintenance. **Here are examples:** a glycol dehydrator is subject to the general standards at 63.764C(1)(i) through (iii); an engine is subject to 63.6601, Tables 2a and 2b; a crusher is subject to 60.672(b), Table 3 and all transfer points are subject to 60.672(e)(1)

**Federally Enforceable Conditions:**
All federal regulations are federally enforceable. All Air Quality Bureau State regulations are federally enforceable except for the following: affirmative defense portions at 20.2.7.6.B, 20.2.7.110(B)(15), 20.2.7.11 through 20.2.7.113, 20.2.7.115, and 20.2.7.116; 20.2.37; 20.2.42; 20.2.43; 20.2.62; 20.2.63; 20.2.86; 20.2.89; and 20.2.90 NMAC. Federally enforceable means that EPA can enforce the regulation as well as the Air Quality Bureau and federally enforceable regulations can count toward determining a facility's potential to emit (PTE) for the Title V, PSD, and nonattainment permit regulations.

INCLUDE ANY OTHER INFORMATION NEEDED TO COMPLETE AN APPLICABILITY DETERMINATION OR THAT IS RELEVENT TO YOUR FACILITY'S NOTICE OF INTENT OR PERMIT.

**EPA Applicability Determination Index for 40 CFR 60, 61, 63, etc**: http://cfpub.epa.gov/adi/

**Table for STATE REGULATIONS:**

| State Regulation Citation | Title | Applies? Enter Yes or No | Unit(s) or Facility | Justification: (You may delete instructions or statements that do not apply in the justification column to shorten the document.) |
|---|---|---|---|---|
| 20.2.1 NMAC | General Provisions | Yes | Facility | General Provisions apply to Notice of Intent, Construction, and Title V permit applications. |
| 20.2.3 NMAC | Ambient Air Quality Standards NMAAQS | Yes | Facility | If subject, this would normally apply to the entire facility.<br>20.2.3 NMAC is a State Implementation Plan (SIP) approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide.<br>Title V applications, see exemption at 20.2.3.9 NMAC |
| 20.2.7 NMAC | Excess Emissions | Yes | Facility | If subject, this would normally apply to the entire facility.<br>If your entire facility or individual pieces of equipment are subject to emissions limits in a permit or numerical emissions standards in a federal or state regulation, this applies. This would not apply to Notices of Intent since these are not permits. |
| 20.2.23 NMAC | Fugitive Dust Control | No for permitted facilities, possible for NOIs | Facility | This regulation does not apply as the facility has no need to incorporate fugitive dust control measures as the facility does not generate enough emissions.<br><br>As of January 2019, the only areas of the State subject to a mitigation plan per 40 CFR 51.930 are in Doña Ana and Luna Counties. As this site is located in Eddy County a mitigation plan is not required. |
| 20.2.33 NMAC | Gas Burning Equipment - Nitrogen Dioxide | No | N/A | **This regulation does not apply to internal combustion equipment such as engines. It only applies to external combustion equipment such as heaters or boilers.**<br>This facility does not have gas burning equipment (external combustion emission sources, such as gas fired boilers and heaters) having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The facility is not subject to this regulation and does not have emission sources that meet the applicability requirements under 20.2.33.108 NMAC. |
| 20.2.34 NMAC | Oil Burning Equipment: $NO_2$ | No | N/A | **This regulation does not apply to internal combustion equipment such as engines. It only applies to external combustion equipment such as heaters or boilers.**<br>This facility does not have oil burning equipment (external combustion emission sources, such as oil fired boilers and heaters) having a heat input of greater than 1,000,000 million British Thermal Units per year per unit. The facility is not subject to this regulation and does not have emission sources that meet the applicability requirements under 20.2.34.108 NMAC. |
| 20.2.35 NMAC | Natural Gas Processing Plant – Sulfur | No | N/A | This regulation could apply to existing (prior to July 1, 1974) or new (on or after July 1, 1974) natural gas processing plants that use a Sulfur Recovery Unit to reduce sulfur emissions.<br>This site is not subject to the requirements of this regulation as it does not process sour gas. |
| 20.2.37 and 20.2.36 NMAC | Petroleum Processing Facilities and Petroleum Refineries | N/A | N/A | **These regulations were repealed by the Environmental Improvement Board. If you had equipment subject to 20.2.37 NMAC before the repeal, your combustion emission sources are now subject to 20.2.61 NMAC.** |
| 20.2.38 NMAC | Hydrocarbon Storage Facility | No | TK-1, TK-2, and TK-3 | There are three 300-bbl tanks at this facility, which do not meet the capacity or throughput thresholds to be subject to this regulation. [20.2.38.109 NMAC] [20.2.38.112 NMAC] |
| 20.2.39 NMAC | Sulfur Recovery Plant - Sulfur | No | N/A | This regulation could apply to sulfur recovery plants that are not part of petroleum or natural gas processing facilities. |

| State Regulation Citation | Title | Applies ? Enter Yes or No | Unit(s) or Facility | Justification: (You may delete instructions or statements that do not apply in the justification column to shorten the document.) |
|---|---|---|---|---|
| 20.2.50 NMAC | Oil and Gas Sector – Ozone Precursor Pollutants | Yes | Facility | This regulation establishes emission standards for volatile organic compounds (VOC) and oxides of nitrogen (NOx) for oil and gas production, processing, compression, and transmission sources. 20.2.50 NMAC subparts below:<br><br>Include the construction status of applicable units as “New”, “Existing”, “Relocation of Existing”, or “Reconstructed” as defined by this Part in your justification:<br><br>Check the box for the subparts that are applicable:<br>☒113 – Engines and Turbines<br>☒114 – Compressor Seals<br>☒115 – Control Devices and Closed Vent Systems<br>☒116 – Equipment Leaks and Fugitive Emissions<br>☐117 – Natural Gas Well Liquid Unloading<br>☒118 – Glycol Dehydrators<br>☐119 – Heaters<br>☒120 – Hydrocarbon Liquid Transfers<br>☐121 – Pig Launching and Receiving<br>☒122 – Pneumatic Controllers and Pumps<br>☒123 – Storage Vessels<br>☐124 – Well Workovers<br>☐125 – Small Business Facilities<br>☐126 – Produced Water Management Unit<br>☐127 – Flowback Vessels and Preproduction Operations<br><br>113 – Enterprise Field Services will comply with the requirements of this subpart.<br>114 – Enterprise Field Services will comply with the requirements of this subpart.<br>115 – Enterprise Field Services will comply with the requirements of this subpart.<br>116 – Enterprise Field Services will comply with the requirements of this subpart.<br>117 – N/A - Chaparral is a gas plant and not a natural gas well; therefore this subpart does not apply.<br>118 – Enterprise Field Services will comply with the requirements of this subpart.<br>119 – N/A - The glycol dehydrator reboilers at Chaparral have rated heat inputs less than 20 MMBtu/hour; therefore this subpart does not apply.<br>120 – Enterprise Field Services will comply with the requirements of this subpart.<br>121 – N/A - There are no pig launchers or receivers at Chaparral; therefore this subpart does not apply.<br>122 – Enterprise Field Services will comply with the requirements of this subpart.<br>123 – Enterprise Field Services will comply with the requirements of this subpart.<br>124 – N/A - There are no oil or natural gas wells at Chaparral; therefore this subpart does not apply.<br>125 – N/A - Chaparral is not classified as a small business facility; therefore this subpart does not apply.<br>126 – N/A - Chaparral is not a water management unit as defined in this regulation; therefore this subpart does not apply.<br>127 – N/A - Chaparral does not contain any wells; therefore this subpart does not apply. |
| 20.2.61.109 NMAC | Smoke & Visible Emissions | Yes | ECD-1, FLARE, C-1000 to C-7000 | This regulation that limits opacity to 20% applies to Stationary Combustion Equipment, such as engines, boilers, heaters, and flares unless your equipment is subject to another state regulation that limits particulate matter such as 20.2.19 NMAC (see 20.2.61.109 NMAC). This regulation is applicable to units ECD-1, FLARE, C-1000 to C-7000 |
| 20.2.70 NMAC | Operating Permits | Yes | Facility | The facility is subject to this regulation because the source is a Title V major source. This site operates under TV Permit number P264. |
| 20.2.71 NMAC | Operating Permit Fees | Yes | Facility | This regulation establishes a schedule of operating permit emission fees. The facility is subject to 20.2.70 NMAC and in turn subject to 20.2.71 NMAC. |

| **State Regulation Citation** | **Title** | **Applies? Enter Yes or No** | **Unit(s) or Facility** | **Justification: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)** |
|---|---|---|---|---|
| 20.2.72 NMAC | Construction Permits | Yes | Facility | This regulation establishes the requirements for obtaining a construction permit. The facility is a stationary source that has potential emission rates greater than 10 pounds per hour or 25 tons per year of any regulated air contaminant for which there is a National or New Mexico Air Quality Standard. Therefore, this facility is subject to 20.2.72 NMAC and complies with NSR Permit 3662-M8-R5. |
| 20.2.73 NMAC | NOI & Emissions Inventory Requirements | Yes | Facility | The facility is a Title V major source and must meet the requirements of 20.2.73.300 NMAC for emissions inventory reporting. |
| 20.2.74 NMAC | Permits – Prevention of Significant Deterioration (PSD) | No | Facility | This regulation establishes requirements for obtaining a prevention of significant deterioration permit. This facility is a PSD minor source. Accordingly, this regulation does not apply. |
| 20.2.75 NMAC | Construction Permit Fees | Yes | Facility | This regulation establishes a schedule of operating permit emission fees. This facility is subject to 20.2.72 NMAC and is in turn subject to 20.2.75 NMAC. |
| 20.2.77 NMAC | New Source Performance | Yes | ECD-1, CRYO, MRU, CVRU-1, FUG-1, FUG-2, FLARE, C-1000 to C-7000 | This regulation establishes state authority to implement new source performance standards (NSPS) for stationary sources as amended in the Federal Register through September 23, 2013. This is a stationary source which is subject to the requirements of 40 CFR Part 60, Subparts A, KKK, and OOOO, therefore, 20.2.77 NMAC applies. |
| 20.2.78 NMAC | Emission Standards for HAPS | No | N/A | This regulation establishes state authority to implement emission standards for hazardous air pollutants subject to 40 CFR Part 61. In the event of asbestos demolition, NESHAP M may apply, making 20.2.78 NMAC applicable. |
| 20.2.79 NMAC | Permits – Nonattainment Areas | No | N/A | This regulation establishes the requirements for obtaining a nonattainment area permit. The facility is not located in a non-attainment area and therefore is not subject to this regulation. |
| 20.2.80 NMAC | Stack Heights | No | N/A | This regulation establishes requirements for the evaluation of stack heights and other dispersion techniques. This regulation does not apply as all stacks at the facility follow good engineering practice |
| 20.2.82 NMAC | MACT Standards for source categories of HAPS | Yes | ECD-1, E-1000 to E-7000, E-VRU-1, DEHY-1, DEHY-2 | This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63, as amended through August 29, 2013. The facility is an area source of HAPs with two applicable MACT standards (MACT HH and MACT ZZZZ). |

## Table for FEDERAL REGULATIONS:

| Federal Regulation Citation | Title | Applies? Enter Yes or No | Unit(s) or Facility | Justification: |
|---|---|---|---|---|
| 40 CFR 50 | NAAQS | Yes | Facility | This regulation defines national ambient air quality standards. The facility meets all applicable national ambient air quality standards for NOx, CO, $SO_2$, $H_2S$, $PM_{10}$, and $PM_{2.5}$ under this regulation. |
| NSPS 40 CFR 60, Subpart A | General Provisions | Yes | ECD-1, CRYO, MRU, FLARE, FUG-1, FUG-2, P24A, P24B, C-1000, To C-7000 | This regulation defines general provisions for relevant standards that have been set under this part. The units listed are subject to or potentially subject to this regulation as they are subject to another rule under this part. |
| NSPS 40 CFR60.40a, Subpart Da | Subpart Da, Performance Standards for **Electric Utility Steam Generating Units** | No | N/A | This regulation establishes standards of performance for electric utility steam generating units. This regulation does not apply because the facility does not operate any electric utility steam generating units. |
| NSPS 40 CFR60.40b Subpart Db | **Electric Utility Steam Generating Units** | | N/A | This regulation establishes standards of performance for industrial-commercial-institutional steam generating units. This regulation does not apply because the facility does not operate any industrial-commercial-institutional steam generating units. |
| 40 CFR 60.40c, Subpart Dc | Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units | No | N/A | Potentially subject units are the reboiler heaters and the mole sieve regen heater. However, these units have a heat input less than 10 MMBtu/hr and, therefore, are not subject to this regulation. |
| NSPS 40 CFR 60, Subpart Ka | Standards of Performance for **Storage Vessels for Petroleum Liquids** for which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and **Prior** to July 23, 1984 | No | N/A | This regulation establishes performance standards for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after May 18, 1978, and prior to July 23, 1984. The tanks at the facility are three (3) 300-bbl (37,800 gallons). The capacities of the tanks at the facility are less than 40,000 gallons regulatory threshold, thus this regulation does not apply to these tanks. [40 CFR Part 60.110a(a)] |
| NSPS | Standards of Performance for | No | No | This regulation establishes performance standards for volatile organic liquid storage vessels (including petroleum liquid storage vessels) for which construction, |

| Federal Regulation Citation | Title | Applies? Enter Yes or No | Unit(s) or Facility | Justification: |
|---|---|---|---|---|
| 40 CFR 60, Subpart Kb | **Volatile Organic Liquid Storage Vessels** (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced **After** July 23, 1984 | | | reconstruction, or modification commenced after July 23, 1984. The tanks at the facility have a capacity of 300-bbl (12,600 gallons or 48 $m^3$) each. Because the capacity of each tank is less than 75 $m^3$, this regulation does not apply. [60.110b(a)] |
| NSPS 40 CFR 60.330 Subpart GG | **Stationary Gas Turbines** | No | N/A | This regulation establishes standards of performance for stationary gas turbines with a heat input at a peak load equal to or greater than 10 MMBtu/hr based on the lower heating value of the fuel fired and have commenced construction, modification, or reconstruction after October 3, 1977. This regulation is not applicable as this facility does not have any stationary gas turbines. |
| NSPS 40 CFR 60, Subpart KKK | Leaks of VOC from **Onshore Gas Plants** | Yes | FUG-1, C-1000, C-2000, C-3000, C-4000, C-5000, C-6000, C-7000, C-VRU1 | This regulation defines standards of performance for equipment leaks of VOC emissions from onshore natural gas processing plants for which construction, reconstruction, or modification commenced after January 20, 1984, and on or before August 23, 2011. The group of all equipment (each pump, pressure relief device, open-ended valve or line, valve, compressor, and flange or other connector that is in VOC service or in wet gas service, and any device or system required by this subpart) except compressors (defined in § 60.631) within a process unit is an affected facility. CRYO unit is subject to NSPS KKK. Units C-1000 through C-6000 are compressors in wet gas service and are subject to the provisions of this subpart. |
| NSPS 40 CFR Part 60 Subpart LLL | Standards of Performance for **Onshore Natural Gas Processing**: $SO_2$ Emissions | No | N/A | This regulation establishes standards of performance for $SO_2$ emissions from onshore natural gas processing for which construction, reconstruction, or modification of the amine sweetening unit commenced after January 20, 1984 and on or before August 23, 2011. This regulation does not apply as the facility does not process natural gas with a $H_2S$ concentration greater than 4 ppmv. |
| NSPS 40 CFR Part 60 Subpart OOOO | Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which construction, modification or reconstruction commenced after August 23, 2011 and before September 18, 2015 | Yes | P24A, P24B, C-1, MRU, FUG-2 | This regulation establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide ($SO_2$) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. This facility is not located in the oil and natural gas production segment, as defined by this regulation. In addition, Units TK-1, TK-2 and TK-3 are not subject to NSPS Subpart OOOO because they commenced construction prior to August 23, 2011. Therefore, they are not subject to this regulation. Units P24A and P24B are centrifugal pumps that are a source of fugitive emissions and are subject to the requirements of NSPS OOOO. The fugitive equipment associated with unit MRU is expected to be monitored under this subpart. |
| NSPS 40 CFR Part 60 Subpart OOOOa | Standards of Performance for Crude Oil and Natural Gas Facilities for | No | N/A | No fugitive components are subject to this rule as the site did not have any construction, modifications, or reconstruction commence after September 18, 2015. |

| Federal Regulation Citation | Title | Applies? Enter Yes or No | Unit(s) or Facility | Justification: |
|---|---|---|---|---|
| | which Construction, Modification or Reconstruction Commenced **After** September 18, 2015 | | | |
| NSPS 40 CFR 60 Subpart IIII | Standards of performance for Stationary Compression Ignition Internal Combustion Engines | No | N/A | This facility does not operate any stationary compression ignition internal combustion engine, therefore it is not subject to this regulation. |
| NSPS 40 CFR Part 60 Subpart JJJJ | Standards of Performance for Stationary Spark Ignition Internal Combustion Engines | Yes | E-1000 | This regulation establishes standards of performance for stationary spark ignition combustion engines. Engine E-1000 must comply with Subpart JJJJ requirements as it was manufactured after January 1, 2008 and constructed after June 12, 2006. Other engines (E-2000 and E-5000) were manufactured prior to the applicability dates of Subpart JJJJ; No physical or operational changes were made to the engines (engines were already capable of running at newly permitted hp rating). Additionally, the exemption 40 CFR 60.14(e)(2) will also apply –change is accomplished without a capital expenditure on those engines. Therefore NSPS JJJJ is not applicable. |
| NSPS 40 CFR 60 Subpart TTTT | Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units | No | N/A | This facility does not operate electric generating units, therefore it is not subject to this regulation. |
| NSPS 40 CFR 60 Subpart UUUU | Emissions Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units | No | N/A | This facility does not operate electric generating units, therefore it is not subject to this regulation. |
| NSPS 40 CFR 60, Subparts WWW, XXX, Cc, and Cf | Standards of performance for Municipal Solid Waste (MSW) Landfills | No | N/A | This facility is not a municipal solid waste landfill, therefore it is not subject to this regulation. |
| NESHAP 40 CFR 61 Subpart A | General Provisions | No | N/A | There are no NESHAP-affected source types at this facility. |
| NESHAP 40 CFR 61 Subpart E | National Emission Standards for **Mercury** | No | N/A | This regulation establishes a national emission standard for mercury. The facility does not have stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge [40 CFR Part 61.50]. The facility is not subject to this regulation |
| NESHAP 40 CFR 61 Subpart V | National Emission Standards for **Equipment Leaks** (Fugitive Emission Sources) | No | N/A | This regulation establishes national emission standards for equipment leaks (fugitive emission sources). The facility does not have equipment that operates in volatile hazardous air pollutant (VHAP) service [40 CFR Part 61.240]. The regulated activities subject to this regulation do not take place at this facility. The facility is not subject to this regulation. |

| **Federal Regulation Citation** | **Title** | **Applies? Enter Yes or No** | **Unit(s) or Facility** | **Justification:** |
|---|---|---|---|---|
| MACT 40 CFR 63, Subpart A | General Provisions | Yes | E-1000 to E-7000, E-VRU-1, DEHY-1, DEHY-2 | Applies if any other Subpart in 40 CFR 63 applies. |
| MACT 40 CFR 63.760 Subpart HH | **Oil and Natural Gas Production Facilities** | Yes | DEHY-1, DEHY-2 | This regulation establishes national emission standards for hazardous air pollutants from oil and natural gas production facilities. Facility is an area source of HAPs. DEHY-1 and DEHY-2 have actual average benzene emissions less than 0.90 Mg/yr. Pursuant to 63.764(e), facility is exempt from standards of 63.764(c)(l) and (d) but has to maintain records required in 63.774(d)(1). |
| MACT 40 CFR 63 Subpart HHH | National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities | No | N/A | This regulation establishes national emission standards for hazardous air pollutants from natural gas transmission and storage facilities. The facility is not subject because it is not a natural gas transmission and storage facility. |
| MACT 40 CFR 63 Subpart DDDDD | National Emission Standards for Hazardous Air Pollutants for Major Industrial, Commercial, and Institutional Boilers & Process Heaters | No | N/A | This facility does not operate boilers or process heaters that meet the regulation definitions. Boilers and process heaters that use natural gas are exempted from complying with this regulation. |
| MACT 40 CFR 63 Subpart UUUUU | National Emission Standards for Hazardous Air Pollutants Coal & Oil Fire Electric Utility Steam Generating Unit | No | N/A | This facility does not operate a steam generating unit. |
| MACT 40 CFR 63 Subpart ZZZZ | National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (**RICE MACT**) | Yes | E-1000 to E-7000, E-VRU-1 | This regulation defines national emissions standards for HAPs for stationary reciprocating Internal Combustion Engines. Facilities are subject to this subpart if they own or operate a stationary RICE. Enterprise will comply with any applicable requirements. |

| Federal Regulation Citation | Title | Applies? Enter Yes or No | Unit(s) or Facility | Justification: |
|---|---|---|---|---|
| 40 CFR 64 | **Compliance Assurance Monitoring** | No | DEHY-1 and DEHY-2 | This regulation defines compliance assurance monitoring. Units DEHY-1 and DEHY-2 have pre-controlled emissions greater than 100 tpy. Therefore, the units meet the applicability criteria of 64.2(a)(3), so 40 CFR 64 does apply. CAM plans are included in TV Permit number P264-R1M1. |
| 40 CFR 68 | **Chemical Accident Prevention** | Yes | Facility | This facility has more than a threshold quantity of a regulated substance in a process, as determined under §68.115, and is therefore an affected source. To comply with this regulation, the facility operator maintains a current RMP |
| Title IV – Acid Rain 40 CFR 72 | **Acid Rain** | No | N/A | This part establishes the acid rain program. This facility is not an acid rain source. This regulation does not apply. |
| Title IV – Acid Rain 40 CFR 73 | **Sulfur Dioxide** Allowance Emissions | No | N/A | This regulation establishes sulfur dioxide allowance emissions for certain types of facilities. This facility is not an acid rain source. This regulation does not apply. |
| Title IV-Acid Rain 40 CFR 75 | **Continuous Emissions Monitoring** | No | N/A | This facility does not generate commercial electric power or electric power for sale, therefore it is not subject to this regulation. |
| Title IV – Acid Rain 40 CFR 76 | **Acid Rain** Nitrogen Oxides **Emission Reduction Program** | No | N/A | This regulation establishes an acid rain nitrogen oxides emission reduction program. This regulation applies to each coal-fired utility unit that is subject to an acid rain emissions limitation or reduction requirement for $SO_2$. This part does not apply because the facility does not operate any coal-fired units [40 CFR Part 76.1]. |
| Title VI – 40 CFR 82 | Protection of **Stratospheric Ozone** | No | N/A | Enterprise owns appliances containing CFCs and is therefore subject to this requirement. Enterprise uses only certified technicians for the maintenance, service, repair and disposal of appliances and maintains the appropriate records for this requirement. |

# Section 14

## Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

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☑ **Title V Sources** (20.2.70 NMAC)**:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Emissions During Startups, Shutdowns, and Emergencies** defining the measures to be taken to mitigate source emissions during startups, shutdowns, and emergencies as required by 20.2.70.300.D.5(f) and (g) NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☐ **NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has developed an **Operational Plan to Mitigate Source Emissions During Malfunction, Startup, or Shutdown** defining the measures to be taken to mitigate source emissions during malfunction, startup, or shutdown as required by 20.2.72.203.A.5 NMAC. This plan shall be kept on site to be made available to the Department upon request. This plan should not be submitted with this application.

☑ **Title V** (20.2.70 NMAC)**, NSR** (20.2.72 NMAC)**, PSD** (20.2.74 NMAC) **& Nonattainment** (20.2.79 NMAC) **Sources:** By checking this box and certifying this application the permittee certifies that it has established and implemented a Plan to Minimize Emissions During Routine or Predictable Startup, Shutdown, and Scheduled Maintenance through work practice standards and good air pollution control practices as required by 20.2.7.14.A and B NMAC. This plan shall be kept on site or at the nearest field office to be made available to the Department upon request. This plan should not be submitted with this application.

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Startup and shutdown procedures are either based on manufacturer's recommendations or based on Enterprise's experience with specific equipment. These procedures are designed to proactively address the potential for malfunction to the greatest extent possible. These procedures dictate a sequence of operations that are designed to minimize emissions from the facility during events that result in shutdown and subsequent startup.

Equipment located at this facility is equipped with various safety devices and features that aid in the prevention of excess emissions in the event of an operational emergency. If an operational emergency does occur and excess emissions occur, Enterprise will submit the required Excess Emissions Report as per 20.2.7 NMAC. Corrective action to eliminate the excess emissions and prevent recurrence in the future will be undertaken as quickly as safety allows.

# Section 15

## Alternative Operating Scenarios

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

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**Alternative Operating Scenarios:** Provide all information required by the department to define alternative operating scenarios. This includes process, material and product changes; facility emissions information; air pollution control equipment requirements; any applicable requirements; monitoring, recordkeeping, and reporting requirements; and compliance certification requirements. Please ensure applicable Tables in this application are clearly marked to show alternative operating scenario.

**Construction Scenarios**: When a permit is modified authorizing new construction to an existing facility, NMED includes a condition to clearly address which permit condition(s) (from the previous permit and the new permit) govern during the interval between the date of issuance of the modification permit and the completion of construction of the modification(s). There are many possible variables that need to be addressed such as: Is simultaneous operation of the old and new units permitted and, if so for example, for how long and under what restraints? In general, these types of requirements will be addressed in Section A100 of the permit, but additional requirements may be added elsewhere. Look in A100 of our NSR and/or TV permit template for sample language dealing with these requirements. Find these permit templates at: www.env.nm.gov/air-quality/permitting-section-procedures-and-guidance/. Compliance with standards must be maintained during construction, which should not usually be a problem unless simultaneous operation of old and new equipment is requested.

In this section, under the bolded title "Construction Scenarios", specify any information necessary to write these conditions, such as: conservative-realistic estimated time for completion of construction of the various units, whether simultaneous operation of old and new units is being requested (and, if so, modeled), whether the old units will be removed or decommissioned, any PSD ramifications, any temporary limits requested during phased construction, whether any increase in emissions is being requested as SSM emissions or will instead be handled as a separate Construction Scenario (with corresponding emission limits and conditions, etc.

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There are no alternative operating scenarios being requested with this application.

# Section 16

## Air Dispersion Modeling

1) Minor Source Construction (20.2.72 NMAC) and Prevention of Significant Deterioration (PSD) (20.2.74 NMAC) ambient impact analysis (modeling): Provide an ambient impact analysis as required at 20.2.72.203.A(4) and/or 20.2.74.303 NMAC and as outlined in the Air Quality Bureau's Dispersion Modeling Guidelines found on the Planning Section's modeling website. If air dispersion modeling has been waived for one or more pollutants, attach the AQB Modeling Section modeling waiver approval documentation.
2) SSM Modeling: Applicants must conduct dispersion modeling for the total short term emissions during routine or predictable startup, shutdown, or maintenance (SSM) using realistic worst case scenarios following guidance from the Air Quality Bureau's dispersion modeling section. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions modeling requirements.
3) Title V (20.2.70 NMAC) ambient impact analysis: Title V applications must specify the construction permit and/or Title V Permit number(s) for which air quality dispersion modeling was last approved. Facilities that have only a Title V permit, such as landfills and air curtain incinerators, are subject to the same modeling required for preconstruction permits required by 20.2.72 and 20.2.74 NMAC.

| **What is the purpose of this application?** | Enter an X for each purpose that applies |
|---|---|
| New PSD major source or PSD major modification (20.2.74 NMAC). See #1 above. | |
| New Minor Source or significant permit revision under 20.2.72 NMAC (20.2.72.219.D NMAC). See #1 above. **Note:** Neither modeling nor a modeling waiver is required for VOC emissions. | |
| Reporting existing pollutants that were not previously reported. | |
| Reporting existing pollutants where the ambient impact is being addressed for the first time. | |
| Title V application (new, renewal, significant, or minor modification. 20.2.70 NMAC). See #3 above. | X |
| Relocation (20.2.72.202.B.4 or 72.202.D.3.c NMAC) | |
| Minor Source Technical Permit Revision 20.2.72.219.B.1.d.vi NMAC for like-kind unit replacements. | |
| Other: i.e. SSM modeling. See #2 above. | |
| This application does not require modeling since this is a No Permit Required (NPR) application. | |
| This application does not require modeling since this is a Notice of Intent (NOI) application (20.2.73 NMAC). | |
| This application does not require modeling according to 20.2.70.7.E(11), 20.2.72.203.A(4), 20.2.74.303, 20.2.79.109.D NMAC and in accordance with the Air Quality Bureau's Modeling Guidelines. | |

**Check each box that applies:**

☐ See attached, approved modeling **waiver for all** pollutants from the facility.
☐ See attached, approved modeling **waiver for some** pollutants from the facility.
☐ Attached in Universal Application Form 4 (UA4) is a **modeling report for all** pollutants from the facility.
☐ Attached in UA4 is a **modeling report for some** pollutants from the facility.
☑ No modeling is required.

# Section 17

## Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

### Compliance Test History Table

| Unit No. | Test Description | Test Date |
|---|---|---|
| 1000 | Tested in accordance with EPA test methods for NOx and CO. | 8/29/2012 |
| | Portable analyzer for NOx and CO. | 7/20/2015 |
| | Tested in accordance with EPA test methods for NOx and CO. | 4/2018 |
| | Tested in accordance with EPA test methods for NOx and CO. | 7/2018 |
| | Tested in accordance with EPA test methods for NOx and CO. | 4/2019 |
| | Tested in accordance with EPA test methods for NOx and CO. | 4/2020 |
| | Tested in accordance with EPA test methods for NOx and CO. | 6/2021 |
| 2000 | Tested in accordance with EPA test methods for NOx and CO. | 8/28/2012 |
| | Portable analyzer for NOx and CO. | 7/20/2015 |
| | Tested in accordance with EPA test methods for NOx and CO. | 4/2018 |
| | Tested in accordance with EPA test methods for NOx and CO. | 7/2018 |
| 3000 | Tested in accordance with EPA test methods for NOx and CO. | 8/27/2012 |
| | Portable analyzer for NOx and CO. | 7/22/2015 |
| | Tested in accordance with EPA test methods for NOx and CO. | 4/2018 |
| 4000 | Tested in accordance with EPA test methods for NOx and CO. | 8/27/2012 |
| | Portable analyzer for NOx and CO. | 7/20/2015 |
| | Tested in accordance with EPA test methods for NOx and CO. | 4/2018 |
| | Tested in accordance with EPA test methods for NOx and CO. | 7/2018 |
| 5000 | Tested in accordance with EPA test methods for NOx and CO. | 8/27/2012 |
| | Portable analyzer for NOx and CO. | 7/20/2015 |
| | Tested in accordance with EPA test methods for NOx and CO. | 4/2018 |
| | Tested in accordance with EPA test methods for NOx and CO. | 7/2018 |
| 6000 | Tested in accordance with EPA test methods for NOx and CO. | 3/27/2014 |
| | Portable analyzer for NOx and CO. | 7/22/2015 |
| | Tested in accordance with EPA test methods for NOx and CO. | 11/2019 |
| | Tested in accordance with EPA test methods for NOx and CO. | 11/2020 |
| | Tested in accordance with EPA test methods for NOx and CO. | 8/2021 |
| 7000 | Tested in accordance with EPA test methods for NOx and CO. | 7/2015 |

# Section 19

## Requirements for Title V Program

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**Who Must Use this Attachment**:

* Any major source as defined in 20.2.70 NMAC.
* Any source, including an area source, subject to a standard or other requirement promulgated under Section 111 - Standards of Performance for New Stationary Sources, or Section 112 Hazardous Air Pollutants, of the 1990 federal Clean Air Act ("federal Act"). Non-major sources subject to Sections 111 or 112 of the federal Act are exempt from the obligation to obtain an 20.2.70 NMAC operating permit until such time that the EPA Administrator completes rulemakings that require such sources to obtain operating permits. In addition, sources that would be required to obtain an operating permit solely because they are subject to regulations or requirements under Section 112(r) of the federal Act are exempt from the requirement to obtain an Operating Permit.
* Any Acid Rain source as defined under title IV of the federal Act. The Acid Rain program has additional forms. See www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/. Sources that are subject to both the Title V and Acid Rain regulations are encouraged to submit both applications simultaneously.
* Any source in a source category designated by the EPA Administrator ("Administrator"), in whole or in part, by regulation, after notice and comment.

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### 19.1 - 40 CFR 64, Compliance Assurance Monitoring (CAM) (20.2.70.300.D.10.e NMAC)

Any source subject to 40CFR, Part 64 (Compliance Assurance Monitoring) must submit all the information required by section 64.7 with the operating permit application. The applicant must prepare a separate section of the application package for this purpose; if the information is already listed elsewhere in the application package, make reference to that location. Facilities not subject to Part 64 are invited to submit periodic monitoring protocols with the application to help the AQB to comply with 20.2.70 NMAC. Sources subject to 40 CFR Part 64, must submit a statement indicating your source's compliance status with any enhanced monitoring and compliance certification requirements of the federal Act.

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This regulation defines compliance assurance monitoring. Units DEHY-1b and DEHY-2b will continue to comply with CAM requirements. A copy of the CAM plan is included in this application.

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### 19.2 - Compliance Status (20.2.70.300.D.10.a & 10.b NMAC)

Describe the facility's compliance status with each applicable requirement at the time this permit application is submitted. This statement should include descriptions of or references to all methods used for determining compliance. This statement should include descriptions of monitoring, recordkeeping and reporting requirements and test methods used to determine compliance with all applicable requirements. Refer to Section 2, Tables 2-N and 2-O of the Application Form as necessary. (20.2.70.300.D.11 NMAC) For facilities with existing Title V permits, refer to most recent Compliance Certification for existing requirements. Address new requirements such as CAM, here, including steps being taken to achieve compliance.

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The Chaparral Gas Plant is in compliance with requirements applicable at the time of this permit application. Enterprise is committed to comply with other applicable requirements for Chaparral as they come into effect during the permit term. After issuance of the Title V Permit, Enterprise shall certify to compliance with the terms and conditions of that permit. Enterprise will continue to be in compliance with applicable requirements as described in Section 13.

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## 19.3 - Continued Compliance (20.2.70.300.D.10.c NMAC)

Provide a statement that your facility will continue to be in compliance with requirements for which it is in compliance at the time of permit application. This statement must also include a commitment to comply with other applicable requirements as they come into effect during the permit term. This compliance must occur in a timely manner or be consistent with such schedule expressly required by the applicable requirement.

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The Chaparral Gas Plant is in compliance with requirements applicable at the time of this permit application. Enterprise is committed to comply with other applicable requirements for Chaparral as they come into effect during the permit term.

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## 19.4 - Schedule for Submission of Compliance (20.2.70.300.D.10.d NMAC)

You must provide a proposed schedule for submission to the department of compliance certifications during the permit term. This certification must be submitted annually unless the applicable requirement or the department specifies a more frequent period. A sample form for these certifications will be attached to the permit.

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Enterprise will submit an annual compliance certification report within 30 days following the end of every 12-month reporting period, according to the schedule prescribed in the subsequent Title v permit.

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## 19.5 - Stratospheric Ozone and Climate Protection

In addition to completing the four (4) questions below, you must submit a statement indicating your source's compliance status with requirements of Title VI, Section 608 (National Recycling and Emissions Reduction Program) and Section 609 (Servicing of Motor Vehicle Air Conditioners).

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1. Does your facility have any air conditioners or refrigeration equipment that uses CFCs, HCFCs or other ozone-depleting substances? ☑ **Yes** ☐ **No**
2. Does any air conditioner(s) or any piece(s) of refrigeration equipment contain a refrigeration charge greater than 50 lbs? ☐ **Yes** ☑ **No**

   (If the answer is yes, describe the type of equipment and how many units are at the facility.)
3. Do your facility personnel maintain, service, repair, or dispose of any motor vehicle air conditioners (MVACs) or appliances ("appliance" and "MVAC" as defined at 82. 152)? ☐ **Yes** ☑ **No**
4. Cite and describe which Title VI requirements are applicable to your facility (i.e. 40 CFR Part 82, Subpart A through G.)

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Title VI, Section 608 may apply to this facility. Though Enterprise may own CFC refrigeration equipment meeting the criteria described in 40 CFR 82, Subpart F, which applies to owners of CFC-containing appliances, enterprise does not “service”, “maintain”, or “repair” Class I or Class II appliances, nor “dispose” of appliances at Chaparral as defined in this Subpart.

Enterprise states that the facility is operated in compliance with and will continue to operate in compliance with the requirements of Title VI, Section 608. Title VI, Section 609 does not apply to Chaparral as there is no servicing of motor vehicle air conditioners performed at Chaparral.

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## 19.6 - Compliance Plan and Schedule

Applications for sources, which are not in compliance with all applicable requirements at the time the permit application is submitted to the department, must include a proposed compliance plan as part of the permit application package. This plan shall include the information requested below:

**A. Description of Compliance Status:** (20.2.70.300.D.11.a NMAC)
A narrative description of your facility's compliance status with respect to all applicable requirements (as defined in 20.2.70 NMAC) at the time this permit application is submitted to the department.

**B. Compliance plan:** (20.2.70.300.D.11.B NMAC)
A narrative description of the means by which your facility will achieve compliance with applicable requirements with which it is not in compliance at the time you submit your permit application package.

**C. Compliance schedule:** (20.2.70.300D.11.c NMAC)
A schedule of remedial measures that you plan to take, including an enforceable sequence of actions with milestones, which will lead to compliance with all applicable requirements for your source. This schedule of compliance must be at least as stringent as that contained in any consent decree or administrative order to which your source is subject. The obligations of any consent decree or administrative order are not in any way diminished by the schedule of compliance.

**D. Schedule of Certified Progress Reports:** (20.2.70.300.D.11.d NMAC)
A proposed schedule for submission to the department of certified progress reports must also be included in the compliance schedule. The proposed schedule must call for these reports to be submitted at least every six (6) months.

**E. Acid Rain Sources:** (20.2.70.300.D.11.e NMAC)
If your source is an acid rain source as defined by EPA, the following applies to you. For the portion of your acid rain source subject to the acid rain provisions of title IV of the federal Act, the compliance plan must also include any additional requirements under the acid rain provisions of title IV of the federal Act. Some requirements of title IV regarding the schedule and methods the source will use to achieve compliance with the acid rain emissions limitations may supersede the requirements of title V and 20.2.70 NMAC. You will need to consult with the Air Quality Bureau permitting staff concerning how to properly meet this requirement.

**NOTE**: The Acid Rain program has additional forms. See www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/. Sources that are subject to both the Title V and Acid Rain regulations are **encouraged** to submit both applications **simultaneously**.

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The Chaparral Gas Plant is in compliance with all applicable requirements. No compliance plan is required.

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## 19.7 - 112(r) Risk Management Plan (RMP)

Any major sources subject to section 112(r) of the Clean Air Act must list all substances that cause the source to be subject to section 112(r) in the application. The permittee must state when the RMP was submitted to and approved by EPA.

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This facility has more than a threshold quantity of a regulated substance in a process, as determined under §68.115, and is therefore an affected source. To comply with this regulation, the facility operator maintains a current RMP.

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## 19.8 - Distance to Other States, Bernalillo, Indian Tribes and Pueblos

Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B NMAC)?

(If the answer is yes, state which apply and provide the distances.)

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The facility is located approximately 73 km from Texas.

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## 19.9 - Responsible Official

Provide the Responsible Official as defined in 20.2.70.7.AD NMAC: Graham Bacon

## CONSTRUCTION INDUSTRY

### A300 Construction Industry – Aggregate – Not Required

### A400 Construction Industry – Asphalt – Not Required

### A500 Construction Industry – Concrete - Not Required

## POWER GENERATION INDUSTRY

### A600 Power Generation Industry – Not Required

## SOLID WASTE DISPOSAL (LANDFILLS) INDUSTRY

### A700 Solid Waste Disposal (Landfills) Industry – Not Required

## MISCELLANEOUS INDUSTRY

### A800 Miscellaneous Operations Introduction – Not Required

## MISCELLANEOUS DOCUMENTS

### A801 40 CFR 64, Compliance Assurance Monitoring (CAM) Plan

A. 40 CFR 64, Compliance Assurance Monitoring (CAM) Plan Glycol Dehydration Units

The TEG dehydrators still vent and flash tank emissions from Units DEHY-1 and DEHY-2 shall be equipped with a BTEX condenser.

| CAM Requirement | BTEX Condenser and condenser vents |
|---|---|
| Condenser Performance Indicator [64.3(a)(l)] | Indicator is the temperature of the non-condensable exhaust stream leaving, or at the outlet of, the condenser. Condenser vents are also routed to the reboiler fireboxes and to Flare (for DEHY-2). |
| Measurement Approach | Condenser exhaust temperature is measured continuously using an in-line thermocouple. |
| Indicator Range [64.3(a)(2)] | Acceptable temperature range is 20 °F to 120 °F. This range has been selected based on atmospheric temperature conditions for this site. |
| Data Representativeness | Guarantee from the thermocouple manufacturer. If the |

# Section 20

## Other Relevant Information

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**Other relevant information**. Use this attachment to clarify any part in the application that you think needs explaining. Reference the section, table, column, and/or field. Include any additional text, tables, calculations or clarifying information.

Additionally, the applicant may propose specific permit language for AQB consideration. In the case of a revision to an existing permit, the applicant should provide the old language and the new language in track changes format to highlight the proposed changes. If proposing language for a new facility or language for a new unit, submit the proposed operating condition(s), along with the associated monitoring, recordkeeping, and reporting conditions. In either case, please limit the proposed language to the affected portion of the permit.

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There is no other relevant information being submitted with this application.

# Section 22: Certification

Company Name: Enterprise Field Services, LLC

I, Rodney M. Sartor, hereby certify that the information and data submitted in this application are true and as accurate as possible, to the best of my knowledge and professional expertise and experience.

Signed this 10th day of July, 2023, upon my oath or affirmation, before a notary of the State of Texas.

*Signature

7/10/2023
Date

Rodney M. Sartor
Printed Name

Senior Director
Title

Scribed and sworn before me on this 10th day of July, 2023.

My authorization as a notary of the State of Texas expires on the

23rd day of February, 2026.

Brenda J. Mendez
Notary's Signature

7/10/2023
Date

Brenda J. Mendez
Notary's Printed Name

BRENDA J. MENDEZ
Notary Public, State of Texas
Comm. Expires 02-23-2026
Notary ID 10264322

NOTARY PUBLIC STATE OF TEXAS

*For Title V applications, the signature must be of the Responsible Official as defined in 20.2.70.7.AE NMAC.