NMED AIR QUALITY BUREAU
TITLE V SIGNIFICANT MODIFICATION APPLICATION
IACX Roswell LLC
Red Bluff No. 3 Compressor Station

Prepared By:

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June 2021

Project 213201.0089

Trinity Consultants

Trinity Consultants
9400 Holly Ave NE, Bldg 3, Ste 300, Albuquerque, NM 87122 / P 505.266.6611 / **trinityconsultants.com**

June 23, 2021

Permit Programs Manager
NMED Air Quality Bureau
525 Camino de los Marquez Suite 1
Santa Fe, NM 87505-1816

RE: Application for Title V Renewal
IACX Roswell LLC – Red Bluff No. 3 Compressor Station

Permit Programs Manager:

IACX Roswell LLC is submitting this application pursuant to 20.2.70.404.C.1.a NMAC for a Significant Modification to Title V permit P073-R3M2 for the Red Bluff No. 3 Compressor Station. This application is submitted in response to the Notice of Violation (NOV) (Track No. IACX-0019-1901) issued on July 29, 2019. This Title V Modification is the final corrective action for Violation 1 in the NOV and is submitted within 12-months of issuance of NSR permit 0412-M4.

The facility is located approximately 23 miles northeast of Roswell, NM. The facility is currently permitted under NSR permit 0412-M4 and Title V permit P073-R3M2. The format and content of this application are consistent with the Bureau's current policy regarding Title V applications.

Enclosed are two hard copies of the application, including an original certification and two discs containing the electronic files. Please feel free to contact either myself at rreese@trinityconsultants.com or Justin Wheeler, Director of Environmental, Health and Safety for IACX Roswell, at (972) 679-2147 if you have any questions regarding this application.

Sincerely,

Rachel Reese
Senior Consultant

Cc: Justin Wheeler (IACX Roswell)
Trinity Project File 213201.0089

Mail Application To:		**For Department use only:**
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		AIRS No.:

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. See Section 1-I for submittal instructions for other permits.

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: **20.2.70.404.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.): 19	Updating Permit/NOI #: P073-R3M2
1	Facility Name: Red Bluff No. 3 Compressor Station	Plant primary SIC Code (4 digits): 4922	
		Plant NAIC code (6 digits):48621	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): Go North out of Roswell, N.M. on U.S. Highway 285 approximately 17.5 miles past the Roswell city limits sign to Red Bluff Road (just before Mile Marker 132). Turn right (East) on Red Bluff Road and go 0.5 miles to "Y" in road (just before road with cattle guard that goes to El Paso Natural Gas Co.). Turn left at "Y" in the road and go 10.3 miles on main traveled road to cross road. Turn left at cross road and go 0.7 miles. Turn right and go 0.4 miles. Turn left and go 100 yards to station site. (Station is painted Carlsbad Cavern brown)		

2	Plant Operator Company Name: IACX Roswell LLC	Phone/Fax: 972-960-3210/ N/A
a	Plant Operator Address: 5001 LBJ Freeway, Suite 300, Dallas, TX 75244	
b	Plant Operator's New Mexico Corporate ID or Tax ID: 82-2010347	
3	Plant Owner(s) name(s): IACX Roswell LLC	Phone/Fax: 972-960-3210/ N/A
a	Plant Owner(s) Mailing Address(s): 5001 LBJ Freeway, Suite 300, Dallas, TX 75244	
4	Bill To (Company): IACX Roswell LLC	Phone/Fax: 972-679-2147/ N/A
a	Mailing Address: 5001 LBJ Freeway, Suite 300, Dallas, TX 75244	E-mail: justinwheeler@iacx.com
5	☐ Preparer: ☑ Consultant: Trinity Consultants, Inc.	Phone/Fax: 505-266-6611/ N/A
a	Mailing Address: 9400 Holly Ave NE, Bldg 3, Suite 300, Albuquerque, NM 87122	E-mail: rreese@trinityconsultants.com
6	Plant Operator Contact: Justin Wheeler	Phone/Fax: 972-679-2147/ N/A
a	Address: 5001 LBJ Freeway, Suite 300, Dallas, TX 75244	E-mail: justinwheeler@iacx.com
7	Air Permit Contact: Justin Wheeler	Title: Director of Environmental, Health and Safety
a	E-mail: justinwheeler@iacx.com	Phone/Fax: 972-679-2147/ N/A
b	Mailing Address: 5001 LBJ Freeway, Suite 300, Dallas, TX 75244	
c	The designated Air permit Contact will receive all official correspondence (i.e. letters, permits) from the Air Quality Bureau.	

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? ☑ Yes ☐ No	1.b If yes to question 1.a, is it currently operating in New Mexico? ☑ Yes ☐ No
2	If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application? ☐ Yes ☑ No	If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application? ☑ Yes ☐ No
3	Is the facility currently shut down? ☐ Yes ☑ No	If yes, give month and year of shut down (MM/YY): N/A
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? ☐ Yes ☑ No	
5	If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? ☐Yes ☐No ☑N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☑ Yes ☐ No	If yes, the permit No. is: P073-R3M2
7	Has this facility been issued a No Permit Required (NPR)? ☐ Yes ☑ No	If yes, the NPR No. is: N/A
8	Has this facility been issued a Notice of Intent (NOI)? ☐ Yes ☑ No	If yes, the NOI No. is: N/A
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☑ Yes ☐ No	If yes, the permit No. is: 0412-M4
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? ☐ Yes ☑ No	If yes, the register No. is: N/A

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: 1.04 MMscf	Daily: 25 MMscf	Annually: 9,125 MMscf
b	Proposed	Hourly: 1.04 MMscf	Daily: 25 MMscf	Annually: 9,125 MMscf
2	What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required)			

a	Current	Hourly: 1.04 MMscf	Daily: 25 MMscf	Annually: 9,125 MMscf
b	Proposed	Hourly: 1.04 MMscf	Daily: 25 MMscf	Annually: 9,125 MMscf

Section 1-D: Facility Location Information

1	Section: 10	Range: 25E	Township: 7S	County: Chaves	Elevation (ft): 3,825
2	UTM Zone: ☐ 12 or ☑ 13			Datum: ☐ NAD 27 ☐ NAD 83 ☑ WGS 84	
a	UTM E (in meters, to nearest 10 meters): 556,800 m			UTM N (in meters, to nearest 10 meters): 3,731,370 m	
b	**AND** Latitude (deg., min., sec.): 33°43'15"			Longitude (deg., min., sec.): -104°23'13"	
3	Name and zip code of nearest New Mexico town: Roswell, NM 88201				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): Go North out of Roswell, N.M. on U.S. Highway 285 approximately 17.5 miles past the Roswell city limits sign to Red Bluff Road (just before Mile Marker 132). Turn right (East) on Red Bluff Road and go 0.5 miles to "Y" in road (just before road with cattle guard that goes to El Paso Natural Gas Co.). Turn left at "Y" in the road and go 10.3 miles on main traveled road to cross road. Turn left at cross road and go 0.7 miles. Turn right and go 0.4 miles. Turn left and go 100 yards to station site. (Station is painted Carlsbad Cavern brown)				
5	The facility is 23 miles northeast of Roswell, NM.				
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**: Chaves.				
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/aqb/modeling/class1areas.html)? ☑ Yes ☐ No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: Yes; Salt Creek Wilderness, 11.1 km.				
9	Name nearest Class I area: Salt Creek Wilderness				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): 10.66 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: 2,450 m				
12	Method(s) used to delineate the Restricted Area: Fencing "**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.				
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? ☐ Yes ☑ No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.				
14	Will this facility operate in conjunction with other air regulated parties on the same property? ☒ No ☐ Yes If yes, what is the name and permit number (if known) of the other facility? N/A				

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

1	Facility **maximum** operating ($\frac{\text{hours}}{\text{day}}$): 24	($\frac{\text{days}}{\text{week}}$): 7	($\frac{\text{weeks}}{\text{year}}$): 52	($\frac{\text{hours}}{\text{year}}$): 8,760		
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: Upon receipt of permit					
4	Month and year of anticipated construction completion: TBD					

5	Month and year of anticipated startup of new or modified facility: TBD
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: NOV		
a	If yes, NOV date or description of issue: 7/29/2019		NOV Tracking No: IACX-0019-1901
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: Notice of Violation	Date: 7/29/2019	Requirement # (or page # and paragraph #): Violation 1
d	Provide the required text to be inserted in this permit: See Section 3		
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 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): Tony Hines	Phone: 972-960-3219
a	R.O. Title: Senior Vice President of Operations	R.O. e-mail: tonyhines@iacx.com
b	R. O. Address: 5001 LBJ Freeway, Suite 300, Dallas, Texas 75244	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC): Justin Wheeler	Phone: 972-679-2147
a	A. R.O. Title: Director of Environmental, Health and Safety	A. R.O. e-mail: justinwheeler@iacx.com
b	A. R. O. Address: 5001 LBJ Freeway, Suite 300, Dallas, TX 75244	
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): IACX Energy LLC is the parent company of IACX Roswell 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.): IACX Energy LLC is the parent company of IACX Roswell LLC	
a	Address of Parent Company: 5001 LBJ Freeway, Suite 300, Dallas, Texas 75244	
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.): IACX Roswell LLC	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: Russell Gibbs, Roswell Area Manager: 575-363-3142	

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

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_____

Email_____

Phone number _____

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 #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] / Date of Construction/ Reconstruction[2]	Controlled by Unit # / Emissions vented to Stack #	Source Classification Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
C-865	RICE 4SLB	Caterpillar	G3516 TALE	4EK04116	1265 hp	1265 hp	2/1/1991 6/5/2006	N/A C-865	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
C-867	RICE 4SRB	Waukesha	L7042 GSIU	350138	1195 hp	1195 hp	2/10/1984 2/25/2019	C-867 C-867	31000203	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	4SRB	N/A
C-868	RICE 4SRB	Waukesha	L7042 GSIU	363094	1195 hp	1195 hp	2/10/1984 3/7/2019	C-868 C-868	31000203	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	4SRB	N/A
C-878	RICE 4SLB	Superior	8GTLA	286649	1073 hp	1073 hp	1/7/1982 1/7/1982	N/A C-878	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
C-880	RICE 4SLB	Caterpillar	G3516 TALE	3RC00411-4EK	1265 hp	1265 hp	1991 2017	N/A C-880	31000203	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SLB	N/A
C-320	RICE 4SLB	Caterpillar	CG137-12	TBD	600 hp	600 hp	2019 2019	C-320 C-320	31000203	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	4SRB	N/A
CAP-1	Microturbine	Capstone	65R-HG4-BU00	9620	65 kW	87.2 hp	11/15/2017 12/1/2017	N/A CAP-1	20100201	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
CAP-2	Microturbine	Capstone	65R-HG4-BU00	9621	65 kW	87.2 hp	11/20/2017 12/1/2017	N/A CAP-2	20100201	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
Dehy-1	Dehydrator Still Vent/ Flash Tank	Latoka	N/A	4140-02	25 MMscf/d	25 MMscf/d	1/1/1981 1/1/1981	N/A N/A	31000304	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
TK-1	Condensate Tank	N/A	115238	595	300 bbl	300 bbl	2009 2009	N/A N/A	40400311	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
TK-2	Condensate Tank	N/A	115239	4585	300 bbl	300 bbl	2009 2009	N/A N/A	40400311	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced	N/A	N/A
FUG	Facility-wide Fugitive Emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	31000220	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
SSM/M	Startup, Shutdown, and Maintenance and Malfunction emissions	N/A	N/A	N/A	N/A	N/A	N/A N/A	N/A N/A	310888811	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ 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 http://www.env.nm.gov/aqb/forms/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. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
Rebl-1	Reboiler	Thermoflux	N/A 4140-02	1.0 MMBtu/hr	20.2.72.202.B.5 NMAC IA List Item #1.a	1981 1981	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
Load	Loading Emissions from Condensate Tanks	N/A	N/A N/A	N/A N/A	20.2.72.202.B.5 NMAC IA List Item #1.a	N/A N/A	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
NGL Load	Loading Emissions from NGL Tank	N/A	N/A N/A	N/A N/A	20.2.72.202.B.5 NMAC IA List Item #1.a	N/A N/A	☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☑ To Be Modified ☐ To be Replaced
Haul	Unpaved Haul Road Emissions	N/A	N/A N/A	N/A N/A	20.2.72.202.B.5 NMAC IA List Item #1.a	N/A N/A	☐ Existing (unchanged) ☐ To be Removed ☑ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
T-1	Lube Oil Storage Tank	N/A	N/A N/A	1500 gal	20.2.72.202.B.2 NMAC IA List Item #5	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
T-2	Ambitrol Storage Tank	N/A	N/A N/A	1500 gal	20.2.72.202.B.2 NMAC IA List Item #5	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
T-3	Glycol Storage Tank	N/A	N/A N/A	1500 gal	20.2.72.202.B.2 NMAC IA List Item #5	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
T-4	Oily Waste Water	N/A	N/A N/A	50 bbl	20.2.72.202.B.2 NMAC IA List Item #5	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
T-5	Used Lube Oil Storage Tank	N/A	N/A N/A	50 bbl	20.2.72.202.B.2 NMAC IA List Item #5	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
HRU	Helium Recovery Unit	N/A	N/A N/A	2 MMscf/day	20.2.72.202.B.5 NMAC IA List Item #1.a	2017 2017	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
NRU-1	Five Nitrogen Rejection Units (2 MMscf/d capacity each)	N/A	N/A N/A	10 MMscf/day	20.2.72.202.B.5 NMAC IA List Item #1.a	N/A N/A	☑ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

[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
C-867	NSCR Catalyst and AFR	12/24/2004	NO_X, CO, and VOC	C-867	NO_X 80%; CO 80%; VOC 88%	catalyst manafacturer
C-868	NSCR Catalyst and AFR	12/6/2004	NO_X, CO, and VOC	C-868	NO_X 80%; CO 80%; VOC 88%	catalyst manafacturer
C-320	NSCR Catalyst	2019	NO_X, CO, and VOC	C-320	NO_X 95%; CO 95%; VOC 79%	catalyst manafacturer
C-1	Condenser	1/1/1981	HAPs and VOCs	Dehy-1	VOCs and HAPs 90%	Engineering Estimate

[1] List each control device on a separate line. For each control device, list all emission units controlled by the control device.

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

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

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

Unit No.	NOx		CO		VOC		SOx		PM[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
C-865[2]	4.43	19.40	5.58	24.50	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	-	-
C-867	29.97	131.26	20.75	90.87	0.69	3.03	0.11	0.46	0.066	0.29	0.066	0.29	0.066	0.29	-	-	-	-
C-868	25.50	111.68	17.65	77.32	0.59	2.58	0.090	0.40	0.066	0.29	0.066	0.29	0.066	0.29	-	-	-	-
C-878[2]	11.80	51.80	7.19	31.10	1.80	7.80	0.48	2.10	0.060	0.25	0.060	0.25	0.060	0.25	<	<	-	-
C-880[2]	4.43	19.40	5.58	24.50	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	-	-
C-320	13.19	57.76	13.19	57.76	0.46	2.03	3.02E-03	0.013	0.044	0.19	0.044	0.19	0.044	0.19	-	-	-	-
TK-1	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	-	-
TK-2	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	-	-
CAP-1[2]	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	-	-
CAP-2[2]	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	-	-
FUG	-	-	-	-	1.30	5.68	-	-	-	-	-	-	-	-	-	-	-	-
Dehy-1	-	-	-	-	9.06	39.70	-	-	-	-	-	-	-	-	-	-	-	-
Totals	89.37	391.56	70.10	306.75	19.71	86.23	0.68	2.98	0.38	1.66	0.38	1.66	0.38	1.66	-	-	-	-

[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).

[2] Units C-865, C-878, and C-880 emissions are representative of NSR permit 412-M3R3. Units CAP-1 and CAP-2 emissions are representative of NSR 412-M3R5.

"<" representative of permit P073-R3M2.

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

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
C-865[2]	4.43	19.40	5.58	24.50	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	-	-
C-867	5.48	23.99	2.32	10.18	0.35	1.51	0.11	0.46	0.066	0.29	0.066	0.29	0.066	0.29	-	-	-	-
C-868	0.45	1.96	1.86	8.14	0.29	1.29	0.090	0.40	0.066	0.29	0.066	0.29	0.066	0.29	-	-	-	-
C-878[2]	11.80	51.80	7.19	31.10	1.80	7.80	0.48	2.10	0.060	0.25	0.060	0.25	0.060	0.25	<	<	-	-
C-880[2]	4.43	19.40	5.58	24.50	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	-	-
C-320	0.66	2.90	0.66	2.90	0.097	0.43	3.02E-03	0.013	0.044	0.19	0.044	0.19	0.044	0.19	-	-	-	-
TK-1	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	-	-
TK-2	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	-	-
CAP-1[2]	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	-	-
CAP-2[2]	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	-	-
FUG	-	-	-	-	1.30	5.68	-	-	-	-	-	-	-	-	-	-	-	-
Dehy-1	-	-	-	-	9.06	39.70	-	-	-	-	-	-	-	-	-	-	-	-
Totals	27.31	119.71	23.36	102.02	18.70	81.82	0.68	2.98	0.38	1.66	0.38	1.66	0.38	1.66	-	-	-	-

[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).

[2] Units C-865, C-878, and C-880 emissions are representative of TV permit P073-R3M2. Units CAP-1 and CAP-2 are representative of NSR 412-M3R5.

"<" representative of permit P073-R3M2.

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

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/M	-	-	-	-	*	10.00	-	-	-	-	-	-	-	-	-	-	-	-
Totals	-	-	-	-	*	10.00	-	-	-	-	-	-	-	-	-	-	-	-

[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).

"*" Indicates that an hourly limit is not appropriate for this operating situation and is not being requested.

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

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

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

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

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		PM		PM10		PM2.5		□ H_2S or □ Lead	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals:																	

Table 2-H: Stack Exit Conditions

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

Stack Number	Serving Unit Number(s) from Table 2-A	Orientation (H-Horizontal V=Vertical)	Rain Caps (Yes or No)	Height Above Ground (ft)	Temp. (F)	Flow Rate		Moisture by Volume (%)	Velocity (ft/sec)	Inside Diameter (ft)
						(acfs)	(dscfs)			
C-865	C-865	V	No	24	225	32.0	-	-	40.8	1.00
C-867	C-867	V	No	40	1060	16.4	-	-	30.3	0.83
C-868	C-868	V	No	40	1060	16.4	-	-	30.3	0.83
C-878	C-878	V	No	40	960	40.1	-	-	42.2	1.10
C-880	C-880	V	No	24	255	32.0	-	-	40.8	1.00
C-320	C-320	V	No	18	1042	42.7	-	-	54.3	1.00
CAP-1	CAP-1	V	No	15	588	9.0	-	-	11.5	1.00
CAP-2	CAP-2	V	No	15	588	9.0	-	-	11.5	1.00

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		n-Hexane ☑ HAP or ☐ TAP		Benzene ☑ HAP or ☐ TAP		Toluene ☑ HAP or ☐ TAP		Xylenes ☑ 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
C-865	C-865	0.44	1.92	0.28	1.23	-	-	-	-	-	-	-	-						
C-867	C-867	0.80	3.51	0.16	0.70	-	-	0.012	0.054	4.35E-03	0.019	1.52E-03	6.66E-03						
C-868	C-868	0.68	2.99	0.14	0.60	-	-	0.010	0.046	3.70E-03	0.016	1.29E-03	5.67E-03						
C-878	C-878	0.37	1.63	0.24	1.05	-	-	-	-	-	-	-	-						
C-880	C-880	0.44	1.92	0.28	1.23	-	-	-	-	-	-	-	-						
C-320	C-320	0.13	0.58	0.093	0.41	-	-	-	-	-	-	-	-						
N/A	TK-1	0.12	0.53	-	-	0.11	0.49	6.66E-03	0.029	1.91E-03	8.38E-03	-	-						
N/A	TK-2	0.12	0.53	-	-	0.11	0.49	6.66E-03	0.029	1.91E-03	8.38E-03	-	-						
CAP-1	CAP-1	8.00E-03	0.035	3.20E-03	0.014	2.97E-04	1.30E-03	1.14E-04	5.00E-04	6.85E-05	3.00E-04	2.28E-04	1.00E-03						
CAP-2	CAP-2	8.00E-03	0.035	3.20E-03	0.014	2.97E-04	1.30E-03	1.14E-04	5.00E-04	6.85E-05	3.00E-04	2.28E-04	1.00E-03						
N/A	FUG	0.053	0.23	-	-	-	-	-	-	-	-	-	-						
N/A	SSM	-	-	-	-	-	-	-	-	-	-	-	-						
N/A	Dehy-1	0.63	2.74	-	-	0.58	2.54	-	-	6.20E-03	0.027	0.024	0.11						
Totals:		3.80	16.66	1.20	5.25	0.80	3.52	0.036	0.16	0.018	0.080	0.028	0.12						

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
C-865	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	9.5 Mscf	83.3 MMscf	0.25 gr S/100 scf	-
C-867	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	7.43 Mscf	65.06 MMscf	0.25 gr S/100 scf	-
C-868	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	6.32 Mscf	55.36 MMscf	0.25 gr S/100 scf	-
C-878	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	8.1 Mscf	71.0 MMscf	0.25 gr S/100 scf	-
C-880	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	9.5 Mscf	83.6 MMscf	0.25 gr S/100 scf	-
C-320	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	4.2 Mscf	37.0 MMscf	0.25 gr S/100 scf	-
CAP-1	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	0.8 Mscf	6.7 MMscf	0.25 gr S/100 scf	-
CAP-2	Natural Gas	Pipeline quality natural gas	1050 Btu/scf	0.8 Mscf	6.7 MMscf	0.25 gr S/100 scf	-

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	Condensate	32.7	68.0	70	14.7	70	14.7
TK-2	40400311	Condensate	Condensate	32.7	68.0	70	14.7	70	14.7

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	2009	Condensate	FX	NA	300	29.5	3.66	3.66	WH	WH	Good	15,330	1.22
TK-2	2009	Condensate	FX	NA	300	29.5	3.66	3.66	WH	WH	Good	15,330	1.22

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	Natural Gas	Gas	25 MMscf/day	Natural Gas	Natural Gas	Gas	25 MMscf/day

Table 2-N: CEM Equipment

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

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
N/A - The facility does not operate CEM Equipment.									

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
C-867	Catalyst Inlet O_2	Inlet to catalyst	V	0.5 to 1.0	as needed	replacement	Electronic	N/A
C-867	Catalyst Inlet Temperature	Inlet to catalyst	F	550°F to 1300°F	as needed	replacement	Electronic	N/A
C-868	Catalyst Inlet O_2	Inlet to catalyst	V	0.5 to 1.0	as needed	replacement	Electronic	N/A
C-868	Catalyst Inlet Temperature	Inlet to catalyst	F	550°F to 1300°F	as needed	replacement	Electronic	N/A

Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									Total GHG Mass Basis ton/yr[4]	Total CO_2e ton/yr[5]
Unit No.	**GWPs [1]**	**1**	**298**	**25**	**22,800**	**footnote 3**										
C-865	**mass GHG**	5125.00	0.0097	0.097											5125.11	
	CO_2e	5125.00	2.89	2.43												5130.32
C-867	**mass GHG**	3995.54	0.0075	0.075											3995.6225	
	CO_2e	3995.54	2.24	1.88												3999.65
C-868	**mass GHG**	3399.55	0.0064	0.064											3399.62	
	CO_2e	3399.55	1.91	1.60												3403.06
C-878	**mass GHG**	4156.00	0.0078	0.078											4156.09	
	CO_2e	4156.00	2.32	1.95												4160.27
C-880	**mass GHG**	5125.00	0.0097	0.097											5125.11	
	CO_2e	5125.00	2.89	2.43												5130.32
C-320	**mass GHG**	2274.88	0.0043	0.043											2274.93	
	CO_2e	2274.88	1.28	1.08												2277.23
CAP-1	**mass GHG**	392.20	0.00074	0.0074											392.21	
	CO_2e	392.20	0.22	0.19												392.61
CAP-2	**mass GHG**	392.20	0.00074	0.0074											392.21	
	CO_2e	392.20	0.22	0.19												392.61
Dehy-1	**mass GHG**	512.36	0.0010	0.010											512.37	
	CO_2e	512.36	0.30	0.25												512.91
FUG	**mass GHG**	0.014	-	14.83											14.84	
	CO_2e	0.014	-	370.75												370.76
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO2e															
Total	**mass GHG**	25372.74	0.048	15.31											25,388.10	
	CO_2e	25372.74	14.27	382.72												25,769.73

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

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

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

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

[5] **CO_2e** means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the green house gas by its GWP.

Section 3

Application Summary

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

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

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

IACX Roswell LLC is submitting this application pursuant to 20.2.70.404.C.1.a NMAC for a Significant Modification to Title V permit P073-R3M2 for the Red Bluff No. 3 Compressor Station. The facility is located approximately 23 miles northeast of Roswell in Chaves County, New Mexico. The Red Bluff No. 3 Compressor Station is an extension of a local gas transportation system that gathers casinghead gas from multiple wells in the area. The facility compresses the gas for delivery to a main line.

The proposed modification seeks to incorporate the changes made to the facility in the application for NSR permit 0412-M4, including the following:

Revisions to the emissions for the glycol dehydrator (Unit Dehy-1); condensate tanks (Units TK-1 and TK-2); startup, shutdown, maintenance, and malfunction (Unit SSM/M); facility-wide fugitives (Unit FUG); and two RICE engines (Units C-867 and C-868). Revisions were also made to the following exempt emission sources: truck loadout from the condensate tanks (Unit Load); NGL loadout (Unit NGL Load); and unpaved haul road activities (Unit Haul).

This application is submitted in response to the Notice of Violation (NOV) (Track No. IACX-0019-1901) issued on July 29, 2019. This Title V Modification is the final corrective action for Violation 1 in the NOV and is submitted within 12-months of issuance of NSR permit 0412-M4.

Equipment currently authorized at the site includes the following:

- Two (2) Caterpillar G3516 compressor engines (Units C-865 and C-880);
- Two (2) Waukesha L7042GSI compressor engines (Units C-867 and C-868);
- One (1) Superior 8GTLA compressor engine (Unit C-878);
- One (1) rinse compressor engine (Unit C-320);
- Two (2) Capstone C65 microturbines (Units CAP-1 and CAP-2);
- One glycol dehydration contactor (unit Dehy-1); and
- Two (2) condensate storage tanks (Units TK-1 and TK-2);

Additional emissions at the facility result from startup, shutdown, maintenance, and malfunction (Unit SSM/M) and facility-wide fugitive component emissions (FUG).

The following insignificant activities and equipment are located at Red Bluff No. 3:

- One (1) glycol dehydration unit reboiler (Unit Rebl-1);
- Five (5) nitrogen rejection units (Unit NRU-1);
- One (1) helium recovery unit (Unit HRU).
- Five (5) miscellaneous storage tanks for lube oil, glycol, etc. (Units T-1 through T-5);
- Loadout emissions from truck loadout of condensate and NGL (Units Load and NGL Load); and
- Unpaved haul road emissions (Unit Haul).

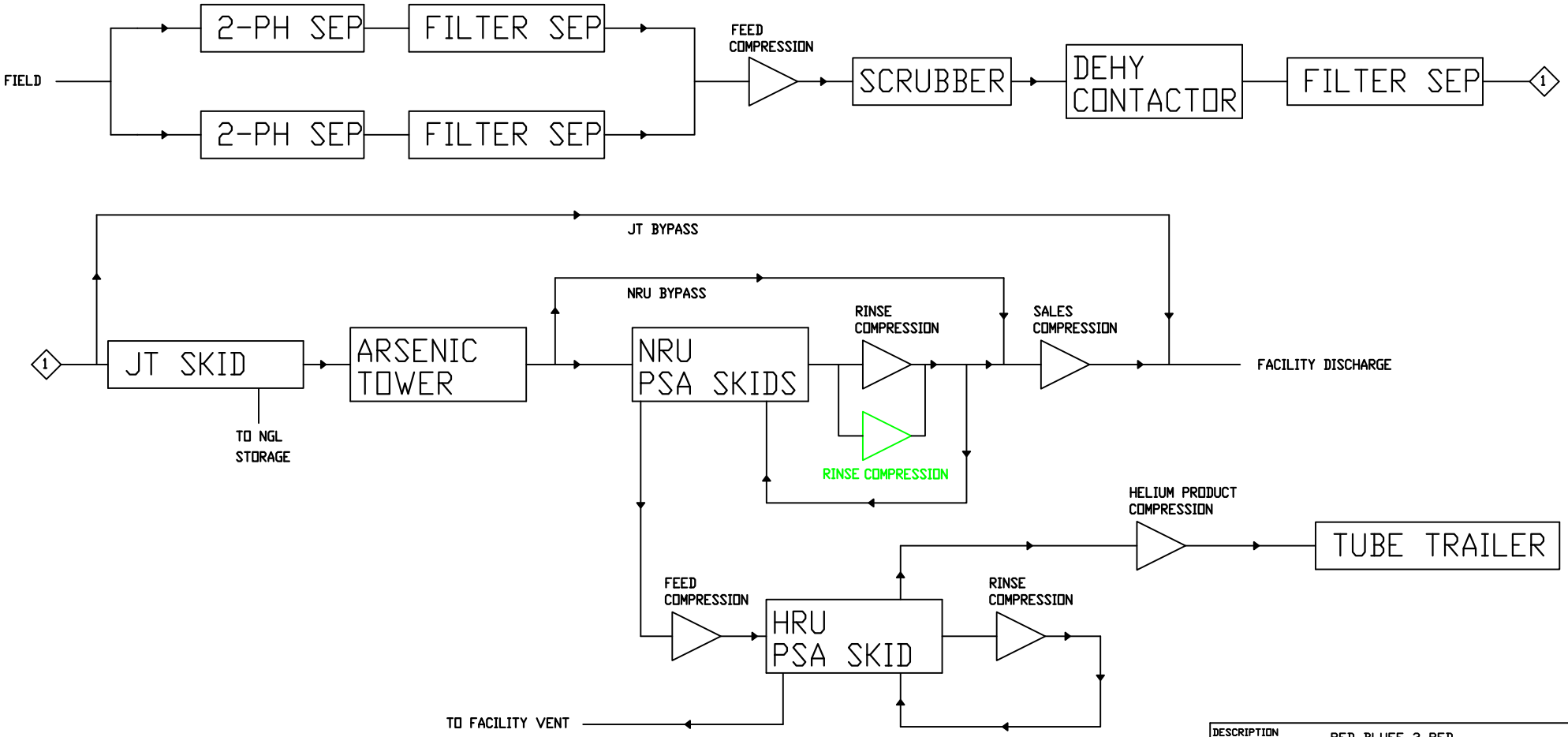
Section 4

Process Flow Sheet

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

A process flow diagram is attached.

REV.	DATE	COMMENT	BY	APPD
0	4/30/19	FIRST ISSUE	AMJ	



DESCRIPTION	RED BLUFF 3 PFD
CUSTOMER	IACX ENERGY

Section 5

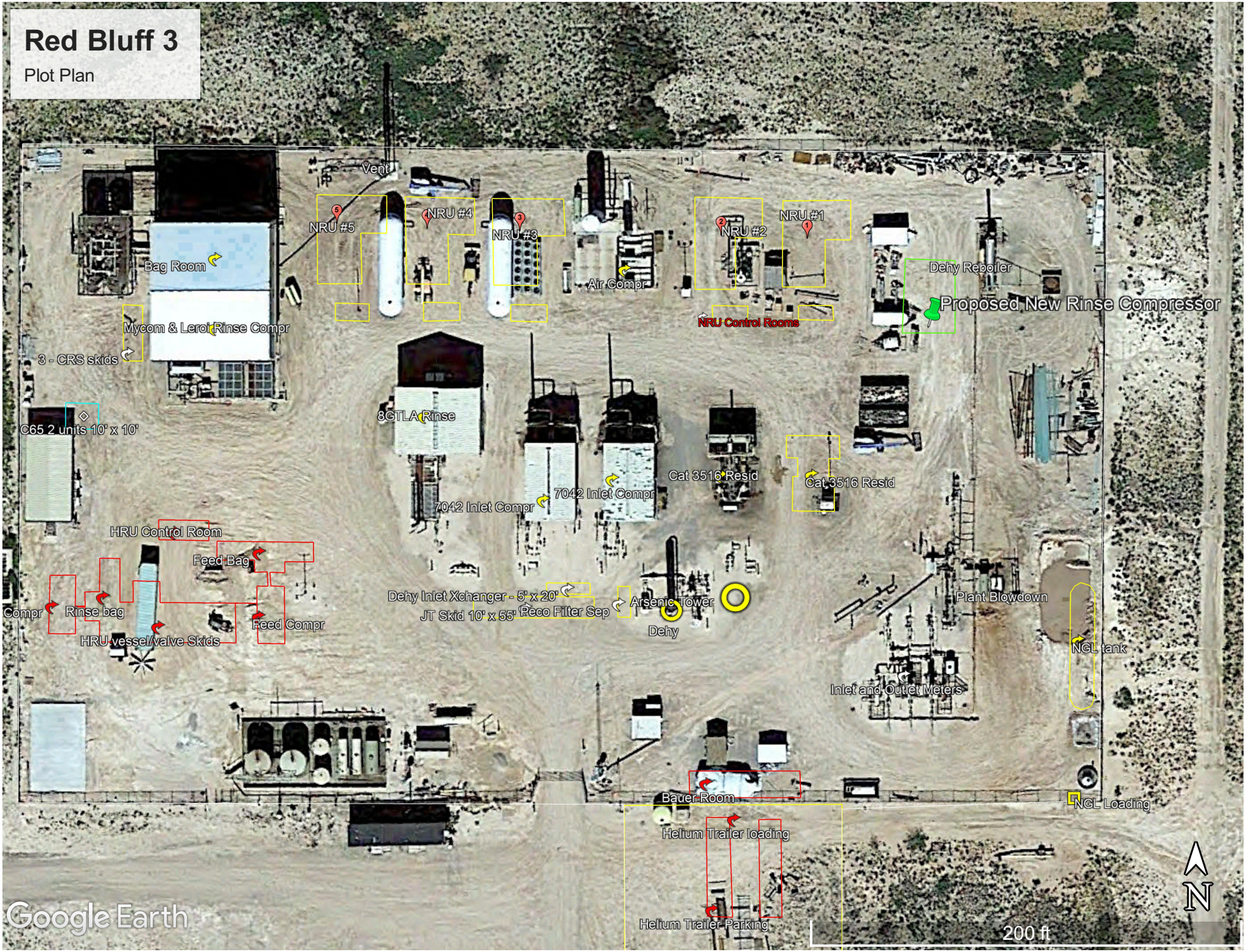
Plot Plan Drawn To Scale

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.

Red Bluff 3

Plot Plan



Section 6

All Calculations

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

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

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

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

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

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

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

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

Control Devices: In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device

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

Compressor Engines (Units C-867 and C-868)

The emission rates for NO_X and CO were calculated using emissions factors from the most recent stack test with a 20% safety factor included. Emissions for VOCs were calculated using emission factors from the catalyst manufacturer data (Johnson & Matthey). SO_2 emissions were calculated based on the pipeline quality natural gas sulfur content of 5 gr/100 scf. Emission rates for particulate matter were calculated using emission factors from AP-42 Table 1.4-2 and hazardous air pollutants (HAPs) were calculated using emission factors from AP-42 Table 3.2-3. Greenhouse gas emissions were calculated using manufacturer fuel usage and emission factors from 40 CFR 98 Tables C-1 and C-2 for natural gas. Global warming potentials were taken from 40 CFR 98 Table A-1.

Compressor Engines (Units C-865 and C-880)

Natural gas combustion in internal combustion compressor engines is considered to generate emissions of nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOC) - which include several HAPs. Maximum emissions from the compressor engine are calculated based on emission factors provided by the manufacturers. All emission values listed in the application forms for the engines corresponds to 100% load at maximum engine speed. Estimated HAP emissions from the compressor engines are calculated based on GRI-HapCalc 3.0. Maximum hourly and annual NOx, CO, and VOC emissions are calculated below. Copies of the specification sheets and emission factors provided by the manufacturers were previously submitted to the Bureau and will not change.

Compressor Engines (Units C-878)

Natural gas combustion in internal combustion compressor engines is considered to generate emissions of nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOC) - which include several HAPs. Maximum emissions from the compressor engine are calculated based on emission factors provided by the manufacturers. All emission values listed in the application forms for the engines corresponds to 100% load at maximum engine speed. Estimated HAP emissions from the compressor engines are calculated based on GRI-HapCalc 3.0. Maximum hourly and annual NOx, CO, and VOC emissions are calculated below. Copies of the specification sheets and emission factors provided by the manufacturers were previously submitted to the Bureau and will not change.

Compressor Engines (Units C-320)

The emission rates for NO_X, CO, and VOC were calculated using emission factors from the catalyst manufacturer data. The emission rate for SO_X was calculated using the default fuel sulfur content from the AECTool of 0.025 grains total sulfur per scf. Emission rates for particulate matter and hazardous air pollutants (HAPs) were calculated using emission factors from AP-42 Table 3.2-2. Greenhouse gas emissions were calculated using manufacturer fuel usage and emission factors from 40 CFR 98 Tables C-1 and C-2 for natural gas. Global warming potentials were taken from 40 CFR 98 Table A-1.

Microturbines (Units CAP-1 & CAP-2)

Emissions of NO_X, CO, and VOC are calculated based on manufacturer data. Emissions of particulates are estimated using emission factors from AP-42 Table 3.1-2a. Emissions of SO_2 are based on fuel consumption and a fuel sulfur content of 2.5 grains total sulfur per Mscf fuel. GRI-HAPCalc was used to determine Total HAP and formaldehyde emissions. Greenhouse gas emissions were calculated based on emission factors from Tables C-1 and C-2 of 40 CFR Part 98.

Glycol Dehydrator Reboiler (Insignificant Unit Reboil-1)

The facility will be equipped with one external combustion sources: a dehy reboiler with a maximum heat input of 1.0 MMBtu/hr. The combustion sources result in CO2, CH4, and N2O from combustion and will be calculated using Equation C-2a and Equation C-9a from Subpart C of 40 CFR 98. The fuel records for this facility are not specific to the engine but rather the sum of the fuel used by the engine. Subpart C reporting allows like type units to be grouped together for emissions reporting.

Helium Recovery Unit (Insignificant Unit HRU)

Emissions from the HRU were estimated based on a representative feed analysis and the gas flow rate. The helium recovery unit will recover 97% of the helium and 3% of the N2 in the gas stream. This calculation of total VOC vented does not account for the recovered helium and N2 as they are not regulated pollutants.

Nitrogen Rejection Unit (Insignificant Unit NRU)
Emissions from the NRU were estimated based on a representative feed analysis and the gas flow rate.

Glycol Dehydrator (Unit Dehy-1)
The regenerator and flash tank emissions for Dehy-1 were calculated using GRI-GLYCalc.

Condensate Tanks (Units TK-1 and TK-2)
Flashing, working, and breathing emissions from the tanks were calculated using BR&E ProMax.

Truck Loadout from Condensate Tanks (Insignificant Unit Load)
Loading emissions from the condensate tanks were calculated using BR&E ProMax. The emissions are exempt pursuant to Insignificant List Item #1.a.

Unpaved Truck Hauling Emissions (Insignificant Unit Haul)
Unpaved haul road emissions are calculated using AP-42 13.2.2 Equations 1a and 2. This unit is exempt pursuant to Insignificant List Item #1.a.

Truck Loadout from NGL bullet tank (Insignificant Unit NGL Load)
Loading emissions from the NGL bullet tank were calculated using PV = nRT; where R = Universal Gas Constant 10.73 cubic feet *psi/lbmole * deg R. This unit's emissions are exempt pursuant to Insignificant List Item #1.a.

Facility-wide Fugitive Emissions (Unit FUG)
Fugitive emissions were calculated using component counts provided by facility engineers and emissions factors referenced from the "Protocol for Equipment Leak Emission Estimates" from the EPA (Table 2-4). A site-specific gas analysis was used to estimate composition.

Startup, Shutdown, and Maintenance/Malfunction (Unit SSM/M)
IACX is requesting 10 tpy VOC emissions associated with Startup, Shutdown and Maintenance (SSM) and Malfunction activities at the facility.

There are two types of blowdown events: unit blowdowns and facility blowdowns. Unit blowdowns are typically associated with SSM activities because they are predictable, and they can be scheduled in most cases. Unit blowdowns occur each time a unit is taken offline for maintenance and/or during startup. Regularly scheduled blowdowns would occur every month for regularly scheduled maintenance. Units are usually offline for two hours or less during a normal preventative maintenance procedure.

Facility blowdowns are emergency events that cannot be anticipated. These occur when the inlet valve must be shut due to unforeseen circumstances such as control valve failure. Facility shutdowns are rare and thus would not be considered SSM events, they are considered malfunctions.

Based on the above description, IACX has determined to request a maximum VOC emission limit of 10 tons per year to account for Startup, Shutdown, and Maintenance/Malfunction (SSM/M). In accordance with "Implementation Guidance for permitting SSM Emissions and Excess Emission" document issued 7 June 2012, "Instead of permitting SSM and upset/malfunction emissions separately, the applicant may request that emissions from both SSM and upset/malfunction be consolidated in the permit with a total limit of 10 tons per year per pollutant per facility for the combined category to reduce concerns about the appropriateness of activities listed as SSM."

Section 6.a

Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC) applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO_2e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO_2e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO_2e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO2e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following □ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

Sources for Calculating GHG Emissions:

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

Global Warming Potentials (GWP):
Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO_2 over a specified time period.

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

Metric to Short Ton Conversion:
Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.
1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

IACX Roswell LLC - Red Bluff #3 Compressor Station

Red Bluff No. 3 Compressor Station

Emissions Summary

Emission Units: All

Description: Facility-wide emissions

Uncontrolled Emissions[1]																		
Unit No.	NO_x		CO		VOC		SO_x		PM		PM_{10}		$PM_{2.5}$		H_2S		HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
C-865	4.43	19.4	5.58	24.5	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	0.44	1.92
C-867	29.97	131.26	20.75	90.9	0.69	3.03	0.11	0.46	0.066	0.29	0.066	0.29	0.066	0.29	-	-	0.80	3.51
C-868	25.50	111.68	17.65	77.3	0.59	2.58	0.090	0.40	0.066	0.29	0.066	0.29	0.066	0.29	-	-	0.68	2.99
C-878	11.8	51.8	7.19	31.1	1.8	7.8	0.48	2.1	0.060	0.25	0.060	0.25	0.060	0.25	<	<	0.37	1.63
C-880	4.43	19.4	5.58	24.5	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	0.44	1.92
C-320	13.2	57.8	13.2	57.8	0.46	2.03	3.02E-03	0.013	0.044	0.19	0.044	0.19	0.044	0.19	-	-	0.13	0.58
TK-1	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	0.12	0.53
TK-2	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	0.12	0.53
CAP-1	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	8.00E-03	0.035
CAP-2	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	8.00E-03	0.035
FUG	-	-	-	-	1.30	5.68	-	-	-	-	-	-	-	-	-	-	0.053	0.23
SSM	-	-	-	-	*	10.00	-	-	-	-	-	-	-	-	-	-	-	-
Dehy-1	-	-	-	-	9.06	39.70	-	-	-	-	-	-	-	-	-	-	0.63	2.74
Total	89.37	391.56	70.10	306.75	19.71	96.23	0.68	2.98	0.38	1.66	0.38	1.66	0.38	1.66	-	-	3.80	16.66

Controlled Emissions[2]																		
Unit No.	NO_x		CO		VOC		SO_x		PM		PM_{10}		$PM_{2.5}$		H_2S		HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
C-865	4.43	19.4	5.58	24.5	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	0.44	1.92
C-867	5.48	23.99	2.32	10.18	0.35	1.51	0.11	0.46	0.066	0.29	0.066	0.29	0.066	0.29	-	-	0.80	3.51
C-868	0.45	1.96	1.86	8.14	0.29	1.29	0.090	0.40	0.066	0.29	0.066	0.29	0.066	0.29	-	-	0.68	2.99
C-878	11.8	51.8	7.19	31.1	1.8	7.8	0.48	2.1	0.060	0.25	0.060	0.25	0.060	0.25	<	<	0.37	1.63
C-880	4.43	19.4	5.58	24.5	1.36	5.95	<	<	0.070	0.32	0.070	0.32	0.070	0.32	<	<	0.44	1.92
C-320	0.66	2.90	0.66	2.90	0.097	0.43	3.02E-03	0.013	0.044	0.19	0.044	0.19	0.044	0.19	-	-	0.13	0.58
TK-1	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	0.12	0.53
TK-2	-	-	-	-	1.54	6.72	-	-	-	-	-	-	-	-	-	-	0.12	0.53
CAP-1	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	8.00E-03	0.035
CAP-2	0.031	0.13	0.081	0.35	6.50E-03	0.029	5.22E-04	2.30E-03	5.20E-06	2.30E-05	5.20E-06	2.30E-05	5.22E-06	2.30E-05	<	<	8.00E-03	0.035
FUG	-	-	-	-	1.30	5.68	-	-	-	-	-	-	-	-	-	-	0.053	0.23
SSM	-	-	-	-	*	10.00	-	-	-	-	-	-	-	-	-	-	-	-
Dehy-1	-	-	-	-	9.06	39.70	-	-	-	-	-	-	-	-	-	-	0.63	2.74
Total	27.31	119.71	23.36	102.02	18.70	91.82	0.68	2.98	0.38	1.66	0.38	1.66	0.38	1.66	-	-	3.80	16.66

[1] Units C-865, C-878, and C-880 emissions are representative of NSR permit 412-M3R3. Units CAP-1 and CAP-2 emissions are representative of NSR 412-M3R5.

[2] Units C-865, C-878, and C-880 emissions are representative of TV permit P073-R3M2. Units CAP-1 and CAP-2 are representative of NSR 412-M3R5.

"<" representative of permit P073-R3M2.

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

Engine Emission Calculations

Engine Input Information	
Engine Make/Model	Waukesha L7042 GSIU
Unit	C-867
Engine Type	4SRB

Engine Parameters			
Specification	**Value**	**Units**	**Notes**
Hours of Operation	8760	hr/yr	-
Maximum Horsepower	1195	hp	TV Permit P073R3
Requested Horsepower	1045.63	hp	2019 Stack Test Data
Maximum Speed	1000	rpm	Manufacturer
Volumetric Exhaust	1113.18	CFM	2019 Stack Test Data
Fuel HHV	1050	Btu/scf	Nominal
Fuel Usage Rate	7458	Btu/hp-hr	Manufacturer
Heat Input Rating	7.80	MMBtu/hr	Calculated
Hourly Fuel Usage	7.43	Mscf/hr	Calculated
Annual Fuel Usage	65.06	MMscf/yr	Calculated
Stack Temp	1060	deg F	TV Permit P073R3
Stack Diameter	0.83	ft	TV Permit P073R3
Stack Height	40	ft	TV Permit P073R3
Stack Velocity	34.29	ft/s	Calculated

Uncontrolled Emissions for Criteria Pollutants, VOCs, and HAPs				
Pollutant	**EF (g/hp-hr)**	**Emissions (lb/hr)**	**(tpy)**	**Notes**
NO_X[1]	13.00	29.97	131.26	Manufacturer
CO[1]	9.00	20.75	90.87	Manufacturer
VOC[1]	0.30	0.69	3.03	Manufacturer
$PM/PM_{10}/PM_{2.5}$[2]	-	0.066	0.29	AP-42 Table 1.4-2
SO_2[3]	-	0.11	0.46	Pipeline Quality Natural Gas
Total HAPs[2]	-	0.80	3.51	AP-42 Table 3.2-3 (4SRB)
Formaldehyde[2]	-	0.16	0.70	AP-42 Table 3.2-3 (4SRB)

Controlled Emissions for Criteria Pollutants, VOCs, and HAPs					
Pollutant	**EF (g/hp-hr)**	**EF (With Safety Factor)[4] (g/hp-hr)**	**Emissions (lb/hr)**	**(tpy)**	**Notes**
NO_X	1.98	2.38	5.48	23.99	2019 Stack Test
CO	0.84	1.01	2.32	10.18	2019 Stack Test
VOC	0.15	-	0.35	1.51	Johnson & Matthey Catalyst
$PM/PM_{10}/PM_{2.5}$	-	-	0.066	0.29	AP-42 Table 1.4-2
SO_2	-	-	0.11	0.46	Pipeline Quality Natural Gas
Total HAPs	-	-	0.80	3.51	AP-42 Table 3.2-3 (4SRB)
Formaldehyde	-	-	0.16	0.70	AP-42 Table 3.2-3 (4SRB)

GHG Emissions Calculations					
Pollutant		**EF[5] kg/MMBtu**	**Emissions (lb/hr)**	**(tpy)**	**Notes**
CO_2		53.06	912.22	3,995.54	40 CFR 98 Subpart C Table C-1
CH_4		1.0E-03	0.017	0.075	40 CFR 98 Subpart C Table C-2
N_2O		1.0E-04	1.72E-03	0.0075	40 CFR 98 Subpart C Table C-2
CO_2e		-	913.17	3,999.67	

[1] Based on TV Permit P073R3

[2] AP-42 (7/2000) Table 3.2-3, 4-stroke rich burn (4SRB)

[3] SO_2 emissions calculated based on the pipeline quality natural gas sulfur content of 5 gr/100 scf

5 grains S/100 scf * 1 lb S/7000 grains S *(64 g/mol SO_2) / (32 g/mol S) * Fuel usage Mscf/hr

[4] A 20% safety factor has been added to NOx and CO emissions.

[5] 40 CFR Part 98, Subpart C, Table C-1 and Table C-2

IACX Roswell LLC - Red Bluff #3 Compressor Station

Engine Emission Calculations

Engine Input Information	
Engine Make/Model	Waukesha L7042 GSIU
Unit	C-868
Engine Type	4SRB

Engine Parameters			
Specification	**Value**	**Units**	**Notes**
Hours of Operation	8760	hr/yr	-
Maximum Horsepower	1195	hp	TV Permit P073R3
Requested Horsepower	889.66	hp	2019 Stack Test Data
Maximum Speed	1000	rpm	Manufacturer
Volumetric Exhaust	1252.21	CFM	2019 Stack Test Data
Fuel HHV	1050	Btu/scf	Nominal
Fuel Usage Rate	7458	Btu/hp-hr	Manufacturer
Heat Input Rating	6.64	MMBtu/hr	Calculated
Hourly Fuel Usage	6.32	Mscf/hr	Calculated
Annual Fuel Usage	55.36	MMscf/yr	Calculated
Stack Temp	1060	deg F	TV Permit P073R3
Stack Diameter	0.83	ft	TV Permit P073R3
Stack Height	40	ft	TV Permit P073R3
Stack Velocity	38.57	ft/s	Calculated

Uncontrolled Emissions for Criteria Pollutants, VOCs, and HAPs				
Pollutant	**EF (g/hp-hr)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Notes**
NO_X[1]	13.00	25.50	111.68	Manufacturer
CO[1]	9.00	17.65	77.32	Manufacturer
VOC[1]	0.30	0.59	2.58	Manufacturer
$PM/PM_{10}/PM_{2.5}$[2]	-	0.066	0.29	AP-42 Table 1.4-2
SO_2[3]	-	0.090	0.40	Pipeline Quality Natural Gas
Total HAPs[2]	-	0.68	2.99	AP-42 Table 3.2-3 (4SRB)
Formaldehyde[2]	-	0.14	0.60	AP-42 Table 3.2-3 (4SRB)

Controlled Emissions for Criteria Pollutants, VOCs, and HAPs					
Pollutant	**EF (g/hp-hr)**	**EF (With Safety Factor)[4] (g/hp-hr)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Notes**
NO_X	0.19	0.23	0.45	1.96	2019 Stack Test
CO	0.79	0.95	1.86	8.14	2019 Stack Test
VOC	0.15	-	0.29	1.29	Johnson & Matthey Catalyst
$PM/PM_{10}/PM_{2.5}$	-	-	0.066	0.29	AP-42 Table 1.4-2
SO_2	-	-	0.090	0.40	Pipeline Quality Natural Gas
Total HAPs	-	-	0.68	2.99	AP-42 Table 3.2-3 (4SRB)
Formaldehyde	-	-	0.14	0.60	AP-42 Table 3.2-3 (4SRB)

GHG Emissions Calculations					
Pollutant		**EF[5] kg/MMBtu**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Notes**
CO_2		53.06	776.15	3,399.55	40 CFR 98 Subpart C Table C-1
CH_4		1.0E-03	0.015	0.064	40 CFR 98 Subpart C Table C-2
N_2O		1.0E-04	1.46E-03	0.0064	40 CFR 98 Subpart C Table C-2
CO_2e		-	776.95	3,403.06	

[1] Based on TV Permit P073R3

[2] AP-42 (7/2000) Table 3.2-3, 4-stroke rich burn (4SRB)

[3] SO_2 emissions calculated based on the pipeline quality natural gas sulfur content of 5 gr/100 scf

5 grains S/100 scf * 1 lb S/7000 grains S *(64 g/mol SO_2) / (32 g/mol S) * Fuel usage Mscf/hr

[4] A 20% safety factor has been added to NOx and CO emissions.

[5] 40 CFR Part 98, Subpart C, Table C-1 and Table C-2

IACX Roswell LLC

Red Bluff No. 3 Compressor Station

Caterpillar CG137-12 - Unit C-320

Emission Unit:	C-320		
Description:	Natural Gas Compressor - 4SRB		
Manufacturer:	Caterpillar		
Model:	CG137-12		
Serial No.:	TBD		
Manufacture Date:	TBD		
Rated Speed:	1800	RPM	Manufacturer
Rated Horse Power:	600	hp	Manufacturer
Fuel Consumption:	7400	BTU/hp-hr	Manufacturer
Fuel Heating Value:	1050	Btu/scf	Nominal
Heating Rate:	4.44	MMBtu/hr	Calculated
Fuel Usage	0.0042	MMscf/hr	Calculated
	37.0	MMscf/yr	Calculated
Operating Hours:	8760	hr/yr	

Emission Rates

Uncontrolled Emissions

NO_x	CO	VOC[1]	SO_2[2]	PM[3]	HCHO	Total HAPs[4]	CO_2	CH_4	N_2O	CO_2e		
9.97	9.97	0.35			0.070						g/hp-hr	Catalyst Manufacturer Data
							531	3.86			g/hp-hr	Manufacturer Data
				0.010					1.00E-04		lb/MMBtu	AP-42 Table 3.2-2, 40 CFR 98 Table C-2
											lb/MMBtu	Scaled for Fuel Heat Value
			0.0025								gr S/scf	
13.19	**13.19**	**0.46**	**0.0030**	**0.044**	**0.093**	**0.13**	**702.39**	**5.11**	**4.44E-04**	**830.17**	**lb/hr**	
57.76	**57.76**	**2.03**	**0.013**	**0.19**	**0.41**	**0.58**	**3076.48**	**22.36**	**1.94E-03**	**3636.15**	**tpy**	

Controlled Emissions

NO_x	CO	VOC[1]	SO_2[2]	PM[3]	HCHO	Total HAPs[4]	CO_2	CH_4	N_2O	CO_2e		
0.50	0.50	0.074			0.070						g/hp-hr	Catalyst Manufacturer Data
95.0%	95.0%	79.0%			0.0%						%	Control Efficiency
							531	3.86			g/hp-hr	Manufacturer Data
				0.010					1.00E-04		lb/MMBtu	AP-42 Table 3.2-2, 40 CFR 98 Table C-2
											lb/MMBtu	Scaled for Fuel Heat Value
			0.0025								gr S/scf	
0.66	**0.66**	**0.097**	**0.0030**	**0.044**	**0.093**	**0.13**	**702.39**	**5.11**	**4.44E-04**	**830.17**	**lb/hr**	
2.90	**2.90**	**0.43**	**0.013**	**0.19**	**0.41**	**0.58**	**3076.48**	**22.36**	**1.94E-03**	**3636.15**	**tpy**	

Notes

[1] VOC emissions include VOC plus HCOH emissions.

[2] SO_2 is calculated based on the default fuel sulfur content from AECT of 0.0025 grains total sulfur per scf.

[3] It is assumed that PM = PM_{10} = $PM_{2.5}$, PM emissions are derivied from AP 42 emissions factors and converted to g/hp-hr using engine specifications.

[4] Total HAPs were calculated using AP-42 emissions factors for a 4-Stroke Rich Burn Engine.

Glycol Dehydrator Emission Calculations

Dehydrator Input Information		
Make	Lakota	
Model Number	N/A	
Serial Number	N/A	
Unit(s):	Dehy-1	
Annual Operating Hours	8760	hr
Dry Gas Flow Rate	25	MMscf/day

VOC and HAP Emissions								
Pollutant Emissions	**Uncontrolled Flash Tank Emissions[1]**		**Regenerator Emissions[2]**		**Total Uncontrolled Emissions[3]**		**Total Controlled Emissions**	
	lb/hr	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**
Methane	12.1236	53.1013	0.0163	0.0713	12.1399	53.1726	12.14	53.17
Carbon Dioxide	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00
Hydrogen Sulfide	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00
Ethane	2.5761	11.2834	0.0117	0.0514	2.5878	11.3348	2.59	11.33
Propane	2.4638	10.7915	0.0191	0.0835	2.4829	10.8750	2.48	10.88
Isobutane	0.7525	3.2958	0.0065	0.0284	0.7590	3.3242	0.76	3.32
n-Butane	1.7091	7.4859	0.0161	0.0706	1.7252	7.5565	1.73	7.56
Isopentane	0.7643	3.3475	0.0046	0.0201	0.7689	3.3676	0.77	3.37
n-Pentane	0.8709	3.8145	0.0047	0.0204	0.8756	3.8349	0.88	3.83
n-Hexane	0.5769	2.5270	0.0023	0.0101	0.5792	2.5371	0.58	2.54
Cyclo Hexane	0.0216	0.0944	0.0002	0.0011	0.0218	0.0955	0.02	0.10
Other Hexanes	0.8080	3.5388	0.0034	0.0150	0.8114	3.5538	0.81	3.55
Methylcyclohexane	0.2502	1.0959	0.0018	0.0078	0.2520	1.1037	0.25	1.10
Heptanes	0.5012	2.1951	0.0014	0.0061	0.5026	2.2012	0.50	2.20
Benzene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00
Toluene	0.0060	0.0264	0.0002	0.0009	0.0062	0.0273	0.01	0.03
Ethylbenzene	0.0158	0.0693	0.0005	0.0020	0.0163	0.0713	0.02	0.07
Xylenes	0.0237	0.1038	0.0007	0.0033	0.0244	0.1071	0.02	0.11
C8+	0.2392	1.0477	0.0001	0.0002	0.2393	1.0479	0.24	1.05
TOTAL VOC	9.00	39.43	0.062	0.27	9.06	39.70	**9.06**	**39.70**
TOTAL HAP	0.62	2.73	0.0037	0.016	0.63	2.74	**0.63**	**2.74**

[1] From "Flash Tank Off Gas" stream in GLYCalc Report

[2] From "Controlled Regenerator Emissions" stream in GLYCalc Report (controlled with condenser).

[3] Summation of the Uncontrolled Flash Tank Emissions and Regenerator Emissions

Condensate Tank Emissions

Uncontrolled Tank Emissions[1]				
Emissions	Total VOC		Total HAP	
	TK-1	TK-2	TK-1	TK-2
	tpy	tpy	tpy	tpy
Flash	0.70	0.70	0.04	0.04
Working & Breathing	6.02	6.02	0.49	0.49
Total	6.72	6.72	0.53	0.53

Notes

[1] Emissions are calculated using ProMax.

Facility-Wide Fugitive Emissions

Emission Factors and Emission Rates for VOCs and HAPs							
Equipment Type	**Emission Factor (lb/hr/ source)**	**Source Count ***	**% VOC C3+**	**VOC Emission Rate (lb/hr)**	**VOC Emission Rate (tpy)**	**HAP Emission Rate (lb/hr)**	**HAP Emission Rate (tpy)**
Valves - Inlet Gas	0.00992	100	9.071%	0.09	0.39	0.01	0.05
Valves - Liquid	0.00551	20	100.00%	0.11	0.48	0.00	0.01
Relief Valves/Other	0.01940	105	9.07%	0.18	0.81	0.024	0.105
Pump Seals - Liquid	0.02866	30	100.00%	0.86	3.77	0.010	0.044
Flanges/Connectors - Inlet Gas	0.00086	35	9.07%	2.73E-03	0.01	3.53E-04	1.55E-03
Flanges/Connectors - Liquid	0.00024	25	100.00%	6.05E-03	0.03	7.10E-05	3.11E-04
Compressor Seals	0.01940	25	9.07%	0.044	0.19	0.006	0.025
Total				**1.30**	**5.68**	**0.053**	**0.23**

* Source counts are actuals from the facility.
Source: EPA Protocol for Equipment Leak Emission Estimates, November, 1995, EPA-453/R-95-017

IACX - Red Bluff #3 Compressor Station

Capstone C65 Microturbine

Emission Unit: CAP-1, CAP-2
Source Description: Natural Gas-Fired Microturbine

Annual operating hours: 8,760

Parameters	Value	Unit	Note
Maximum Power Rating	65	kW	Manufacturer data
Maximum Horsepower	87.17	hp	Calculated
Total Mass Flow of Exhaust	1.08	lb/s	Manufacturer data
Fuel Heating Value	1,050	Btu/scf	Nominal
Net Heat Rate LHV	11,800	Btu/kWh	Manufacturer data
Fuel Usage	767,000	Btu/hr	Calculated
Hourly Fuel Usage	0.73	Mscf/hr	Calculated
Annual Fuel Usage	6.4	MMscf/yr	Calculated
Heat Input	0.77	MMBtu/hr	Calculated

Emissions per Unit

	NOx	CO	VOC	SO_2[1]	PM[2]	Total HAP[3]	HCOH[3]	CO_2	CH_4	N_2O	CO_2e[5]	Unit	Note
Emission Factors	0.16	0.42	0.034									g/hp-hr	Manufacturer data
					0.0066							lb/MMBtu	AP-42 Table 3.1-2a
					0.0068							lb/MMBtu	EF adjusted based on fuel heat value[4]
								53.06	0.001	1.0E-04		kg/MMBtu	Table C-1 and C-2 of 40 CFR Part 98
								116.73	0.0022	2.2E-04		lb/MMBtu	
Emission Rates	***0.031***	***0.081***	***0.0065***	***5.22E-04***	***5.2E-06***			***89.5***	***0.0017***	***1.7E-04***	***89.6***	***lb/hr***	
						0.0080	***0.0032***					***lb/hr***	
	0.13	***0.35***	***0.029***	***0.0023***	***2.3E-05***	***0.035***	***0.014***	***392.2***	***0.0074***	***7.4E-04***	***392.6***	***tpy***	*8760 hrs/yr*

[1] SO_2 emissions based on fuel consumption and fuel sulfur content of 2.5 gr S/Mscf
2 gr S/Mscf * fuel scf/hr * 1 lb/7000 gr * 64 lb SO_2/ 32 lb S = lb/hr SO_2

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

[3] GRI HAPCalc

[4] AP-42 Table 1.4-1 natural gas heat value is: 1,020 Btu/scf

[5] Global Warming Potentials (GWP) are from Table A-1 of the EPA GHG MRR under 40 CFR Part 98.
CH_4 GWP = 25
N_2O GWP = 298

Exhaust Parameters

Parameters	Value	Unit	Note
Exhaust temp	588	°F	Manufacturer data
Stack height	15.0	ft	Engineering Estimate
Stack diameter	1.00	ft	Engineering Estimate
Exhaust flow (Actual)	540	acfm	*Flow (acfm) = Flow (scfm) * (Stack Temp + 460) / 528 * 29.92 / Site Bar. Pres. / (100% - Moisture%)*
Exhaust velocity	11.5	ft/sec	Exhaust flow / stack area
O_2 F factor	8,710	dscf/MMBtu	Method 9
Moisture	10	%	nominal
Exhaust flow (Dry)	213.5	dscfm	= heat input * O2 F * [20.9 / (20.9 - O2%)]
O_2 %	10	%	
Site Elevation	3,741	ft MSL	
Pressure at Elevation	26.09	in Hg	

Caterpillar G3516 TALE

- Maximum emissions calculated based on 100% load.
- Nominal power rating is 1340 hp at 100% load.
- Unit is turbocharged and is not derated, per NMED policy.
- 1.50 g/hp-hr NOx uncontrolled (engine manufacturer data).
- 1.89 g/hp-hr CO uncontrolled (engine manufacturer data).
- 0.46 g/hp-hr VOC uncontrolled (engine manufacturer data).
- Maximum fuel firing rate is 7471 Btu/hp-hr at 100% load (manufacturer specifications).
- Heating value of fuel gas is 1049 Btu/scf.
- Unit is authorized for 8760 hr/yr of operation at 100% load.
- Maximum particulate emissions are estimated using AP-42 emission factors for natural gas combustion.
- 7.6 lb/10^6 scf (Table 1.4-2)

Maximum Fuel Consumption

(7471 Btu/hp-hr)(1340 hp) / (1049 Btu/scf) = 9544 scf/hr

Maximum Uncontrolled Emissions

NO_x = (1.50 g/hp-hr)(1340 hp) / (453.6 g/lb) = 4.43 lb/hr = 19.40 tn/yr

CO = (1.89 g/hp-hr)(1340 hp) / (453.6 g/lb) = 5.58 lb/hr = 24.5 tn/yr

VOC = (0.46 g/hp-hr)(1340 hp) / (453.6 g/lb) = 1.36 lb/hr = 5.95 tn/yr

PM = (9544 scf/hr)(7.6 lb/10^6 scf) = 0.07 lb/hr = 0.32 tn/yr

Superior 8GTLA

- Maximum emissions calculated based on 100% load.
- Nominal power rating is 1073 hp at 100% load.
- Unit is turbocharged and is not derated, per NMED policy.
- 5.0 g/hp-hr NOx uncontrolled (engine manufacturer data).
- 3.0 g/hp-hr CO uncontrolled (engine manufacturer data).
- 0.75 g/hp-hr VOC uncontrolled (engine manufacturer data).
- Maximum fuel firing rate is 7400 Btu/hp-hr at 100% load (manufacturer specifications).
- Heating value of fuel gas is 1049 Btu/scf.
- Unit is authorized for 8760 hr/yr of operation at 100% load.
- Maximum particulate emissions are estimated using AP-42 emission factors for natural gas combustion.
- 7.6 lb/10^6 scf (Table 1.4-2)

Maximum Fuel Consumption

(7400 Btu/hp-hr)(1073 hp) / (1049 Btu/scf) = 7569 scf/hr

Maximum Uncontrolled Emissions

NOx = (5.0 g/hp-hr)(1073 hp) / (453.6 g/lb) = 11.83 lb/hr = 51.8 tn/yr

CO = (3.0 g/hp-hr)(1073 hp) / (453.6 g/lb) = 7.10 lb/hr = 31.1 tn/yr

VOC = (0.75 g/hp-hr)(1073 hp) / (453.6 g/lb) = 1.77 lb/hr = 7.8 tn/yr

PM = (7569 scf/hr)(7.6 lb/10^6 scf) = 0.06 lb/hr = 0.25 tn/yr

Insignificant Equipment

IACX - Red Bluff #3 Compressor Station

HRU Vent Emissions

Emission Unit: HRU-1
Source Description: Helium Recovery Unit (HRU)

HRU Vent Flow Rate 0.925 MMSCFD

Component	MW	HRU Inlet mol %[1]	HRU Vent mol %	HRU Vent lb/year[2]	HRU Vent lb/hr	HRU Vent ton/yr
He	4.0	0.41%	4.40%	156,373.68	17.85	78.19
N2	28.01	7.00%	40.99%	10,200,983.09	1,164.50	5,100.49
CO2	44.01	0.29%	0.00%	0.00	0.00	0.00
CH4	16.04	84.95%	54.59%	7,779,800.47	888.11	3,889.90
C2	30.07	4.81%	0.027%	7,266.97	0.83	3.63
C3	44.1	1.72%	0.0021%	826.75	0.094	0.413
iC4	58.12	0.24%	0.00%	0.00	0.00	0.00
nC4	58.12	0.42%	0.00%	0.00	0.00	0.00
iC5	72.15	0.08%	0.00%	0.00	0.00	0.00
nC5	72.15	0.07%	0.00%	0.00	0.00	0.00
C6	86.18	0.01%	0.00%	0.00	0.00	0.00
Total VOC				**826.75**	**0.094**	**0.413**

[1] Representative feed analysis

[2] HRU Vent scf x mol % x 365 days x MW lb/lbmol / 380 scf/lbmol = lb/year
The helium recovery unit will recover 97% of the helium and 3% of the N2. This calculation of total VOC vented does not account for the recovered helium and N2 as they are not regulated pollutants.

IACX - Red Bluff #3 Compressor Station

NRU Vent Emissions

Emission Unit: NRU-1
Source Description: Nitrogen Rejection Unit (NRU)

NRU Vent Flow Rate	0.185	MMSCFD	Per NRU
Number of NRU	5.0		
NRU Vent Flow Rate	0.925	MMSCFD	Site total for 5 NRUs

Component	MW	NRU Inlet mol %[1]	NRU Vent mol %	NRU Vent lb/year[2]	NRU Vent lb/hr	NRU Vent ton/yr
He	4.0	0.41%	4.40%	156,373.68	17.85	78.19
N2	28.01	7.00%	40.99%	10,200,983.09	1,164.50	5,100.49
CO2	44.01	0.29%	0.00%	0.00	0.00	0.00
CH4	16.04	84.95%	54.59%	7,779,800.47	888.11	3,889.90
C2	30.07	4.81%	0.027%	7,266.97	0.83	3.63
C3	44.1	1.72%	0.0021%	826.75	0.094	0.413
iC4	58.12	0.24%	0.00%	0.00	0.00	0.00
nC4	58.12	0.42%	0.00%	0.00	0.00	0.00
iC5	72.15	0.08%	0.00%	0.00	0.00	0.00
nC5	72.15	0.07%	0.00%	0.00	0.00	0.00
C6	86.18	0.01%	0.00%	0.00	0.00	0.00
Total		100.0%	100.0%	18,145,251.0	2,071.4	9,072.6
Total VOC				**826.75**	**0.094**	**0.413**

[1] Representative feed analysis
[2] NRU Vent scf x mol % x 365 days x MW lb/lbmol / 380 scf/lbmol = lb/year

IACX Roswell LLC - Red Bluff #3 Compressor Station

Dehydrator Reboiler Emission Calculations

Heater Input Information	
Make/Model	Thermoflux
Serial Number	4140-02
Unit(s):	Rebl-1

Heater Parameters		
Input heat rate	1.00	MMBtu/hr
Fuel heat value	1050	Btu/scf
Fuel rate	0.95	Mscf/hr
Annual operating hours	8760	hours
Annual fuel usage	8.34	MMscf/yr

Emissions for Criteria Pollutants, VOCs and HAPs

NO_x [1]	CO [1]	VOC [1]	SO_2 [2]	PM [1,3]	HCHO	Toluene	Benzene	n-Hexane	Naphthalene	Dichlorobenzene	HAPs	Units
100	84	5.5	-	7.6	0.075	3.40E-03	2.10E-03	1.80E+00	6.10E-04	1.20E-03	-	lb/MMscf
102.9	86.5	5.7	-	7.8	0.077	3.50E-03	2.16E-03	1.85E+00	6.28E-04	1.24E-03	-	lb/MMscf
0.098	0.082	0.0054	0.014	0.0075	7.35E-05	3.33E-06	2.06E-06	1.76E-03	5.98E-07	1.18E-06	1.85E-03	lb/hr [4]
0.43	0.36	0.024	0.060	0.033	3.22E-04	1.46E-05	9.02E-06	7.73E-03	2.62E-06	5.15E-06	8.08E-03	tons/yr [5]

GHG Emissions Calculations

Pollutant	EF [6] kg/MMBtu	Emissions (lb/hr)	Emissions (tpy)	Notes
CO_2	53.06	116.98	61.41	40 CFR 98 Subpart C Table C-1
CH_4	1.0E-03	2.20E-03	1.16E-03	40 CFR 98 Subpart C Table C-2
N_2O	1.0E-04	2.20E-04	1.16E-04	40 CFR 98 Subpart C Table C-2
CO_2e	-	117.10	61.48	

[1] Emission factors from AP-42 Tables 1.4-1 and 1.4-2 (7/98)
Emission factors have been adjusted according to AP-42: EF (at fuel heating value) = Fuel Heat Value / EF Heat Value (1020 Btu/scf) * EF (at 1020 Btu/scf)

[2] SO_2 emissions based on fuel content of 5 grains of sulfur per 100 scf
SO_2 lb/hr = 5gr S/100 scf * Fuel usage (scf/hr) * 1 lb/7000 gr * 64lb SO_2/ 32lb S

[3] Assumes PM (Total) = PM_{10}= $PM_{2.5}$

[4] Hourly emission rates calculated as follows:
NO_X, CO, VOC, PM, HAPs lb/hr = EF (lb/MMscf) * Fuel usage (Mscf/hr) * 1MMscf/1000Mscf

[5] Annual emissions calculated as follows:
tons/yr = Hourly emissions (lb/hr) * Hours of operation * 1ton/2000lb

[6] GHG emission factors taken from 40 CFR Part 98, Subpart C, Table C-1 and Table C-2

Truck Loading

Emission unit: Load

Source Description: Condensate Loading

ProMax Tank Loading Emissions		
Condensate Tanks		
VOC Emissions		
0.020	lb/hr	Total
0.087	tpy	Total
HAP Emissions		
0.0071	lb/hr	Total
0.031	tpy	Total

Individual HAP Emission Calculations	
Condensate Tanks	
HAP	**tons/yr**
n-Hexane	0.007
Benzene	3.76E-04
Toluene	1.09E-04
Ethylbenzene	1.08E-06
Xylenes	7.33E-06
Total	**0.0071**

TPY Values for All Tanks	
Pollutant	**tons/yr**
VOC	0.087
HAPs	0.031

IACX Roswell LLC - Red Bluff #3 Compressor Station

Red Bluff No. 3 Compressor Station

Unit: NGL LOAD

Hose Parameters

Vapor Hose Diameter	2	inches
Vapor Hose Length	10	foot
Hose Volume	0.218	ft^3
Number of Hoses	2	
Total Hose Volume	0.436	ft^3

NGL Data[1]

NGL Tank Pressure	321.27	psia
NGL Throughput	24	bbl/day
NGL Throughput	28,000	gal/month
Capacity of Tank	9000	gal/load
NGL Throughput	3.11	loads/month

[1] Values obtained from a similar facility.

Physical Data

Loadout Temperature (T)	591.67	R
Molecular Weight	46.315	lb/lbmol
Moles in the vapor phase (n)	2.21E-02	$lbmol/ft^3$
Vapor Density[2]	1.02E+00	lb/ft^3

[2] Calculated using PV = nRT, where R = Universal Gas Constant 10.73 cubic feet *psi/lbmole * deg R

VOC Emissions from Pressurized NGL Loadout

Source	Density (lb/ft^3)	Hose Volume (ft^3/load)	Loads per month	Monthly Emissions (lb/month)[3]	Annual Emissions (tpy)[4]
Vapor Hoses	1.023	0.436	3.11	1.39	0.0083
Total				1.39	0.0083

[3] Monthly Emissions (lb/month) = Density (lb/ft^3) x Hose Volume (ft^3/load) x Loads per month (load/month)

$$\text{Monthly Emission Rate (lb/month)} = \frac{1.02\ \text{lb}}{\text{ft}^3} \times \frac{0.436332313\ \text{load}}{} \times \frac{3.1111111\ \text{month}}{} = \frac{1.39\ \text{lb}}{\text{month}}$$

[4] Annual Emission Rate (tpy) = Uncontrolled emission rate (lb/hr) x (8,760 hr/yr) / (2,000 lb/ton).

$$\text{Annual Emission Rate (tpy)} = \frac{1.39\ \text{month}}{} \times \frac{12\ \text{months}}{\text{yr}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = \frac{8.33\text{E-}03\ \text{lb}}{\text{yr}}$$

Haul Road Emissions

Haul Road Input Information	
Unit(s):	Haul
Source Description:	Fugitive Dust Generated by Trucks

Unpaved Haul Road Parameters		
Parameter	**Value**	**Unit**
Empty Vehicle Weight[1]	16	ton
Load Size [2]	26.8	ton
Loaded Vehicle Weight[3]	42.8	ton
Mean Vehicle Weight[4]	29.4	ton
Vehicles Per Day [5]	1.00	VPD
Vehicles Per Year	365	VPY
Segment Length	7.58E-03	mile
Trips per Segment	1	-
Effective Segment Length[6]	7.58E-03	mile
Trips per Hour[7]	0.042	-
Wet Days[8]	70	day
Surface Silt Content[9]	4.8	%
Control Efficiency	0	%

[1] Empty vehicle weight includes driver and occupants and full fuel load.

[2] Include cargo, transported materials, etc. (7.1 lb/gal RVP5 *7560 gal truck/ 2000lb/ton)

[3] Loaded vehicle weight = Empty + Load Size

[4] Mean Vehicle weight = (Loaded Weight + Empty Weight) / 2

[5] Client provided

[6] Effective segment length = trips per segment * segment length

[7] Trips per hour = Vehicles per day * Segments per trip ÷ Hours of Operation per Day

[8] Wet days is the NM default allowed by NMED without additional justification

[9] Surface silt content based on AP-42 Section 13.2.2.3

Unpaved Road Emission Factors

Route	Calculation Parameters [1]												Hourly Emission Factors			Annual Emission Factors		
	s	W	P	k			a			b			E [2]			E_{ext}		
	Silt Content [1]	Mean Vehicle Weight	Wet Days	PM_{30}	PM_{10}	$PM_{2.5}$	PM_{30}	PM_{10}	$PM_{2.5}$	PM_{30}	PM_{10}	$PM_{2.5}$	PM_{30}	PM_{10}	$PM_{2.5}$	PM_{30}	PM_{10}	$PM_{2.5}$
	%	tons	day	lb/VMT	lb/VMT	lb/VMT							lb/VMT	lb/VMT	lb/VMT	lb/VMT	lb/VMT	lb/VMT
Trucks	4.8	29.42	70	4.9	1.5	0.15	0.70	0.90	0.90	0.45	0.45	0.45	7.21	1.84	0.18	5.83	1.48	0.15

[1] Emission factors calculated per AP-42 Sec. 13.2.2.3 November, 2006, Equation 2.

Unpaved Road Emissions

Route	Calculation Inputs						Uncontrolled Emissions						Controlled Emissions					
	Annual Operation	Segment Length	Trips per Segment	Number of Trucks per Year	Effective Segment Length	Average VMT/yr	PM_{30}		PM_{10}		$PM_{2.5}$		PM_{30}		PM_{10}		$PM_{2.5}$	
	hr	mi		trucks/yr	mi	mi/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Trucks	8,760	7.58E-03	1	365	0.01	3	0.0023	0.0081	0.00058	0.0021	0.000058	0.00021	0.0023	0.0081	0.00058	0.0021	0.00006	0.00021
Totals							**0.0023**	**0.0081**	**0.00058**	**0.0021**	**0.000058**	**0.00021**	**0.0023**	**0.0081**	**0.00058**	**0.0021**	**0.00006**	**0.00021**

[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 (%)

k, a, b = constants from AP-42 Table 13.2.2-2

W = Weighted Mean Vehicle Weight from Haul Road Inputs (tons)

[3] VMT/hr = Vehicle Miles Travelled per hour= Trips per hour * Segment Length

[4] Wet Day Emission Factor = E * (365 - Wet Days)/365. Wet days value is the NM default allowed by NMED without additional justification.

[5] Controlled Emissions = Uncontrolled Emissions * (1 - Control Factor/100%)

Control Efficiency = 0%

Section 7

Information Used To Determine Emissions

Information Used to Determine Emissions shall include the following:

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

Compressor Engines (Units C-867 and C-868)

- Recent Stack Tests
- Manufacturer Engine and Catalyst Data (Johnson & Matthey)
- AP-42 Table 1.4-2
- AP-42 Table 3.2-3
- 40 CFR 98 Subparts A and C

Compressor Engines (Units C-865 and C-880)

- Manufacturer Engine Data
- AP-42 Table 1.4-2
- AP-42 Table 3.2-3
- 40 CFR 98 Subparts A and C

Compressor Engines (Unit C-878)

- Manufacturer Engine Data
- AP-42 Table 1.4-2
- AP-42 Table 3.2-3
- 40 CFR 98 Subparts A and C

Compressor Engines (Unit C-320)

- Manufacturer Engine and Catalyst Data
- AP-42 Table 1.4-2
- AP-42 Table 3.2-3
- 40 CFR 98 Subparts A and C

Microturbines (Units CAP-1 & CAP-2)

- Manufacturer data
- AP-42 Table 3.1-2a
- GRI-HAPCalc output
- Tables C-1 and C-2 of 40 CFR Part 98

Helium Recovery Unit (Unit HRU)
- Representative feed analysis

Nitrogen Recovery Unit (Unit NRU)
- Representative feed analysis

Glycol Dehydrator Reboiler (Unit Reboil-1)
- Manufacturer Data
- AP-42 Table 1.4-1 & 2

Glycol Dehydrator (Unit Dehy-1)
- Extended Gas Analysis
- GRI-GLYCalc
- 40 CFR 98 Subparts A and C

Condensate Tanks (Units TK-1 and TK-2)
- Liquids Analysis
- BR&E ProMax

Truck Loadout from Condensate Tanks (Unit Load)
- Liquids Analysis
- BR&E ProMax

Unpaved Truck Hauling Emissions (Unit Haul)
- AP-42 13.2.2 Equations 1a and 2

Facility-wide Fugitive Emissions (Unit FUG)
- Gas analysis
- Protocol for Equipment Leak Emission Estimates from the EPA (Table 2-4)

2.0 PERFORMANCE OVERVIEW SUMMARY

Results of the emissions test are summarized in Table 2-1 and Table 2-2 below; the site conditions are tabulated in Table 2-3: Test Conditions and Operational Data. Emissions rates and factors were calculated using the methods discussed in Section 5 – Emissions Calculations.

Table 2-1: Customer and Source Summary

TEST INFORMATION	
Test Prepared For	IACX Energy 5400 LBJ Freeway, Suite 460 Dallas, TX 75240
Responsible Contact	David Rowland Phone: 575-513-0572 Email: davidrowland@iacxroswell.com
Test Location	RedBluff#3
Unit Number	867
Test Date	Oct 10, 2019
Source	Waukesha L7042GSIU
Source Serial Number	350138
Site Rated Horsepower	1195
Source Purpose	Compressor
Permit Number	P073R2M1
Hour Meter Reading	167385

Table 2-2: Test Results

TEST RESULTS AND UNIT OPERATIONAL DATA					
Parameter	**Units**	**Average**	**Run 1**	**Run 2**	**Run 3**
Fuel Consumption	(sft^3/hr)	7,283.98	7,299.42	7,285.64	7,266.87
O2 Percentage	%	0.21	0.20	0.21	0.21
Adjusted O2 Percentage	%	0.02	0.03	0.02	0.02
Exhaust Flow Rate	($dsft^3$/hr)	66,790.82	67495.23	67406.56	67231.02
Engine Power	(bhp)	967.80	1,044.43	1,045.63	813.33
Engine Load	%	80.99	87.40	87.50	68.06
Speed	RPM	874.33	874.00	875.00	874.00
Parameter	**Permitted**	**Average**	**Run 1**	**Run 2**	**Run 3**
CO					
ppmvd		332.68	397.93	337.74	262.37
ppm at 15% O2		93.79	112.24	95.19	73.95
lb/MMBTU HHV		0.21	0.25	0.21	0.17
g/bhp-hr		0.77	0.84	0.71	0.71
lb/hr	2.30	1.62	1.94	1.64	1.27
ton/yr		7.08	8.49	7.19	5.57
NOx					
ppmvd		379.91	324.37	369.19	446.15
ppm at 15% O2		107.10	91.49	104.06	125.76
lb/MMBTU HHV		0.40	0.34	0.39	0.47
g/bhp-hr		1.44	1.13	1.28	1.98
lb/hr	5.30	3.03	2.59	2.95	3.55
ton/yr		13.28	11.37	12.90	15.55

Table 2-3: Test Conditions and Operational Data

TEST RUN TIMES					
			Run 1	Run 2	Run 3
		Start Time	17:50:54	18:16:19	18:42:24
		End Time	18:11:54	18:37:19	19:03:24
SITE CONDITIONS					
Parameter	**Units**	**Average**	**Run 1**	**Run 2**	**Run 3**
Ambient Temperature	F	77.00	75.00	77.00	79.00
Humidity	%	32.00	30.00	34.00	32.00
Barometric Pressure	"Hg	30.01	30.01	30.01	30.01
ENGINE DATA					
Manifold Pressure	PSIg	7.00	7.00	7.00	7.00
Speed	RPM	874.33	874.00	875.00	874.00
Intake Manifold Temp	°F	110.33	110.00	109.00	112.00

2.0 PERFORMANCE OVERVIEW SUMMARY

Results of the emissions test are summarized in Table 2-1 and Table 2-2 below; the site conditions are tabulated in Table 2-3: Test Conditions and Operational Data. Emissions rates and factors were calculated using the methods discussed in Section 5 – Emissions Calculations.

Table 2-1: Customer and Source Summary

TEST INFORMATION	
Test Prepared For	IACX Energy 5400 LBJ Freeway, Suite 460 Dallas, TX 75240
Responsible Contact	David Rowland Phone: 575-513-0572 Email: davidrowland@iacxroswell.com
Test Location	Red Bluff #3
Unit Number	868
Test Date	Dec 16, 2019
Source	Waukesha L7042GSIU
Source Serial Number	23528/A
Site Rated Horsepower	1195
Source Purpose	Compressor
Permit Number	P073R2M1
Hour Meter Reading	4749

Table 2-2: Test Results

TEST RESULTS AND UNIT OPERATIONAL DATA					
Parameter	**Units**	**Average**	**Run 1**	**Run 2**	**Run 3**
Fuel Consumption	(sft^3/hr)	8,100.76	8,179.75	8,076.87	8,045.66
O2 Percentage	%	0.06	0.06	0.06	0.06
Adjusted O2 Percentage	%	0.00	0.00	0.00	0.00
Exhaust Flow Rate	($dsft^3$/hr)	74,201.41	75132.42	74186.68	73901.48
Engine Power	(bhp)	879.44	889.66	876.34	872.32
Engine Load	%	73.59	74.45	73.33	73.00
Speed	RPM	884.67	886.00	884.00	884.00
Parameter	**Permitted**	**Average**	**Run 1**	**Run 2**	**Run 3**
CO					
ppmvd		259.58	285.83	237.10	255.81
ppm at 15% O2		73.10	80.50	66.77	72.04
lb/MMBTU HHV		0.16	0.18	0.15	0.16
g/bhp-hr		0.72	0.79	0.66	0.71
lb/hr	2.30	1.40	1.56	1.28	1.37
ton/yr		6.14	6.82	5.59	6.01
NOx					
ppmvd		39.68	42.22	38.86	37.95
ppm at 15% O2		11.17	11.89	10.94	10.69
lb/MMBTU HHV		0.04	0.04	0.04	0.04
g/bhp-hr		0.18	0.19	0.18	0.17
lb/hr	5.30	0.35	0.38	0.34	0.33
ton/yr		1.54	1.66	1.50	1.46

Table 2-3: Test Conditions and Operational Data

TEST RUN TIMES					
			Run 1	Run 2	Run 3
		Start Time	13:36:00	14:01:00	14:26:00
		End Time	13:57:00	14:22:00	14:47:00
SITE CONDITIONS					
Parameter	**Units**	**Average**	**Run 1**	**Run 2**	**Run 3**
Ambient Temperature	F	50.00	50.00	50.00	50.00
Humidity	%	50.00	50.00	50.00	50.00
Barometric Pressure	"Hg	30.00	30.00	30.00	30.00
ENGINE DATA					
Ignition Timing	BTDC	24.00	24.00	24.00	24.00
Speed	RPM	884.67	886.00	884.00	884.00

DRESSER Waukesha

L7042GSI

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

Specifications

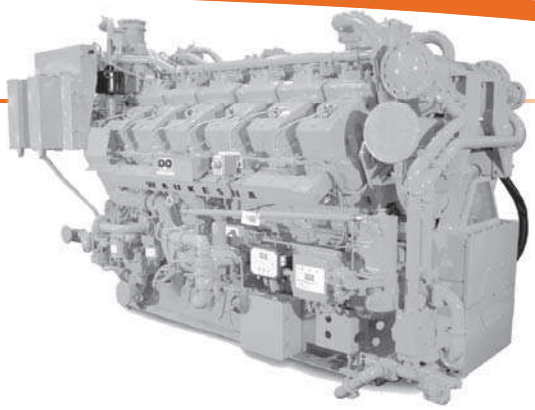


Image may not be an accurate representation of this model

Cylinders: V12
Piston Displacement: 7040 cu. in. (115 L)
Bore & Stroke: 9.375" x 8.5" (238 x 216 mm)
Compression Ratio: 8:1
Jacket Water System Capacity: 100 gal. (379 L)
Lube Oil Capacity: 190 gal. (719 L)
Starting System: 125 - 150 psi air/gas 24V electric
Dry Weight: 21,000 lb. (9525 kg)

Standard Equipment

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

AIR FUEL RATIO CONTROL (AFR) – Integrated ESM® - AFR catalyst rich-burn control, main fuel gas regulator actuators, exhaust O2 sensor(s), and post turbocharger exhaust thermocouple. Factory mounted and tested. AFR maintains emissions through load and speed changes. The ESM AFR meets Canadian Standards Association Class 1, Division 2, Group A, B, C & D (Canada & US) hazardous location requirements. Note: For dual fuel applications, ESM AFR system will control the primary fuel source only.

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.

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 wet type bainitic cast iron 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.

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 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.

ENGINE ROTATION – Counterclockwise when facing flywheel.

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. Two natural gas, 4" (102 mm) updraft carburetors and two mounted Fisher 99, 2" (51 mm) gas regulators, 30 – 60 psi (207 – 414 kPa) fuel inlet pressure required. 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 – Ignition Power Module (IPM) controlled by ESM, with spark timing. 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 – 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 S6543-36 performance curve for use with standard 10" diameter crankshaft pulley.

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: L7042GSI 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
L7042GSI	8:1	9.375'' x 8.5'' (238 x 216)	7040 (115)	1480	1834	1233	1528	1110	1376	987	1223
				(1104)	(1368)	(920)	(1139)	(828)	(1026)	(736)	(912)

		1200 rpm		1000 rpm	
		C	I	C	I
	Power bhp (kWb)	1480 (1104)	1834 (1368)	1233 (919)	1528 (1139)
	BSFC (LHV) Btu/bhp-hr (kJ/kWh)	7696 (10774)	7457 (10550)	7458 (10553)	7225 (10222)
	Fuel Consumption Btu/hr x 1000 (kW)	11390 (3304)	13677 (4009)	9196 (2694)	11040 (3234)
Emissions	NOx g/bhp-hr (mg/nm^3 @ 5% O_2)	13.00 (4815)	13.00 (4815)	13.00 (4815)	13.00 (4815)
	CO g/bhp-hr (mg/nm^3 @ 5% O_2)	9.00 (3333)	9.00 (3333)	9.00 (3333)	9.00 (3333)
	THC g/bhp-hr (mg/nm^3 @ 5% O_2)	2.00 (741)	2.00 (741)	2.00 (741)	2.00 (741)
	NMHC g/bhp-hr (mg/nm^3 @ 5% O_2)	0.30 (111)	0.30 (111)	0.30 (111)	0.30 (111)
Heat Balance	Heat to Jacket Water Btu/hr x 1000 (kW)	3526 (1033)	4125 (1209)	2908 (852)	3380 (991)
	Heat to Lube Oil Btu/hr x 1000 (kW)	352 (103)	382 (112)	310 (91)	338 (99)
	Heat to Intercooler Btu/hr x 1000 (kW)	228 (67)	403 (118)	118 (35)	212 (62)
	Heat to Radiation Btu/hr x 1000 (kW)	662 (194)	681 (200)	584 (171)	611 (179)
	Total Exhaust Heat Btu/hr x 1000 (kW)	3281 (962)	3705 (1086)	2482 (728)	2880 (844)
Intake/ Exhaust System	Induction Air Flow scfm (Nm^3/hr)	2275 (3496)	2650 (3993)	1836 (2822)	2140 (3224)
	Exhaust Flow lb/hr (kg/hr)	10124 (4592)	12070 (5475)	8173 (3707)	9745 (4421)
	Exhaust Temperature °F (°C)	1126 (608)	1145 (618)	1056 (569)	1096 (591)

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/ft^3 (35.3 MJ/nm^3) 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/ft^3 (35.3 MJ/nm^3) SLHV.

Heat data based on fuel consumption +2%.

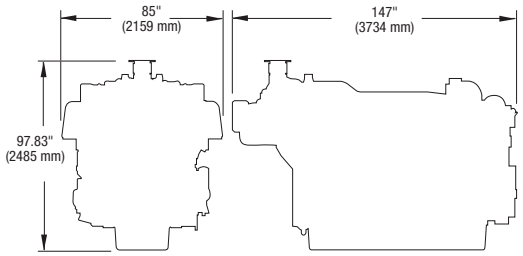
Heat rejection based on cooling exhaust temperature to 77°F (25°C).

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.



Dresser, Inc.
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DRESSER Waukesha

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www.dresser.com/waukesha

JOHNSON MATTHEY

EMISSION CONTROL EQUIPMENT SPECIFICATION

434 Devon Park Drive, Wayne, PA 19087
Tel: 610.971.3160 Fax: 610.971.3116

AGAVE ENERGY — Date: 9/10/04

Emission Data

Jenifer Knowlton

ENGINE DATA	Rich Burn
Engine Mfg:	Waukesha
Engine Model:	7042GSI
Bhp:	1078
RPM:	900
Load:	100%
Fuel:	Natural Gas
Temp into Catalyst, °F:	1050
Operating Hours, hrs/yr:	8760

ENGINE PREFORMANCE	
Exhaust Flow, acfm:	4600
Exhaust Flow, scfm:	1574
Exhaust Flow, scfh:	94421
Exhaust Flow, lb/hr:	7118
Exhaust MW:	28.6

TYPICAL (Rich Burn)	MW	
Ar, vol %:	39.9	-
N2, vol %:	28.0	79.70
O2, vol %:	32.0	0.30
H2O, vol%:	18.0	10.00
CO2, vol %:	44.0	10.00

EMISSIONS DATA	PRE	POST	% Reduction
NOx as NO2, g/Bhp-hr:	13.00	2.00	84.6%
NOx as NO2, lb/hr:	30.90	4.75	
NOx as NO2, tons/yr:	135.35	20.82	
NOx as NO2, ppmv:	2,700.78	415.50	
NOx as NO2, ppmvd @ 15% O2:	860.86	132.44	
CO, g/Bhp-hr:	9.00	2.00	77.8%
CO, lb/hr:	21.39	4.75	
CO, tons/yr:	93.70	20.82	
CO, ppmv:	3,071.76	682.61	
CO, ppmvd @ 15% O2:	979.11	217.58	
THC as CH4, g/Bhp-hr:	2.00	1.00	50.0%
THC as CH4, lb/hr:	4.75	2.38	
THC as CH4, tons/yr:	20.82	10.41	
THC as CH4, ppmv:	1,194.57	597.29	
THC as CH4, ppmvd @ 15% O2:	380.77	190.38	
NMHC as CH4, g/Bhp-hr:	0.30	0.15	50.0%
NMHC as CH4, lb/hr:	0.71	0.36	
NMHC as CH4, tons/yr:	3.12	1.56	
NMHC as CH4, ppmv:	179.19	89.59	
NMHC as CH4, ppmvd @ 15% O2:	57.11	28.56	

SCOPE OF SUPPLY	QRC68-12
Exhaust Line Size, (inches)	12
Attenuation type	Critical
Drawing reference	8201-1
Element (s):	1
Housing:	Carbon
Back Pressure: estimated (inches H2O)	7

G. W. Kennemer, Engine Industrial Sales Manager 281.358.3500 fax: 281-355-4558 email: kennemerg@jmusa.com

Engine exhaust data shown is sourced from engine manufacturer data corresponding to catalyst converter settings. A slightly rich to stoichiometric air fuel ratio is required (oxygen content in the exhaust of 0.3% - 0.7%), (oxygen sensor will read signal of 700 - 800, or between of 0.97 - 0.99). Maximum service temperature 1300 degree F. Minimum operating temperature 750 degree F. The reduction and efficiency information is the calculated, complete values that can be achieved when the engine is operating at the conditions referenced above. And the testing according to the engine manufacturer specification for catalytic operation. Warranty 12 months from date of shipment or 12 months from date of start-up. Written notice required.

JM

Johnson Matthey

Table I Engine Rich burn

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 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES[a]
(SCC 2-02-002-53)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	2.21 E+00	A
NO_x[c] <90% Load	2.27 E+00	C
CO[c] 90 - 105% Load	3.72 E+00	A
CO[c] <90% Load	3.51 E+00	C
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	3.58 E-01	C
Methane[g]	2.30 E-01	C
VOC[h]	2.96 E-02	C
PM10 (filterable)[i,j]	9.50 E-03	E
PM2.5 (filterable)[j]	9.50 E-03	E
PM Condensable[k]	9.91 E-03	E
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[l]	2.53 E-05	C
1,1,2-Trichloroethane[l]	<1.53 E-05	E
1,1-Dichloroethane	<1.13 E-05	E
1,2-Dichloroethane	<1.13 E-05	E
1,2-Dichloropropane	<1.30 E-05	E
1,3-Butadiene[l]	6.63 E-04	D
1,3-Dichloropropene[l]	<1.27 E-05	E
Acetaldehyde[l,m]	2.79 E-03	C
Acrolein[l,m]	2.63 E-03	C
Benzene[l]	1.58 E-03	B
Butyr/isobutyraldehyde	4.86 E-05	D
Carbon Tetrachloride[l]	<1.77 E-05	E

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES (Concluded)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Chlorobenzene[l]	<1.29 E-05	E
Chloroform[l]	<1.37 E-05	E
Ethane[n]	7.04 E-02	C
Ethylbenzene[l]	<2.48 E-05	E
Ethylene Dibromide[l]	<2.13 E-05	E
Formaldehyde[l,m]	2.05 E-02	A
Methanol[l]	3.06 E-03	D
Methylene Chloride[l]	4.12 E-05	C
Naphthalene[l]	<9.71 E-05	E
PAH[l]	1.41 E-04	D
Styrene[l]	<1.19 E-05	E
Toluene[l]	5.58 E-04	A
Vinyl Chloride[l]	<7.18 E-06	E
Xylene[l]	1.95 E-04	A

[a] Reference 7. Factors represent uncontrolled levels. For NO_x, CO, and PM-10, "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. PM10 = Particulate Matter $\leq$ 10 microns (μm) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

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

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

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

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2,

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

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

[100-Year Time Horizon]

Name	CAS No.	Chemical formula	Global warming potential (100 yr.)
Chemical-Specific GWPs			
Carbon dioxide	124-38-9	CO_2	1
Methane	74-82-8	CH_4	[a] 25
Nitrous oxide	10024-97-2	N_2O	[a] 298
Fully Fluorinated GHGs			
Sulfur hexafluoride	2551-62-4	SF_6	[a] 22,800
Trifluoromethyl sulphur pentafluoride	373-80-8	SF_5CF_3	17,700
Nitrogen trifluoride	7783-54-2	NF_3	17,200
PFC-14 (Perfluoromethane)	75-73-0	CF_4	[a] 7,390
PFC-116 (Perfluoroethane)	76-16-4	C_2F_6	[a] 12,200
PFC-218 (Perfluoropropane)	76-19-7	C_3F_8	[a] 8,830
Perfluorocyclopropane	931-91-9	$C\text{-}C_3F_6$	17,340
PFC-3-1-10 (Perfluorobutane)	355-25-9	C_4F_{10}	[a] 8,860
PFC-318 (Perfluorocyclobutane)	115-25-3	$C\text{-}C_4F_8$	[a] 10,300
PFC-4-1-12 (Perfluoropentane)	678-26-2	C_5F_{12}	[a] 9,160
PFC-5-1-14 (Perfluorohexane, FC-72)	355-42-0	C_6F_{14}	[a] 9,300
PFC-6-1-12	335-57-9	C_7F_{16}; $CF_3(CF_2)_5CF_3$	[b] 7,820
PFC-7-1-18	307-34-6	C_8F_{18}; $CF_3(CF_2)_6CF_3$	[b] 7,620
PFC-9-1-18	306-94-5	$C_{10}F_{18}$	7,500
PFPMIE (HT-70)	NA	$CF_3OCF(CF_3)CF_2OCF_2OCF_3$	10,300
Perfluorodecalin (cis)	60433-11-6	$Z\text{-}C_{10}F_{18}$	[b] 7,236
Perfluorodecalin (trans)	60433-12-7	$E\text{-}C_{10}F_{18}$	[b] 6,288
Saturated Hydrofluorocarbons (HFCs) With Two or Fewer Carbon-Hydrogen Bonds			
HFC-23	75-46-7	CHF_3	[a] 14,800
HFC-32	75-10-5	CH_2F_2	[a] 675
HFC-125	354-33-6	C_2HF_5	[a] 3,500
HFC-134	359-35-3	$C_2H_2F_4$	[a] 1,100
HFC-134a	811-97-2	CH_2FCF_3	[a] 1,430
HFC-227ca	2252-84-8	$CF_3CF_2CHF_2$	[b] 2640

HFC-227ea	431-89-0	C_3HF_7	[a] 3,220
HFC-236cb	677-56-5	$CH_2FCF_2CF_3$	1,340
HFC-236ea	431-63-0	CHF_2CHFCF_3	1,370
HFC-236fa	690-39-1	$C_3H_2F_6$	[a] 9,810
HFC-329p	375-17-7	$CHF_2CF_2CF_2CF_3$	[b] 2360
HFC-43-10mee	138495-42-8	$CF_3CFHCFHCF_2CF_3$	[a] 1,640
Saturated Hydrofluorocarbons (HFCs) With Three or More Carbon-Hydrogen Bonds			
HFC-41	593-53-3	CH_3F	[a] 92
HFC-143	430-66-0	$C_2H_3F_3$	[a] 353
HFC-143a	420-46-2	$C_2H_3F_3$	[a] 4,470
HFC-152	624-72-6	CH_2FCH_2F	53
HFC-152a	75-37-6	CH_3CHF_2	[a] 124
HFC-161	353-36-6	CH_3CH_2F	12
HFC-245ca	679-86-7	$C_3H_3F_5$	[a] 693
HFC-245cb	1814-88-6	$CF_3CF_2CH_3$	[b] 4620
HFC-245ea	24270-66-4	$CHF_2CHFCHF_2$	[b] 235
HFC-245eb	431-31-2	$CH_2FCHFCF_3$	[b] 290
HFC-245fa	460-73-1	$CHF_2CH_2CF_3$	1,030
HFC-263fb	421-07-8	$CH_3CH_2CF_3$	[b] 76
HFC-272ca	420-45-1	$CH_3CF_2CH_3$	[b] 144
HFC-365mfc	406-58-6	$CH_3CF_2CH_2CF_3$	794
Saturated Hydrofluoroethers (HFEs) and Hydrochlorofluoroethers (HCFEs) With One Carbon-Hydrogen Bond			
HFE-125	3822-68-2	CHF_2OCF_3	14,900
HFE-227ea	2356-62-9	$CF_3CHFOCF_3$	1,540
HFE-329mcc2	134769-21-4	$CF_3CF_2OCF_2CHF_2$	919
HFE-329me3	428454-68-6	$CF_3CFHCF_2OCF_3$	[b] 4,550
1,1,1,2,2,3,3-Heptafluoro-3-(1,2,2,2-tetrafluoroethoxy)-propane	3330-15-2	$CF_3CF_2CF_2OCHFCF_3$	[b] 6,490
Saturated HFEs and HCFEs With Two Carbon-Hydrogen Bonds			
HFE-134 (HG-00)	1691-17-4	CHF_2OCHF_2	6,320
HFE-236ca	32778-11-3	$CHF_2OCF_2CHF_2$	[b] 4,240
HFE-236ca12 (HG-10)	78522-47-1	$CHF_2OCF_2OCHF_2$	2,800
HFE-236ea2 (Desflurane)	57041-67-5	$CHF_2OCHFCF_3$	989
HFE-236fa	20193-67-3	$CF_3CH_2OCF_3$	487
HFE-338mcf2	156053-88-2	$CF_3CF_2OCH_2CF_3$	552
HFE-338mmz1	26103-08-2	$CHF_2OCH(CF_3)_2$	380
HFE-338pcc13 (HG-01)	188690-78-0	$CHF_2OCF_2CF_2OCHF_2$	1,500
HFE-43-10pccc (H-Galden 1040x, HG-11)	E1730133	$CHF_2OCF_2OC_2F_4OCHF_2$	1,870
HCFE-235ca2 (Enflurane)	13838-16-9	CHF_2OCF_2CHFCl	[b] 583
HCFE-235da2 (Isoflurane)	26675-46-7	$CHF_2OCHClCF_3$	350
HG-02	205367-61-9	$HF_2C-(OCF_2CF_2)$	[b] 3,825
HG-03	173350-37-3	$HF_2C-(OCF_2CF_2)$	[b] 3,670

HG-20	249932-25-0	HF_2C-(OCF_2)	[b] 5,300
HG-21	249932-26-1	HF_2C-$OCF_2CF_2OCF_2OCF_2O$-CF_2H	[b] 3,890
HG-30	188690-77-9	HF_2C-(OCF_2)	[b] 7,330
1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12,13,13,15,15-eicosafluoro-2,5,8,11,14-Pentaoxapentadecane	173350-38-4	$HCF_2O(CF_2CF_2O)_4CF_2H$	[b] 3,630
1,1,2-Trifluoro-2-(trifluoromethoxy)-ethane	84011-06-3	$CHF_2CHFOCF_3$	[b] 1,240
Trifluoro(fluoromethoxy)methane	2261-01-0	CH_2FOCF_3	[b] 751
Saturated HFEs and HCFEs With Three or More Carbon-Hydrogen Bonds			
HFE-143a	421-14-7	CH_3OCF_3	756
HFE-245cb2	22410-44-2	$CH_3OCF_2CF_3$	708
HFE-245fa1	84011-15-4	$CHF_2CH_2OCF_3$	286
HFE-245fa2	1885-48-9	$CHF_2OCH_2CF_3$	659
HFE-254cb2	425-88-7	$CH_3OCF_2CHF_2$	359
HFE-263fb2	460-43-5	$CF_3CH_2OCH_3$	11
HFE-263m1; R-E-143a	690-22-2	$CF_3OCH_2CH_3$	[b] 29
HFE-347mcc3 (HFE-7000)	375-03-1	$CH_3OCF_2CF_2CF_3$	575
HFE-347mcf2	171182-95-9	$CF_3CF_2OCH_2CHF_2$	374
HFE-347mmy1	22052-84-2	$CH_3OCF(CF_3)_2$	343
HFE-347mmz1 (Sevoflurane)	28523-86-6	$(CF_3)_2CHOCH_2F$	[c] 216
HFE-347pcf2	406-78-0	$CHF_2CF_2OCH_2CF_3$	580
HFE-356mec3	382-34-3	$CH_3OCF_2CHFCF_3$	101
HFE-356mff2	333-36-8	$CF_3CH_2OCH_2CF_3$	[b] 17
HFE-356mmz1	13171-18-1	(CF_3)	27
HFE-356pcc3	160620-20-2	$CH_3OCF_2CF_2CHF_2$	110
HFE-356pcf2	50807-77-7	$CHF_2CH_2OCF_2CHF_2$	265
HFE-356pcf3	35042-99-0	CHF_2OCH	502
HFE-365mcf2	22052-81-9	$CF_3CF_2OCH_2CH_3$	[b] 58
HFE-365mcf3	378-16-5	$CF_3CF_2CH_2OCH_3$	11
HFE-374pc2	512-51-6	$CH_3CH_2OCF_2CHF_2$	557
HFE-449s1 (HFE-7100) Chemical blend	163702-07-6	C_4F	297
	163702-08-7	(CF_3)	
HFE-569sf2 (HFE-7200) Chemical blend	163702-05-4	$C_4F_9OC_2H_5$	59
	163702-06-5	$(CF_3)_2CFCF_2OC_2H_5$	
HG'-01	73287-23-7	$CH_3OCF_2CF_2OCH_3$	[b] 222
HG'-02	485399-46-0	$CH_3O(CF_2CF_2O)_2CH_3$	[b] 236
HG'-03	485399-48-2	$CH_3O(CF_2CF_2O)$	[b] 221
Difluoro(methoxy)methane	359-15-9	CH_3OCHF_2	[b] 144
2-Chloro-1,1,2-trifluoro-1-methoxyethane	425-87-6	CH_3OCF_2CHFCl	[b] 122
1-Ethoxy-1,1,2,2,3,3,3-heptafluoropropane	22052-86-4	$CF_3CF_2CF_2OCH_2CH_3$	[b] 61
2-Ethoxy-3,3,4,4,5-pentafluorotetrahydro-2,5-bis[1,2,2,2-tetrafluoro-1-	920979-28-8	$C_{12}H_5F_{19}O_2$	[b] 56

(trifluoromethyl)ethyl]-furan			
1-Ethoxy-1,1,2,3,3,3-hexafluoropropane	380-34-7	CF_3CHFCF	[b] 23
Fluoro(methoxy)methane	460-22-0	CH_3OCH_2F	[b] 13
1,1,2,2-Tetrafluoro-3-methoxy-propane; Methyl 2,2,3,3-tetrafluoropropyl ether	60598-17-6	$CHF_2CF_2CH_2OCH_3$	[b] 0.5
1,1,2,2-Tetrafluoro-1-(fluoromethoxy)ethane	37031-31-5	$CH_2FOCF_2CF_2H$	[b] 871
Difluoro(fluoromethoxy)methane	461-63-2	CH_2FOCHF_2	[b] 617
Fluoro(fluoromethoxy)methane	462-51-1	CH_2FOCH_2F	[b] 130
Fluorinated Formates			
Trifluoromethyl formate	85358-65-2	$HCOOCF_3$	[b] 588
Perfluoroethyl formate	313064-40-3	$HCOOCF_2CF_3$	[b] 580
1,2,2,2-Tetrafluoroethyl formate	481631-19-0	$HCOOCHFCF_3$	[b] 470
Perfluorobutyl formate	197218-56-7	$HCOOCF_2CF_2CF_2CF_3$	[b] 392
Perfluoropropyl formate	271257-42-2	$HCOOCF_2CF_2CF_3$	[b] 376
1,1,1,3,3,3-Hexafluoropropan-2-yl formate	856766-70-6	$HCOOCH(CF_3)$	[b] 333
2,2,2-Trifluoroethyl formate	32042-38-9	$HCOOCH_2CF_3$	[b] 33
3,3,3-Trifluoropropyl formate	1344118-09-7	$HCOOCH_2CH_2CF_3$	[b] 17
Fluorinated Acetates			
Methyl 2,2,2-trifluoroacetate	431-47-0	CF_3COOCH_3	[b] 52
1,1-Difluoroethyl 2,2,2-trifluoroacetate	1344118-13-3	$CF_3COOCF_2CH_3$	[b] 31
Difluoromethyl 2,2,2-trifluoroacetate	2024-86-4	$CF_3COOCHF_2$	[b] 27
2,2,2-Trifluoroethyl 2,2,2-trifluoroacetate	407-38-5	$CF_3COOCH_2CF_3$	[b] 7
Methyl 2,2-difluoroacetate	433-53-4	HCF_2COOCH_3	[b] 3
Perfluoroethyl acetate	343269-97-6	$CH_3COOCF_2CF_3$	[b] 2.1
Trifluoromethyl acetate	74123-20-9	CH_3COOCF_3	[b] 2.0
Perfluoropropyl acetate	1344118-10-0	$CH_3COOCF_2CF_2CF_3$	[b] 1.8
Perfluorobutyl acetate	209597-28-4	$CH_3COOCF_2CF_2CF_2CF_3$	[b] 1.6
Ethyl 2,2,2-trifluoroacetate	383-63-1	$CF_3COOCH_2CH_3$	[b] 1.3
Carbonofluoridates			
Methyl carbonofluoridate	1538-06-3	$FCOOCH_3$	[b] 95
1,1-Difluoroethyl carbonofluoridate	1344118-11-1	$FCOOCF_2CH_3$	[b] 27
Fluorinated Alcohols Other Than Fluorotelomer Alcohols			
Bis(trifluoromethyl)-methanol	920-66-1	$(CF_3)_2CHOH$	195
(Octafluorotetramethy-lene) hydroxymethyl group	NA	$X\text{-}(CF_2)_4CH(OH)\text{-}X$	73
2,2,3,3,3-Pentafluoropropanol	422-05-9	$CF_3CF_2CH_2OH$	42
2,2,3,3,4,4,4-Heptafluorobutan-1-ol	375-01-9	C_3F_7CH2OH	[b] 25
2,2,2-Trifluoroethanol	75-89-8	CF_3CH_2OH	[b] 20
2,2,3,4,4,4-Hexafluoro-1-butanol	382-31-0	$CF_3CHFCF_2CH_2OH$	[b] 17
2,2,3,3-Tetrafluoro-1-propanol	76-37-9	$CHF_2CF_2CH_2OH$	[b] 13
2,2-Difluoroethanol	359-13-7	CHF_2CH2OH	[b] 3
2-Fluoroethanol	371-62-0	CH_2FCH_2OH	[b] 1.1

4,4,4-Trifluorobutan-1-ol	461-18-7	$CF_3(CH_2)$	[b] 0.05
Unsaturated Perfluorocarbons (PFCs)			
PFC-1114; TFE	116-14-3	$CF_2=CF_2$; C_2F_4	[b] 0.004
PFC-1216; Dyneon HFP	116-15-4	C_3F_6; $CF_3CF=CF_2$	[b] 0.05
PFC C-1418	559-40-0	c-C_5F_8	[b] 1.97
Perfluorobut-2-ene	360-89-4	$CF_3CF=CFCF_3$	[b] 1.82
Perfluorobut-1-ene	357-26-6	$CF_3CF_2CF=CF_2$	[b] 0.10
Perfluorobuta-1,3-diene	685-63-2	$CF_2=CFCF=CF_2$	[b] 0.003
Unsaturated Hydrofluorocarbons (HFCs) and Hydrochlorofluorocarbons (HCFCs)			
HFC-1132a; VF2	75-38-7	C_2H	[b] 0.04
HFC-1141; VF	75-02-5	C_2H	[b] 0.02
(E)-HFC-1225ye	5595-10-8	$CF_3CF=CHF(E)$	[b] 0.06
(Z)-HFC-1225ye	5528-43-8	$CF_3CF=CHF(Z)$	[b] 0.22
Solstice 1233zd(E)	102687-65-0	$C_3H_2ClF_3$; $CHCl=CHCF_3$	[b] 1.34
HFC-1234yf; HFO-1234yf	754-12-1	$C_3H_2F_4$; $CF_3CF=CH_2$	[b] 0.31
HFC-1234ze(E)	1645-83-6	$C_3H_2F_4$; trans-$CF_3CH=CHF$	[b] 0.97
HFC-1234ze(Z)	29118-25-0	$C_3H_2F_4$Cis-$CF_3CH=CHF$; $CF_3CH=CHF$	[b] 0.29
HFC-1243zf; TFP	677-21-4	$C_3H_3F_3$, $CF_3CH=CH_2$	[b] 0.12
(Z)-HFC-1336	692-49-9	$CF_3CH=CHCF_3(Z)$	[b] 1.58
HFC-1345zfc	374-27-6	$C_2F_5CH=CH_2$	[b] 0.09
Capstone 42-U	19430-93-4	$C_6H_3F_9$, $CF_3(CF_2)$	[b] 0.16
Capstone 62-U	25291-17-2	$C_8H_3F_{13}$, $CF_3(CF_2)_5CH=CH_2$	[b] 0.11
Capstone 82-U	21652-58-4	$C_{10}H_3F_{17}$, $CF_3(CF_2)_7CH=CH_2$	[b] 0.09
Unsaturated Halogenated Ethers			
PMVE; HFE-216	1187-93-5	$CF_3OCF=CF_2$	[b] 0.17
Fluoroxene	406-90-6	$CF_3CH_2OCH=CH_2$	[b] 0.05
Fluorinated Aldehydes			
3,3,3-Trifluoro-propanal	460-40-2	CF_3CH_2CHO	[b] 0.01
Fluorinated Ketones			
Novec 1230 (perfluoro (2-methyl-3-pentanone))	756-13-8	$CF_3CF_2C(O)CF(CF3)_2$	[b] 0.1
Fluorotelomer Alcohols			
3,3,4,4,5,5,6,6,7,7,7-Undecafluoroheptan-1-ol	185689-57-0	CF	[b] 0.43
3,3,3-Trifluoropropan-1-ol	2240-88-2	$CF_3CH_2CH_2OH$	[b] 0.35
3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-Pentadecafluorononan-1-ol	755-02-2	$CF_3(CF_2)_6CH_2CH_2OH$	[b] 0.33
3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-Nonadecafluoroundecan-1-ol	87017-97-8	$CF_3(CF_2)_8CH_2CH_2OH$	[b] 0.19
Fluorinated GHGs With Carbon-Iodine Bond(s)			
Trifluoroiodomethane	2314-97-8	CF_3I	[b] 0.4
Other Fluorinated Compounds			

Dibromodifluoromethane (Halon 1202)	75-61-6	CBR_2F_2	[b] 231
2-Bromo-2-chloro-1,1,1-trifluoroethane (Halon-2311/Halothane)	151-67-7	$CHBrClCF_3$	[b] 41

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

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

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

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

[d] For electronics manufacturing (as defined in § 98.90), the term "fluorinated GHGs" in the definition of each fluorinated GHG group in § 98.6 shall include fluorinated heat transfer fluids (as defined in § 98.98), whether or not they are also fluorinated GHGs.

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

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Federal Environment and Safety Codified Regulations
TITLE 40—Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
SUBPART C—General Stationary Fuel Combustion Sources

Table C-1 to Subpart C of Part 98 —Default CO_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)	1.026×10^{-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
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	2.516×10^{-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	0.092×10^{-3}	274.32
Coke Oven Gas	0.599×10^{-3}	46.85
Fuel Gas [4]	1.388×10^{-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	0.485×10^{-3}	52.07
Other Biomass Gases	0.655×10^{-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.

Federal Environment and Safety Codified Regulations
TITLE 40—Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
SUBPART C—General Stationary Fuel Combustion Sources

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)	1.1×10^{-02}	1.6×10^{-03}
Natural Gas	1.0×10^{-03}	1.0×10^{-04}
Petroleum Products (All fuel types in Table C-1)	3.0×10^{-03}	6.0×10^{-04}
Fuel Gas	3.0×10^{-03}	6.0×10^{-04}
Other Fuels—Solid	3.2×10^{-02}	4.2×10^{-03}
Blast Furnace Gas	2.2×10^{-05}	1.0×10^{-04}
Coke Oven Gas	4.8×10^{-04}	1.0×10^{-04}
Biomass Fuels—Solid (All fuel types in Table C-1, except wood and wood residuals)	3.2×10^{-02}	4.2×10^{-03}
Wood and wood residuals	7.2×10^{-03}	3.6×10^{-03}
Biomass Fuels—Gaseous (All fuel types in Table C-1)	3.2×10^{-03}	6.3×10^{-04}
Biomass Fuels—Liquid (All fuel types in Table C-1)	1.1×10^{-03}	1.1×10^{-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.

[75 FR page 79154, Dec. 17, 2010; 78 FR page 71952, Nov. 29, 2013; 81 FR page 89252, Dec. 9, 2016]

ISSN 2167-8065

HOWARD
Athens, TX (903) 677-0700 . Beeville, TX (361) 354-5200 . Midland, TX (432) 704-5351

GAS EXTENDED ANALYSIS REPORT

LAB REPORT NUMBER: 190812-1020-08-081219-02_8_12_2019 4_14_01 PM

PHYSICAL CONSTANTS PER GPA 2145-16

CUSTOMER :	IACX	DATE SAMPLED:	08/08/2019
STATION:	37636	DATE ANALYZED:	08/12/2019
PRODUCER:	IACX	EFFECTIVE DATE:	08/01/2019
LEASE:	RB #3 NRU INLET		

COMPONENT	MOLE %	GPM	WT. %
HELIUM	0.404		0.087
H2S	0.000		0.000
OXYGEN	0.037		0.064
NITROGEN	5.920		8.960
CARBON DIOXIDE	0.029		0.069
METHANE	86.251		74.760
ETHANE	4.280	1.141	6.953
PROPANE	1.669	0.458	3.978
I-BUTANE	0.268	0.087	0.842
N-BUTANE	0.556	0.175	1.746
I-PENTANE	0.165	0.060	0.643
N-PENTANE	0.173	0.062	0.674
HEXANE PLUS	0.248	0.100	1.224
TOTAL	100.000	2.083	100.000

REAL SP. GRAVITY	0.6402	REAL BTU DRY	1040.657
MOL. WT.	18.508	REAL BTU SAT	1022.445
Z FACTOR	0.9977	PRESS BASE	14.650
C2+ GPM	2.083	C4+ GPM	0.484
C3+ GPM	0.942	C5+ GPM	0.222

SAMPLED BY	RA	SAMPLE PRESS:	110
SAMPLE TYPE:	COMPOSITE	SAMPLE TEMP:	100
CYLINDER NO.:	5064	COUNTY / STATE:	0
COMMENT:	COMPOSITE	ANALYST	MIKE HOBGOOD

* SEE NEXT PAGE FOR C6+ COMPOSITIONAL BREAKDOWN

STATION: 37636 LEASE: RB #3 NRU INLET

C6+ FRACTION COMPOSITION

HEXANE ISOMERS (C6'S)		MOLE %	GPM	WT. %
2,2-Dimethylbutane	P	0.013	0.005	0.059
2,3-Dimethylbutane	PN	0.000	0.000	0.000
2-Methylpentane	P	0.050	0.021	0.232
3-Methylpentane	P	0.030	0.012	0.142
Methylcyclopentane	N	0.015	0.005	0.069
Benzene	A	0.000	0.000	0.000
Cyclohexane	N	0.002	0.001	0.008
n-Hexane	P	0.072	0.029	0.333
HEPTANE ISOMERS (C7'S)				
3,3-Dimethylpentane	P	0.000	0.000	0.000
2,2-Dimethylpentane	P	0.003	0.001	0.016
2,4-Dimethylpentane	P	0.003	0.001	0.014
2 & 3-Methylhexane	P	0.001	0.001	0.006
2,3-Dimethylpentane	P	0.001	0.000	0.005
1,t-3-Dimethylcyclopentane	N	0.000	0.000	0.000
1,c-3-Dimethylcyclopentane	N	0.000	0.000	0.000
3-Ethylpentane	N	0.000	0.000	0.000
1,t-2-Dimethylcyclopentane	N	0.000	0.000	0.000
Toluene	A	0.000	0.000	0.002
Methylcyclohexane	N	0.017	0.007	0.089
Ethylcyclopentane	N	0.000	0.000	0.000
n-Heptane	P	0.017	0.008	0.094
OCTANE ISOMERS (C8'S)				
2,4 & 2,5-Dimethylhexane	P	0.001	0.000	0.003
2,2,4-Trimethylpentane	N	0.000	0.000	0.000
1,t-2,c-4-Trimethylcyclopentane	N	0.000	0.000	0.000
1,t-2,c-3-Trimethylcyclopentane	N	0.000	0.000	0.000
2-Methylheptane	P	0.002	0.001	0.010
1,c-2,t-4-Trimethylcyclopentane	N	0.000	0.000	0.000
3-Methylheptane	P	0.003	0.001	0.018
1,c-3-Dimethylcyclohexane	N	0.000	0.000	0.000
1,t-4-Dimethylcyclohexane	N	0.000	0.000	0.000
methyl-ethylcyclopentanes	N	0.000	0.000	0.000
1,t-3 & 1,c-4 Dimethylcyclohexane	N	0.001	0.000	0.004
1,c-2-Dimethylcyclohexane	N	0.003	0.001	0.000
Ethylcyclohexane	N	0.002	0.001	0.010
Ethylbenzene	A	0.001	0.000	0.006
m & p-Xylene	A	0.001	0.000	0.006
o-Xylene	A	0.001	0.000	0.004
Cyclooctane	P	0.001	0.000	0.003
n-Octane	P	0.004	0.002	0.025

HOWARD
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STATION: 37636 **LEASE:** RB #3 NRU INLET

C6+ FRACTION COMPOSITION

NONANE ISOMERS (C9'S)		MOLE %	GPM	WT. %
Trimethylhexanes	P	0.000	0.000	0.000
Dimethylpentanes	P	0.000	0.000	0.000
Isopropylcyclopentane	N	0.000	0.000	0.000
n-Propylcyclopentane	N	0.000	0.000	0.000
3-Methyloctane	P	0.000	0.000	0.000
Trimethylcyclohexanes	N	0.000	0.000	0.000
Isopropylbenzene	A	0.000	0.000	0.003
Isopropylcyclohexane	N	0.000	0.000	0.000
n-Propylcyclohexane	N	0.001	0.000	0.004
n-Propyllbenzene	A	0.001	0.000	0.005
m-Ethyltoluene	A	0.000	0.000	0.000
p-Ethyltoluene	A	0.000	0.000	0.000
1,3,5-Trimethylbenzene	A	0.000	0.000	0.001
4 & 5-Methylnonane	P	0.000	0.000	0.000
o-Ethyltoluene & 3-Methylnonane	AP	0.000	0.000	0.000
1,2,3-Trimethylbenzene	A	0.000	0.000	0.000
n-Nonane	P	0.001	0.001	0.008
DECANE ISOMERS (C10'S)				
2-Methylnonane	P	0.000	0.000	0.000
tert-Butylbenzene	A	0.000	0.000	0.000
1,2,4-Trimethylbenzene	A	0.000	0.000	0.002
Isobutylcyclohexane & tert-Butylcyclohexane		0.000	0.000	0.000
Isobutylbenzene	A	0.000	0.000	0.000
sec-Butylbenzene	A	0.000	0.000	0.002
n-Butylcyclohexane	N	0.000	0.000	0.003
1,3-Diethylbenzene	A	0.000	0.000	0.000
1,2-Diethylbenzene & n-Butylbenzene	A	0.000	0.000	0.000
1,4-Diethylbenzene	A	0.000	0.000	0.000
n-Decane	P	0.003	0.002	0.019
UNDECANE ISOMERS (C11'S)				
n-Undecane	P	0.000	0.000	0.000
DODECANE ISOMERS (C12'S)				
n-Dodecane +	P	0.000	0.000	0.000

x Michael Holzwarth
ANALYST

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Red Bluff v01
File Name: P:\1. CLIENTS\IACX\PROJECT\Red Bluff 3 Compressor Station\193201.0231 IACX RB3 NSR Sig Rev\06 CALCULATIONS\Red_Bluff_GLYCalc.ddf
Date: March 17, 2020

DESCRIPTION:

Description:

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0163	0.391	0.0713
Ethane	0.0117	0.282	0.0514
Propane	0.0191	0.458	0.0835
Isobutane	0.0065	0.156	0.0284
n-Butane	0.0161	0.387	0.0706
Isopentane	0.0046	0.110	0.0201
n-Pentane	0.0047	0.112	0.0204
n-Hexane	0.0023	0.056	0.0101
Cyclohexane	0.0002	0.006	0.0011
Other Hexanes	0.0034	0.082	0.0150
Heptanes	0.0014	0.033	0.0061
Methylcyclohexane	0.0018	0.043	0.0078
Toluene	0.0002	0.005	0.0009
Ethylbenzene	0.0005	0.011	0.0020
Xylenes	0.0007	0.018	0.0033
C8+ Heavies	<0.0001	0.001	0.0002
Total Emissions	0.0895	2.149	0.3921
Total Hydrocarbon Emissions	0.0895	2.149	0.3921
Total VOC Emissions	0.0615	1.476	0.2694
Total HAP Emissions	0.0037	0.090	0.0164
Total BTEX Emissions	0.0014	0.034	0.0062

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.1659	3.982	0.7267
Ethane	0.1287	3.088	0.5636
Propane	0.2888	6.930	1.2648
Isobutane	0.1380	3.312	0.6044
n-Butane	0.4189	10.054	1.8349
Isopentane	0.2208	5.300	0.9672
n-Pentane	0.3212	7.708	1.4067
n-Hexane	0.4001	9.602	1.7524
Cyclohexane	0.0576	1.382	0.2522
Other Hexanes	0.4161	9.985	1.8223
Heptanes	0.7379	17.709	3.2319

Methylcyclohexane	0.8859	21.261	3.8802
Toluene	0.2090	5.015	0.9152
Ethylbenzene	0.9918	23.804	4.3442
Xylenes	2.2233	53.360	9.7382
C8+ Heavies	4.0517	97.240	17.7463
Total Emissions	11.6555	279.732	51.0511
Total Hydrocarbon Emissions	11.6555	279.732	51.0511
Total VOC Emissions	11.3609	272.662	49.7608
Total HAP Emissions	3.8242	91.781	16.7500
Total BTEX Emissions	3.4241	82.179	14.9976

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	6.0618	145.483	26.5507
Ethane	1.2881	30.913	5.6417
Propane	1.2319	29.566	5.3957
Isobutane	0.3762	9.030	1.6479
n-Butane	0.8546	20.509	3.7429
Isopentane	0.3821	9.171	1.6737
n-Pentane	0.4354	10.451	1.9073
n-Hexane	0.2885	6.923	1.2635
Cyclohexane	0.0108	0.259	0.0472
Other Hexanes	0.4040	9.695	1.7694
Heptanes	0.2506	6.014	1.0976
Methylcyclohexane	0.1251	3.002	0.5479
Toluene	0.0030	0.072	0.0132
Ethylbenzene	0.0079	0.190	0.0346
Xylenes	0.0118	0.284	0.0519
C8+ Heavies	0.1196	2.870	0.5238
Total Emissions	11.8514	284.433	51.9091
Total Hydrocarbon Emissions	11.8514	284.433	51.9091
Total VOC Emissions	4.5015	108.037	19.7167
Total HAP Emissions	0.3112	7.470	1.3632
Total BTEX Emissions	0.0228	0.546	0.0997

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	12.1236	290.966	53.1013
Ethane	2.5761	61.827	11.2834
Propane	2.4638	59.131	10.7915
Isobutane	0.7525	18.059	3.2958
n-Butane	1.7091	41.019	7.4859
Isopentane	0.7643	18.342	3.3475
n-Pentane	0.8709	20.902	3.8145
n-Hexane	0.5769	13.846	2.5270
Cyclohexane	0.0216	0.517	0.0944
Other Hexanes	0.8080	19.391	3.5388
Heptanes	0.5012	12.028	2.1951
Methylcyclohexane	0.2502	6.005	1.0959
Toluene	0.0060	0.144	0.0264
Ethylbenzene	0.0158	0.380	0.0693
Xylenes	0.0237	0.569	0.1038

C8+ Heavies	0.2392	5.741	1.0477
Total Emissions	23.7028	568.867	103.8182
Total Hydrocarbon Emissions	23.7028	568.867	103.8182
Total VOC Emissions	9.0031	216.074	39.4335
Total HAP Emissions	0.6225	14.939	2.7264
Total BTEX Emissions	0.0455	1.093	0.1994

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	6.0781	145.874	26.6220
Ethane	1.2998	31.195	5.6931
Propane	1.2510	30.023	5.4792
Isobutane	0.3827	9.185	1.6763
n-Butane	0.8707	20.896	3.8136
Isopentane	0.3867	9.281	1.6938
n-Pentane	0.4401	10.562	1.9276
n-Hexane	0.2908	6.979	1.2736
Cyclohexane	0.0110	0.264	0.0483
Other Hexanes	0.4074	9.777	1.7844
Heptanes	0.2520	6.047	1.1037
Methylcyclohexane	0.1269	3.045	0.5557
Toluene	0.0032	0.077	0.0141
Ethylbenzene	0.0084	0.201	0.0367
Xylenes	0.0126	0.302	0.0552
C8+ Heavies	0.1196	2.871	0.5240
Total Emissions	11.9409	286.582	52.3012
Total Hydrocarbon Emissions	11.9409	286.582	52.3012
Total VOC Emissions	4.5630	109.513	19.9861
Total HAP Emissions	0.3150	7.559	1.3796
Total BTEX Emissions	0.0242	0.580	0.1059

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	53.8280	26.6220	50.54
Ethane	11.8470	5.6931	51.94
Propane	12.0563	5.4792	54.55
Isobutane	3.9002	1.6763	57.02
n-Butane	9.3208	3.8136	59.09
Isopentane	4.3147	1.6938	60.74
n-Pentane	5.2213	1.9276	63.08
n-Hexane	4.2793	1.2736	70.24
Cyclohexane	0.3466	0.0483	86.08
Other Hexanes	5.3612	1.7844	66.72
Heptanes	5.4270	1.1037	79.66
Methylcyclohexane	4.9761	0.5557	88.83
Toluene	0.9416	0.0141	98.50
Ethylbenzene	4.4135	0.0367	99.17
Xylenes	9.8419	0.0552	99.44

C8+ Heavies	18.7940	0.5240	97.21
Total Emissions	154.8693	52.3012	66.23
Total Hydrocarbon Emissions	154.8693	52.3012	66.23
Total VOC Emissions	89.1943	19.9861	77.59
Total HAP Emissions	19.4763	1.3796	92.92
Total BTEX Emissions	15.1970	0.1059	99.30

EQUIPMENT REPORTS:

CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature:	80.00 deg. F
Condenser Pressure:	14.70 psia
Condenser Duty:	3.64e-003 MM BTU/hr
Hydrocarbon Recovery:	0.87 bbls/day
Produced Water:	1.91 bbls/day
Ambient Temperature:	80.00 deg. F
Excess Oxygen:	5.00 %
Combustion Efficiency:	90.00 %
Supplemental Fuel Requirement:	3.64e-003 MM BTU/hr

Component	Emitted	Destroyed
Methane	9.82%	90.18%
Ethane	9.12%	90.88%
Propane	6.60%	93.40%
Isobutane	4.71%	95.29%
n-Butane	3.85%	96.15%
Isopentane	2.07%	97.93%
n-Pentane	1.45%	98.55%
n-Hexane	0.58%	99.42%
Cyclohexane	0.42%	99.58%
Other Hexanes	0.82%	99.18%
Heptanes	0.19%	99.81%
Methylcyclohexane	0.20%	99.80%
Toluene	0.10%	99.90%
Ethylbenzene	0.05%	99.95%
Xylenes	0.03%	99.97%
C8+ Heavies	0.00%	100.00%

ABSORBER

Calculated Absorber Stages:	1.34
Specified Dry Gas Dew Point:	7.00 lbs. H2O/MMSCF
Temperature:	110.0 deg. F
Pressure:	650.0 psig
Dry Gas Flow Rate:	6.5000 MMSCF/day
Glycol Losses with Dry Gas:	0.1028 lb/hr
Wet Gas Water Content:	Saturated
Calculated Wet Gas Water Content:	109.68 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	3.23 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol

Water	6.37%	93.63%
Carbon Dioxide	99.78%	0.22%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.94%	0.06%
Propane	99.91%	0.09%
Isobutane	99.87%	0.13%
n-Butane	99.83%	0.17%
Isopentane	99.83%	0.17%
n-Pentane	99.78%	0.22%
n-Hexane	99.65%	0.35%
Cyclohexane	98.48%	1.52%
Other Hexanes	99.73%	0.27%
Heptanes	99.36%	0.64%
Methylcyclohexane	98.31%	1.69%
Toluene	83.80%	16.20%
Ethylbenzene	77.99%	22.01%
Xylenes	70.50%	29.50%
C8+ Heavies	96.92%	3.08%

FLASH TANK

Flash Control: Combustion device
Flash Control Efficiency: 50.00 %
Flash Temperature: 110.0 deg. F
Flash Pressure: 60.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.91%	0.09%
Carbon Dioxide	15.47%	84.53%
Nitrogen	1.27%	98.73%
Methane	1.35%	98.65%
Ethane	4.76%	95.24%
Propane	10.49%	89.51%
Isobutane	15.50%	84.50%
n-Butane	19.69%	80.31%
Isopentane	22.64%	77.36%
n-Pentane	27.17%	72.83%
n-Hexane	41.17%	58.83%
Cyclohexane	73.57%	26.43%
Other Hexanes	34.44%	65.56%
Heptanes	59.72%	40.28%
Methylcyclohexane	78.80%	21.20%
Toluene	97.42%	2.58%
Ethylbenzene	98.59%	1.41%
Xylenes	99.08%	0.92%
C8+ Heavies	95.07%	4.93%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	31.20%	68.80%

Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	1.28%	98.72%
n-Pentane	1.17%	98.83%
n-Hexane	0.90%	99.10%
Cyclohexane	4.03%	95.97%
Other Hexanes	1.99%	98.01%
Heptanes	0.70%	99.30%
Methylcyclohexane	4.74%	95.26%
Toluene	8.06%	91.94%
Ethylbenzene	10.51%	89.49%
Xylenes	13.00%	87.00%
C8+ Heavies	12.20%	87.80%

STREAM REPORTS:

WET GAS STREAM

Temperature: 110.00 deg. F
Pressure: 664.70 psia
Flow Rate: 2.72e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.31e-001	2.98e+001
Carbon Dioxide	6.89e-002	2.17e+001
Nitrogen	8.95e+000	1.79e+003
Methane	7.47e+001	8.57e+003
Ethane	6.94e+000	1.49e+003
Propane	3.97e+000	1.25e+003
Isobutane	8.41e-001	3.50e+002
n-Butane	1.74e+000	7.25e+002
Isopentane	6.42e-001	3.32e+002
n-Pentane	6.73e-001	3.48e+002
n-Hexane	3.33e-001	2.05e+002
Cyclohexane	7.99e-003	4.81e+000
Other Hexanes	5.01e-001	3.09e+002
Heptanes	2.26e-001	1.62e+002
Methylcyclohexane	8.89e-002	6.25e+001
Toluene	2.00e-003	1.32e+000
Ethylbenzene	5.99e-003	4.55e+000
Xylenes	9.99e-003	7.59e+000
C8+ Heavies	1.10e-001	1.34e+002
Total Components	100.00	1.58e+004

DRY GAS STREAM

Temperature: 110.00 deg. F
Pressure: 664.70 psia

Flow Rate: 2.71e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.47e-002	1.90e+000
Carbon Dioxide	6.89e-002	2.17e+001
Nitrogen	8.97e+000	1.79e+003
Methane	7.48e+001	8.57e+003
Ethane	6.96e+000	1.49e+003
Propane	3.98e+000	1.25e+003
Isobutane	8.42e-001	3.49e+002
n-Butane	1.75e+000	7.24e+002
Isopentane	6.43e-001	3.31e+002
n-Pentane	6.73e-001	3.47e+002
n-Hexane	3.32e-001	2.04e+002
Cyclohexane	7.89e-003	4.74e+000
Other Hexanes	5.01e-001	3.08e+002
Heptanes	2.25e-001	1.61e+002
Methylcyclohexane	8.76e-002	6.14e+001
Toluene	1.68e-003	1.10e+000
Ethylbenzene	4.68e-003	3.55e+000
Xylenes	7.06e-003	5.35e+000
C8+ Heavies	1.07e-001	1.30e+002
Total Components	100.00	1.58e+004

LEAN GLYCOL STREAM

Temperature: 110.00 deg. F
Flow Rate: 1.50e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.84e+001	8.29e+002
Water	1.50e+000	1.26e+001
Carbon Dioxide	5.57e-013	4.70e-012
Nitrogen	4.07e-012	3.43e-011
Methane	6.14e-018	5.17e-017
Ethane	4.65e-008	3.92e-007
Propane	5.70e-009	4.80e-008
Isobutane	1.61e-009	1.36e-008
n-Butane	3.58e-009	3.02e-008
Isopentane	3.39e-004	2.86e-003
n-Pentane	4.51e-004	3.80e-003
n-Hexane	4.29e-004	3.62e-003
Cyclohexane	2.86e-004	2.42e-003
Other Hexanes	1.00e-003	8.44e-003
Heptanes	6.17e-004	5.20e-003
Methylcyclohexane	5.23e-003	4.41e-002
Toluene	2.17e-003	1.83e-002
Ethylbenzene	1.38e-002	1.16e-001
Xylenes	3.94e-002	3.32e-001
C8+ Heavies	6.68e-002	5.63e-001
Total Components	100.00	8.43e+002

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 110.00 deg. F
Pressure: 664.70 psia
Flow Rate: 1.64e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.12e+001	8.29e+002
Water	4.47e+000	4.06e+001
Carbon Dioxide	8.17e-003	7.42e-002
Nitrogen	2.85e-001	2.59e+000
Methane	1.35e+000	1.23e+001
Ethane	2.98e-001	2.70e+000
Propane	3.03e-001	2.75e+000
Isobutane	9.80e-002	8.90e-001
n-Butane	2.34e-001	2.13e+000
Isopentane	1.09e-001	9.88e-001
n-Pentane	1.32e-001	1.20e+000
n-Hexane	1.08e-001	9.81e-001
Cyclohexane	8.97e-003	8.15e-002
Other Hexanes	1.36e-001	1.23e+000
Heptanes	1.37e-001	1.24e+000
Methylcyclohexane	1.30e-001	1.18e+000
Toluene	2.57e-002	2.33e-001
Ethylbenzene	1.24e-001	1.12e+000
Xylenes	2.84e-001	2.58e+000
C8+ Heavies	5.34e-001	4.85e+000
Total Components	100.00	9.09e+002

FLASH TANK OFF GAS STREAM

Temperature: 110.00 deg. F
Pressure: 74.70 psia
Flow Rate: 4.11e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.91e-001	3.73e-002
Carbon Dioxide	1.32e-001	6.27e-002
Nitrogen	8.44e+000	2.56e+000
Methane	6.98e+001	1.21e+001
Ethane	7.91e+000	2.58e+000
Propane	5.16e+000	2.46e+000
Isobutane	1.20e+000	7.52e-001
n-Butane	2.72e+000	1.71e+000
Isopentane	9.78e-001	7.64e-001
n-Pentane	1.11e+000	8.71e-001
n-Hexane	6.18e-001	5.77e-001
Cyclohexane	2.36e-002	2.16e-002
Other Hexanes	8.66e-001	8.08e-001
Heptanes	4.62e-001	5.01e-001
Methylcyclohexane	2.35e-001	2.50e-001
Toluene	6.03e-003	6.02e-003
Ethylbenzene	1.38e-002	1.58e-002
Xylenes	2.06e-002	2.37e-002
C8+ Heavies	1.30e-001	2.39e-001
Total Components	100.00	2.64e+001

FLASH TANK GLYCOL STREAM

Temperature: 110.00 deg. F
Flow Rate: 1.58e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.40e+001	8.29e+002
Water	4.59e+000	4.05e+001
Carbon Dioxide	1.30e-003	1.15e-002
Nitrogen	3.72e-003	3.29e-002
Methane	1.88e-002	1.66e-001
Ethane	1.46e-002	1.29e-001
Propane	3.27e-002	2.89e-001
Isobutane	1.56e-002	1.38e-001
n-Butane	4.75e-002	4.19e-001
Isopentane	2.53e-002	2.24e-001
n-Pentane	3.68e-002	3.25e-001
n-Hexane	4.58e-002	4.04e-001
Cyclohexane	6.80e-003	6.00e-002
Other Hexanes	4.81e-002	4.24e-001
Heptanes	8.42e-002	7.43e-001
Methylcyclohexane	1.05e-001	9.30e-001
Toluene	2.58e-002	2.27e-001
Ethylbenzene	1.26e-001	1.11e+000
Xylenes	2.90e-001	2.56e+000
C8+ Heavies	5.23e-001	4.61e+000
Total Components	100.00	8.82e+002

FLASH GAS EMISSIONS

Flow Rate: 9.98e+002 scfh
Control Method: Combustion Device
Control Efficiency: 50.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.82e+001	2.28e+001
Carbon Dioxide	2.95e+001	3.41e+001
Nitrogen	3.48e+000	2.56e+000
Methane	1.44e+001	6.06e+000
Ethane	1.63e+000	1.29e+000
Propane	1.06e+000	1.23e+000
Isobutane	2.46e-001	3.76e-001
n-Butane	5.59e-001	8.55e-001
Isopentane	2.01e-001	3.82e-001
n-Pentane	2.30e-001	4.35e-001
n-Hexane	1.27e-001	2.88e-001
Cyclohexane	4.87e-003	1.08e-002
Other Hexanes	1.78e-001	4.04e-001
Heptanes	9.51e-002	2.51e-001
Methylcyclohexane	4.85e-002	1.25e-001
Toluene	1.24e-003	3.01e-003
Ethylbenzene	2.83e-003	7.91e-003
Xylenes	4.24e-003	1.18e-002
C8+ Heavies	2.67e-002	1.20e-001

Total Components	100.00	7.14e+001

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 6.34e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.27e+001	2.79e+001
Carbon Dioxide	1.56e-002	1.15e-002
Nitrogen	7.02e-002	3.29e-002
Methane	6.19e-001	1.66e-001
Ethane	2.56e-001	1.29e-001
Propane	3.92e-001	2.89e-001
Isobutane	1.42e-001	1.38e-001
n-Butane	4.31e-001	4.19e-001
Isopentane	1.83e-001	2.21e-001
n-Pentane	2.66e-001	3.21e-001
n-Hexane	2.78e-001	4.00e-001
Cyclohexane	4.09e-002	5.76e-002
Other Hexanes	2.89e-001	4.16e-001
Heptanes	4.41e-001	7.38e-001
Methylcyclohexane	5.40e-001	8.86e-001
Toluene	1.36e-001	2.09e-001
Ethylbenzene	5.59e-001	9.92e-001
Xylenes	1.25e+000	2.22e+000
C8+ Heavies	1.42e+000	4.05e+000
Total Components	100.00	3.96e+001

CONDENSER PRODUCED WATER STREAM

Temperature: 80.00 deg. F
Flow Rate: 5.57e-002 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	1.00e+002	2.79e+001	999868.
Carbon Dioxide	1.28e-003	3.56e-004	13.
Nitrogen	7.71e-005	2.15e-005	1.
Methane	8.20e-004	2.28e-004	8.
Ethane	7.66e-004	2.13e-004	8.
Propane	8.65e-004	2.41e-004	9.
Isobutane	1.69e-004	4.70e-005	2.
n-Butane	5.84e-004	1.63e-004	6.
Isopentane	1.24e-004	3.46e-005	1.
n-Pentane	1.40e-004	3.90e-005	1.
n-Hexane	6.29e-005	1.75e-005	1.
Cyclohexane	4.25e-005	1.19e-005	0.
Other Hexanes	7.21e-005	2.01e-005	1.
Heptanes	2.21e-005	6.17e-006	0.
Methylcyclohexane	1.55e-004	4.33e-005	2.
Toluene	1.16e-003	3.22e-004	12.
Ethylbenzene	2.07e-003	5.77e-004	21.
Xylenes	4.84e-003	1.35e-003	48.
C8+ Heavies	2.16e-007	6.03e-008	0.

Total Components	100.00	2.79e+001	1000000.

CONDENSER RECOVERED OIL STREAM

Temperature: 80.00 deg. F
Flow Rate: 2.53e-002 gpm

Component	Conc. (wt%)	Loading (lb/hr)
Water	2.05e-002	2.20e-003
Carbon Dioxide	4.02e-003	4.33e-004
Nitrogen	2.59e-003	2.79e-004
Methane	2.61e-002	2.81e-003
Ethane	1.03e-001	1.11e-002
Propane	9.10e-001	9.79e-002
Isobutane	6.78e-001	7.30e-002
n-Butane	2.39e+000	2.58e-001
Isopentane	1.63e+000	1.75e-001
n-Pentane	2.55e+000	2.75e-001
n-Hexane	3.50e+000	3.77e-001
Cyclohexane	5.13e-001	5.52e-002
Other Hexanes	3.55e+000	3.82e-001
Heptanes	6.73e+000	7.24e-001
Methylcyclohexane	8.07e+000	8.68e-001
Toluene	1.92e+000	2.07e-001
Ethylbenzene	9.17e+000	9.87e-001
Xylenes	2.06e+001	2.21e+000
C8+ Heavies	3.77e+001	4.05e+000
Total Components	100.00	1.08e+001

CONDENSER VENT STREAM

Temperature: 80.00 deg. F
Pressure: 14.70 psia
Flow Rate: 1.03e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.50e+000	1.71e-002
Carbon Dioxide	8.98e-001	1.07e-002
Nitrogen	4.30e+000	3.26e-002
Methane	3.75e+001	1.63e-001
Ethane	1.44e+001	1.17e-001
Propane	1.60e+001	1.91e-001
Isobutane	4.13e+000	6.49e-002
n-Butane	1.03e+001	1.61e-001
Isopentane	2.35e+000	4.58e-002
n-Pentane	2.38e+000	4.65e-002
n-Hexane	9.94e-001	2.32e-002
Cyclohexane	1.06e-001	2.41e-003
Other Hexanes	1.47e+000	3.42e-002
Heptanes	5.13e-001	1.39e-002
Methylcyclohexane	6.68e-001	1.77e-002
Toluene	8.42e-002	2.10e-003
Ethylbenzene	1.62e-001	4.66e-003
Xylenes	2.60e-001	7.46e-003

Component	Conc. (vol%)	Loading (lb/hr)
C8+ Heavies	7.75e-003	3.57e-004
Total Components	100.00	9.56e-001

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 9.37e-001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	4.11e+001	1.63e-002
Ethane	1.58e+001	1.17e-002
Propane	1.75e+001	1.91e-002
Isobutane	4.52e+000	6.49e-003
n-Butane	1.12e+001	1.61e-002
Isopentane	2.57e+000	4.58e-003
n-Pentane	2.61e+000	4.65e-003
n-Hexane	1.09e+000	2.32e-003
Cyclohexane	1.16e-001	2.41e-004
Other Hexanes	1.60e+000	3.42e-003
Heptanes	5.62e-001	1.39e-003
Methylcyclohexane	7.31e-001	1.77e-003
Toluene	9.22e-002	2.10e-004
Ethylbenzene	1.78e-001	4.66e-004
Xylenes	2.84e-001	7.46e-004
C8+ Heavies	8.49e-003	3.57e-005
Total Components	100.00	8.95e-002

HOWARD
Athens, TX (903) 677-0700 . Beeville, TX (361) 354-5200 . Midland, TX (432) 704-5351

LIQUID EXTENDED ANALYSIS REPORT

LABORATORY REPORT NUMBER 190107-1020-12-010719-02

PHYSICAL CONSTANTS PER GPA 2145-09 & TP-17 (1998)

CUSTOMER :	IACX	DATE SAMPLED:	12/27/2018
STATION:	20126	DATE ANALYZED:	01/07/2019
PRODUCER:	IACX	EFFECTIVE DATE:	12/01/2018
LEASE:	BITTER LAKES		

COMPONENT	MOLE %	LIQUID VOL %	WT. %
H2S	0.000	0.000	0.000
OXYGEN	0.000	0.000	0.000
NITROGEN	0.031	0.009	0.011
CARBON DIOXIDE	0.000	0.000	0.000
METHANE	0.056	0.024	0.011
ETHANE	2.243	1.536	0.817
PROPANE	2.873	2.028	1.530
I-BUTANE	1.862	1.560	1.310
N-BUTANE	7.966	6.430	5.606
I-PENTANE	10.254	9.602	8.958
N-PENTANE	13.205	12.256	11.536
HEXANE PLUS	61.510	66.555	70.221
TOTAL	100.000	100.000	100.000

IDEAL SP. GRAVITY	0.6703	BTU / GAL	116007.20
MOL. WT.	82.588	VAPOR PRESS.	39.30
CUBIC FT / GAL	25.678	LBS / GAL	5.59
C1/C2 LV % RATIO	1.563	API GRAVITY	79.60
CO2/C2 LV % RATIO	0.000	SP GRAV AS VAPOR	2.85

SAMPLED BY	DT	SAMPLE PRESS:	
SAMPLE TYPE:	SPOT	SAMPLE TEMP:	
CYLINDER NO.:	5152	COUNTY / STATE:	0
COMMENT:	SPOT	ANALYST	MIKE HOBGOOD

* SEE NEXT PAGE FOR C6+ COMPOSITIONAL BREAKDOWN

05-27-2016

HOWARD
Athens, TX (903) 677-0700 . Beeville, TX (361) 354-5200 . Edmond, OK (405) 525-0579

STATION: 20126 LEASE: BITTER LAKES

C6+ FRACTION COMPOSITION

HEXANE ISOMERS (C6'S)		MOLE %	LIQ VOL %	WT. %
2,2-Dimethylbutane	P	0.963	1.029	1.005
2,3-Dimethylbutane	PN	0.000	0.000	0.000
2-Methylpentane	P	7.511	7.975	7.837
3-Methylpentane	P	4.516	4.716	4.712
Methylcyclopentane	N	0.000	0.000	0.000
Benzene	A	1.287	0.922	1.218
Cyclohexane	N	5.380	4.686	5.483
n-Hexane	P	12.773	13.448	13.328
C6 TOTALS		**32.430**		
HEPTANE ISOMERS (C7'S)				
3,3-Dimethylpentane	P	0.170	0.198	0.206
2,3-Dimethylpentane	P	0.000	0.000	0.000
2,2-Dimethylpentane	P	0.422	0.506	0.513
2,4-Dimethylpentane	P	1.224	1.468	1.485
2 & 3-Methylhexane	P	0.429	0.504	0.521
1,t-3-Dimethylcyclopentane	N	0.000	0.000	0.000
1,c-3-Dimethylcyclopentane	N	0.000	0.000	0.000
1,t-2-Dimethylcyclopentane	N	0.000	0.000	0.000
3-Ethylpentane	N	0.000	0.000	0.000
Toluene	A	1.026	0.879	1.145
Methylcyclohexane	N	7.920	8.147	9.416
Ethylcyclopentane	N	0.000	0.000	0.000
n-Heptane	P	8.547	10.097	10.370
C7 TOTALS		**19.738**		
OCTANE ISOMERS (C8'S)				
2,4 & 2,5-Dimethylhexane	P	0.627	0.833	0.868
1,t-2,c-4-Trimethylcyclopentane	N	0.000	0.000	0.000
1,t-2,c-3-Trimethylcyclopentane	N	0.000	0.000	0.000
2-Methylheptane	P	2.470	3.258	3.416
1,c-2,t-4-Trimethylcyclopentane	N	0.000	0.000	0.000
3-Methylheptane	P	0.763	0.995	1.055
1,c-3-Dimethylcyclohexane	N	0.088	0.103	0.119
1,t-4-Dimethylcyclohexane	N	0.000	0.000	0.000
methyl-ethylcyclopentanes	N	0.000	0.000	0.000
1,t-3 & 1,c-4 Dimethylcyclohexane	N	0.400	0.461	0.543
1,c-2-Dimethylcyclohexane	N	0.243	0.276	0.330
Ethylcyclohexane	N	0.787	0.904	1.070
Ethylbenzene	A	0.025	0.025	0.032
m & p-Xylene	A	0.093	0.092	0.119
o-Xylene	A	0.090	0.087	0.115
Cyclooctane	P	0.029	0.031	0.039
n-Octane	P	3.257	4.272	4.505
C8 TOTALS		**8.871**		

HOWARD
Athens, TX (903) 677-0700 . Beeville, TX (361) 354-5200 . Edmond, OK (405) 525-0579

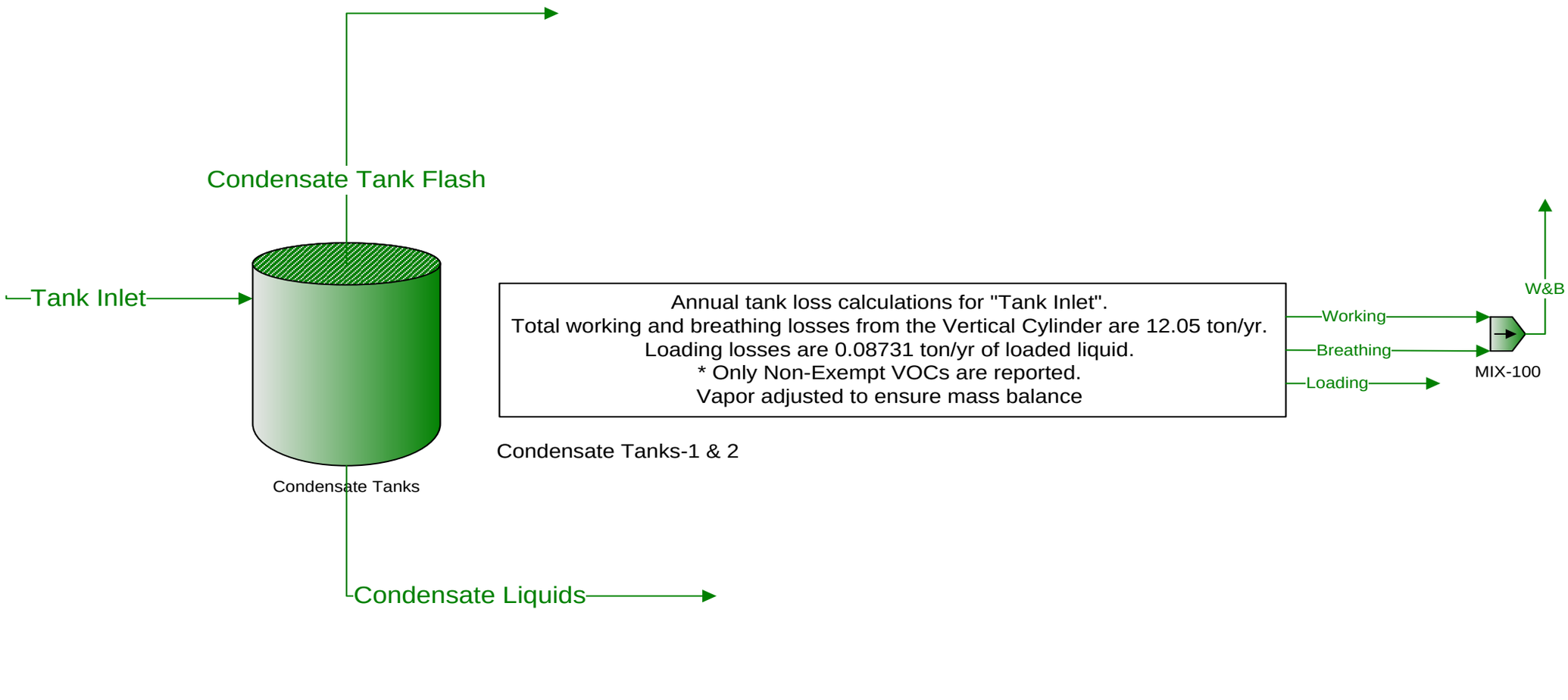
STATION: 20126 **LEASE:** BITTER LAKES

C6+ FRACTION COMPOSITION

NONANE ISOMERS (C9'S)		MOLE %	LIQ VOL %	WT. %
Trimethylhexanes	P	0.000	0.000	0.000
Dimethylpentanes	P	0.000	0.000	0.000
Isopropylcyclopentane	N	0.000	0.000	0.000
n-Propylcyclopentane	N	0.000	0.000	0.000
3-Methyloctane	P	0.000	0.000	0.000
Trimethylcyclohexanes	N	0.000	0.000	0.000
Isopropylbenzene	A	0.029	0.032	0.042
Isopropylcyclohexane	N	0.000	0.000	0.000
n-Propylcyclohexane	N	0.022	0.028	0.033
n-Propyllbenzene	A	0.033	0.037	0.048
m-Ethyltoluene	A	0.000	0.000	0.000
p-Ethyltoluene	A	0.000	0.000	0.000
1,3,5-Trimethylbenzene	A	0.004	0.004	0.006
4 & 5-Methylnonane	P	0.000	0.000	0.000
o-Ethyltoluene & 3-Methylnonane	AP	0.000	0.000	0.000
1,2,3-Trimethylbenzene	A	0.000	0.000	0.000
n-Nonane	P	0.024	0.034	0.037
C9 TOTALS		**0.111**		
DECANE ISOMERS (C10'S)				
2-Methylnonane	P	0.000	0.000	0.000
tert-Butylbenzene	A	0.013	0.016	0.020
1,2,4-Trimethylbenzene	A	0.029	0.032	0.042
Isobutylcyclohexane & tert-Butylcyclohexane		0.192	0.267	0.326
Isobutylbenzene	A	0.000	0.000	0.000
sec-Butylbenzene	A	0.005	0.007	0.009
n-Butylcyclohexane	N	0.015	0.022	0.026
1,3-Diethylbenzene	A	0.000	0.000	0.000
1,2-Diethylbenzene & n-Butylbenzene	A	0.010	0.013	0.016
1,4-Diethylbenzene	A	0.000	0.000	0.000
n-Decane	P	0.096	0.151	0.166
C10 TOTALS		**0.359**		
UNDECANE ISOMERS (C11'S)				
n-Undecane	P	0.000	0.000	0.000
DODECANE ISOMERS (C12'S)				
n-Dodecane +	P	0.000	0.000	0.000

x Michael Holsomb.
ANALYST

"Condensate Tank Flash" C3+ Mass Flow =1.399 ton/yr



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:

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

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

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

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

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

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

1 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:

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

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

13.2.2.3 Controls[18-22]

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

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

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

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

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

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EPA-453/R-95-017
November 1995

Air

EPA

Protocol for Equipment Leak Emission Estimates

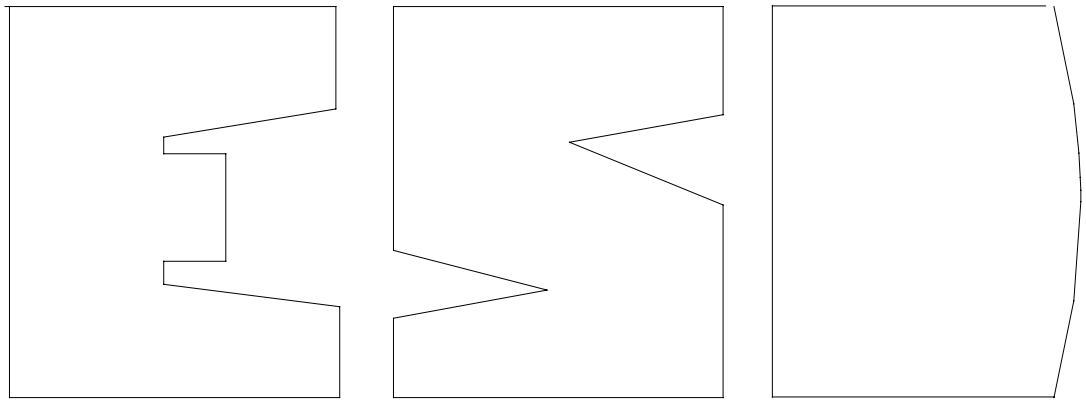


TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

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

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

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

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

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Product Specification

Model C65 – Capstone MicroTurbine™

Summary

This Product Specification describes the Capstone Model C65 MicroTurbine power generating system (hereafter referred to by Capstone as a MicroTurbine). The MicroTurbine provides on-site electrical power for primary or standby applications, and for peak shaving, base loading, and/or capacity additions. MicroTurbine(s) may generate power in parallel with an electrical utility (Grid Connect mode), or isolated from the utility (Stand Alone mode). The system consists of a turbine engine, solid-state power electronics, a fuel system, and an indoor/outdoor-rated NEMA 3R enclosure.

Major turbine engine components include a compressor, a recuperator (exhaust gas heat exchanger), a combustor, a turbine, and a generator. The turbine engine is air-cooled and supported on air-lubricated compliant foil bearings. The compressor impeller, turbine rotor, and generator rotor are mounted on a single shaft, which comprises the only moving part in the engine. Power electronics are solid-state, double conversion type, producing three-phase alternating current output power from the high-frequency alternating current engine output.

Available Model Types

Model C65 MicroTurbine systems are available in several versions, depending on fuel type, ICHP integrated heat recovery, certifications, and other characteristics. Table 1 below summarizes the available construction types covered by this Product Specification.

Table 1. C65 Model Designations

C65 Model Designations	ICHP Core Material		Certifications (1)		Dual Mode Capable	Fuel Capability			
	Copper	SS	CE	CARB (2)		Natural Gas	Landfill Gas	Digester Gas	Propane (HD-5)
Standard	Option	Option	Option		Option	X			X (4)
CARB	X			X	Option	X			
Low NOx	Option				Option	X			
NYC (3)	Option				Option	X			X (4)
Landfill			Option	Option			X (4)		
Digester		Option	Option	Option				X (4)	

Notes:

(1) All versions are UL Listed except the CE Certified models

(2) Systems are in process of being certified by the California Air Resources Board for exhaust emissions

(3) The New York City versions include a fuel regulator inside the MicroTurbine enclosure

(4) Operation on these fuels may be limited – see sections below

The tables and figures in the sections below may group the performance of these different construction types. Unless otherwise specified, the designation "C65" will cover all these construction types, and "All Other C65" will define all other constructions except any designations that are specifically called out in a given section.

Definitions

- ISO conditions are defined as: 15 °C (59 °F), 60% relative humidity, and sea level pressure of 101.3 kPa (14.696 psia).
- HHV: Higher Heating Value
- LHV: Lower Heating Value
- HPNG: High Pressure Natural Gas
- LPNG: Low Pressure Natural Gas
- L/DG: Landfill/Digester Gas
- SG: Sour Gas
- kW_{th} – Kilowatt (thermal)
- kW_e – Kilowatt (electric)
- Scf: Standard cubic feet (standard references ISO temperature and pressure)
- SCFM: Standard Cubic Feet per Minute (standard references ISO temperature and pressure)
- SLPM: Standard Liters per Minute (standard references ISO temperature and pressure).
- THD: Total Harmonic Distortion

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Performance Specification

Performance Ratings at Full Load Power

Table 2 summarizes performance ratings at full load power and ISO conditions, without fuel gas compression or other external parasitic loads.

Table 2. Performance Ratings

Parameter	C65 CARB & Low NOx	All Other C65
Net Power Output	65 (+0/-3) kW net	65 (+0/-2) kW net
Net Efficiency (LHV)	28 (± 2)%	29 (± 2)%
Nominal Net Heat Rate (LHV)	12,900 kJ /kWh (12,200 Btu /kWh)	12,400 kJ /kWh (11,800 Btu /kWh)
Nominal Generator Heat Rate (LHV)	12,100 kJ /kWh (11,400 Btu /kWh)	11,600 kJ /kWh (11,000 Btu /kWh)
Nominal Steady State Fuel Flow (HHV) Notes (1) and (2)	919,000 kJ/hr (871,000 Btu/hr)	888,000 kJ/hr (842,000 BTU/hr)

Notes:

(1) The ratio of Higher Heating Value (HHV) to Lower Heating Value (LHV) is assumed to be 1.1.

(2) Onload fuel flows can be up to two times higher than the steady state values.

Electrical Performance Ratings at Full Load Power

Table 3 presents the electrical performance ratings for Model C65 MicroTurbines operating in the Grid Connect mode at ISO conditions with zero back pressure, and without fuel gas compression or other external parasitic loads.

Table 3. Electrical Performance Ratings in Grid Connect Mode

Parameter	C65 CARB & Low NOx	All Other C65
Net Power Output	65 (+0/-3) kW	65 (+0/-2) kW
Max Apparent Power Output (1)	65 kVA at 480 VAC	65 kVA at 480 VAC
Nominal Voltage Operating Range	400 to 480 VAC	400 to 480 VAC
Nominal Frequency Operating Range	50/60 Hz	50/60 Hz
Output Voltage Connection (2)	3-phase, 3 or 4 wire wye	3-phase, 3 or 4 wire wye
Max Output Current	100 Amps RMS steady state	100 Amps RMS steady state
Current THD	IEEE 519 compliant, 5%	IEEE 519 compliant, 5%

Notes:

(1) The microturbine system operates at unity power factor in Grid Connect mode.

(2) The grid must be neutral grounded.

Table 4 presents the electrical performance ratings for C65 MicroTurbines operating in the Stand Alone mode at ISO conditions, without fuel gas compression or other external parasitic loads.

Table 4. Electrical Performance Ratings in Stand Alone Mode

Parameter	C65 CARB & Low NOx	All Other C65 Types
Net Power Output	65 (+0/-3) kW	65 (+0/-2) kW
Max Apparent Power Output (1)	83 kVA at 480 VAC	83 kVA at 480 VAC
Nominal Voltage Operating Range	400 to 480 VAC	400 to 480 VAC
Frequency Operating Range	10 to 60 Hz	10 to 60 Hz
Output Voltage Connection (2)	3-phase, 4 wire wye	3-phase, 4 wire wye
Max Output Current (3)	127 Amps RMS steady state	127 Amps RMS steady state
Voltage THD	IEEE 519 Compliant, 5%	IEEE 519 Compliant, 5%

Notes:

(1) System power factor is limited by maximum current in Stand Alone mode

(2) Neutral must be solidly grounded

(3) Values assume linear load

Performance Derating

Performance is affected by ambient temperature and elevation. The performance ratings listed above are at full load power at ISO conditions. Performance derating occurs at ambient temperatures and elevations above ISO conditions and is also affected by air inlet pressure, back pressure, and system parasitic loads (e.g. fuel gas compressor, battery charging).

Typical derating curves for power output and efficiency based on ambient temperature are shown in the curves on the following pages. These curves assume no parasitic losses and zero inlet and exhaust back pressure.

Figure 1 presents the nominal rating and minimum/maximum net power output versus ambient temperature (at sea level) for the standard C65 MicroTurbine, without fuel gas compression. For C65 ICHP versions, this plot assumes the heat recovery module is in full bypass mode.

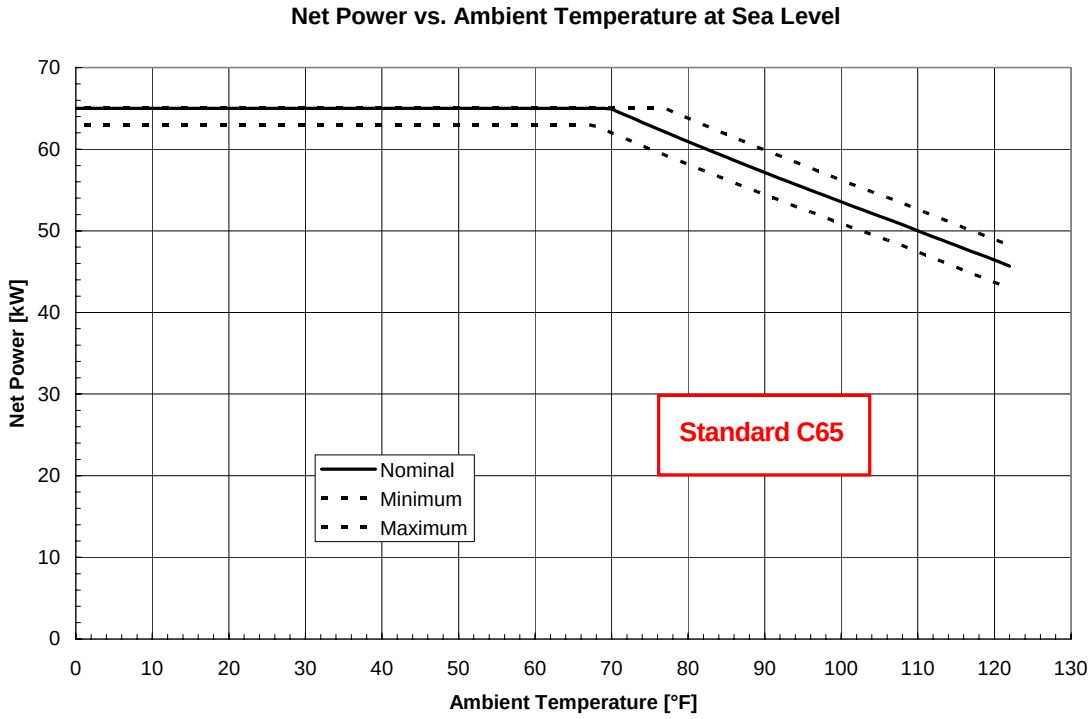

Figure 1. C65 Net Power Output vs. Ambient Temperature

Notes:

(1) Nominal Rating and Min/Max Net Power vs. Ambient Temperature at Sea Level with Zero Back Pressure for the Standard C65 MicroTurbine (without Gas Compression).

(2) All other C65 versions behave according to Figure 1, except the CARB and Low NOx versions.

Figure 2 presents the nominal rating and minimum/maximum net efficiency versus ambient temperature (at sea level) for the standard C65 MicroTurbine, without gas compression. For C65 ICHP versions, this plot assumes the heat recovery module is in full bypass mode.

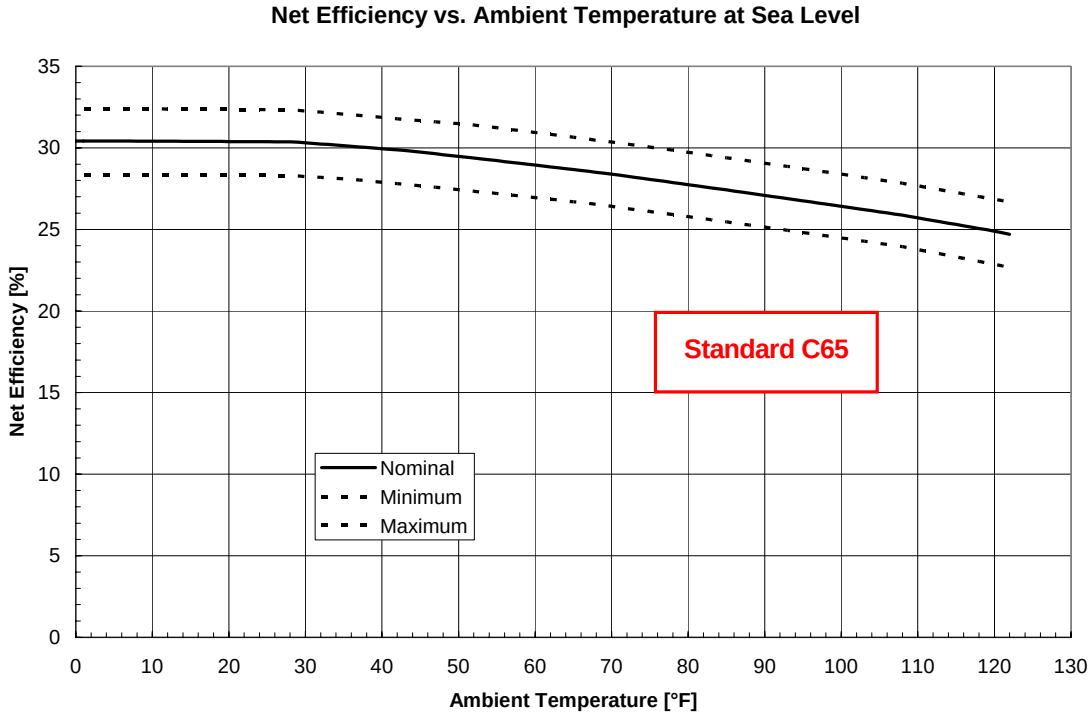

Figure 2. C65 Net Efficiency vs. Ambient Temperature

Notes:

(1) Nominal Rating and Min/Max Net Efficiency vs. Ambient Temperature at Sea Level with Zero Back Pressure for the Standard C65 MicroTurbine (without Gas Compression).

(2) All other C65 versions behave according to Figure 2, except the CARB and Low NOx versions.

Figure 3 presents the nominal rating and minimum/maximum net power output versus ambient temperature (at sea level) for the C65 CARB & Low NOx versions, including the ICHP module in full heat recovery mode but without fuel gas compression.

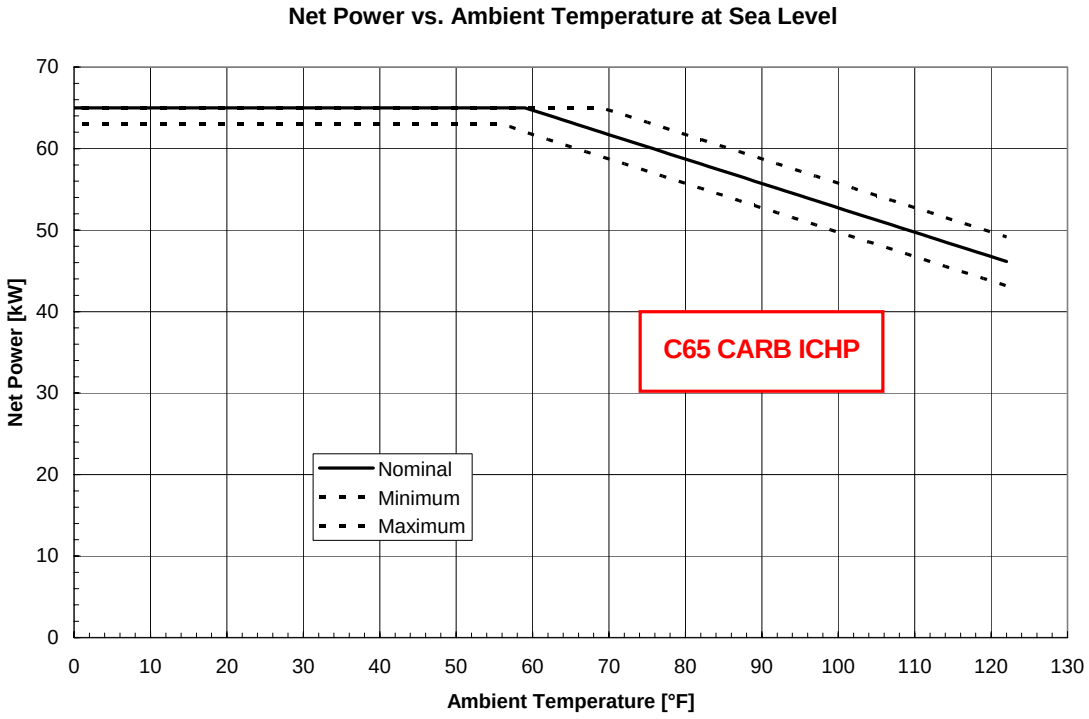

Figure 3. C65 CARB & Low NOx Net Power vs. Ambient Temperature

Note:

(1) Nominal Rating and Min/Max Net Power vs. Ambient Temperature at Sea Level with Zero Back Pressure for the C65 CARB and Low NOx versions (without Gas Compression).

Figure 4 presents the nominal rating and minimum/maximum net efficiency versus ambient temperature (at sea level) for the C65 CARB and Low NOx versions, including the ICHP module in full heat recovery mode but without fuel gas compression.

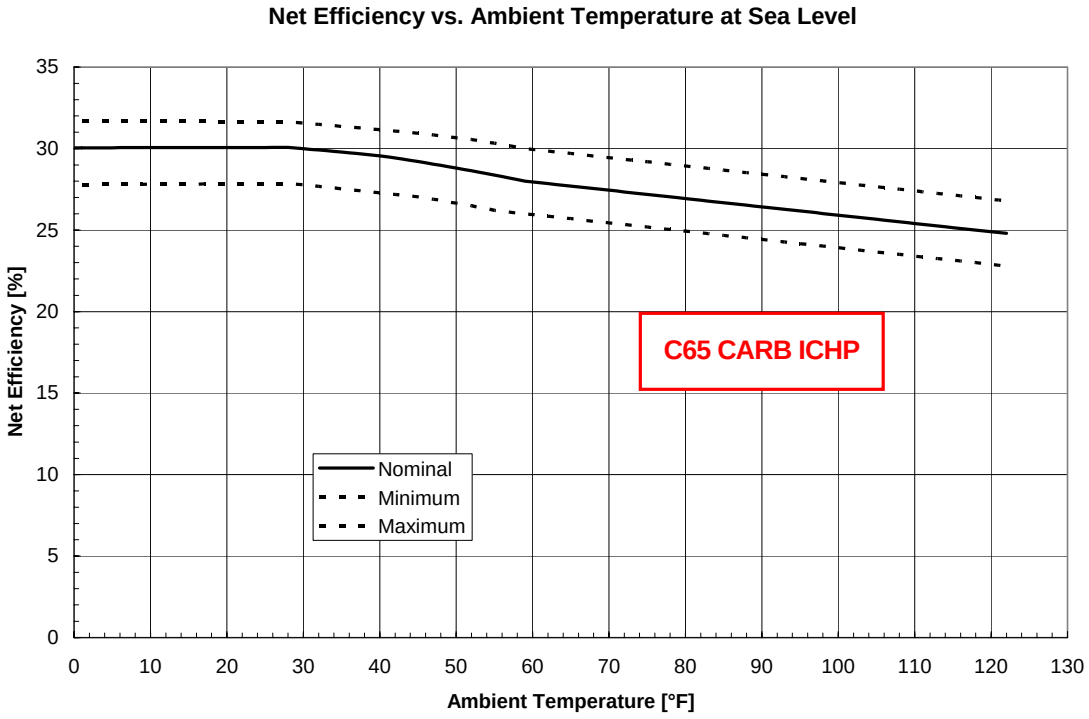

Figure 4. C65 CARB & Low NOx Net Efficiency vs. Ambient Temperature

Note:

(1) Nominal Rating and Min/Max Net Efficiency vs. Ambient Temperature at Sea Level with Zero Back Pressure for the C65 CARB and Low NOx versions (without Gas Compression).

Fuel Input Requirements at Full Load Power

Table 5 presents fuel input requirements at full load power and ISO conditions.

Table 5. Fuel Input Requirements

C65 Version	Fuel Type	Fuel Heat Content Range (HHV)
Standard **CARB** **Low NOx** **NYC**	Natural Gas	30,700 – 47,500 kJ/m^3 (825 to 1,275 Btu/scf)
Standard **NYC**	Propane (HD-5) (1)	91,300 - 95,000 kJ/m^3 (2,450 to 2,550 Btu/scf)
Landfill	Landfill Gas (2)	13,000 - 22,300 kJ/m^3 (350 to 600 Btu/scf)
Digester	Digester Gas (2)	20,500 - 32,600 kJ/m^3 (550 to 875 Btu/scf)

Notes:

(1) Propane (HD-5) will limit the ambient temperatures, elevation, and minimum power conditions where the microturbine systems can operate. Full operation is possible above 65°F and below 4,000 ft elevation; however, the fuel must always remain in the gaseous state. Contact Capstone for specific application guidance.

(2) Minimum power output is 35kW for these fuels. Additional fuel gas conditioning will be required. Consult Capstone for specific application guidance.

Exhaust Output Ratings at Full Load Power

Table 6 presents nominal exhaust output ratings at full load power and ISO conditions, using natural gas.

Table 6. Exhaust Output Ratings

Parameter	C65 CARB & Low NOx	All Other C65
Nominal Exhaust Gas Temp (1)	311 °C (592 °F)	309 °C (588 °F)
Nominal Total Exhaust Energy (1)	623,000 kJ/hr (591,000 Btu/hr)	591,000 kJ/hr (561,000 Btu/hr)
NOx Emissions (2)	<4 ppm V @ 15% O_2	<9 ppm V @ 15% O_2
Exhaust Mass Flow	0.51 kg/s (1.13 lbm/s)	0.49 kg/s (1.08 lbm/s)

Notes:

(1) These are the final exhaust temperature and exhaust energy if the ICHP versions' heat recovery module is bypassing exhaust heat. Temperature and exhaust energy will be lower while recovering heat.

(2) Emissions for standard natural gas at 1,000 BTU/scf HHV.

Air Flow Requirements at Full Load Power

Table 7 summarizes the nominal air flow requirements of the C65 MicroTurbine systems.

Table 7. Air Flow Requirements at ISO Conditions with Zero Back Pressure

Parameter	All C65
Engine Inlet Air Flow	965 scfm (27,300 slpm)
Engine Inlet Air Temp (1) (2)	-20 to 50 °C (-4 to 122 °F)
Electronics Controller Inlet Air Flow (3)	500 scfm (14,200 slpm)
Electronics Controller Inlet Air Temp (2)	-20 to 50 °C (-4 to 122 °F)
Battery and Battery Controller Inlet Air Flow (4)	370 scfm (10,500 slpm)
Battery Inlet Air Temp	-20 to 50 °C (-4 to 122 °F)

Notes:

(1) For C65 versions that include the ICHP integral heat recovery module, minimum operating ambient temperature may be higher, depending on heat recovery fluid characteristics. For water, minimum ambient temperature is 1.7 °C (35 °F).

(2) The Electronics Controller inlet air temperature must be within 2 °C (3.6 °F) of the Engine inlet air temperature.

(3) Values for the C65 Grid Connect versions are comprised of 250 scfm for the Load Control Module and 250 scfm for the Engine Control Module.

(4) Values for the C65 Dual Mode versions are comprised of 250 scfm for the Battery Control Module and 120 scfm for the Battery, and are in addition to the Electronics Controller air flow for the grid connect version.

Acoustic Emissions Ratings at Full Load Power

Table 8 presents nominal acoustic emissions ratings, captured at full rated output power at a distance of 10 meters (33 feet). Actual sound levels for a given installation depend on many site factors, so the numbers provided here should only be used as general guidance.

Table 8. Acoustic Emissions Ratings

Parameter	C65 ICHP Versions	All Other C65
Acoustic Emissions (1)	65 dBA	70 dBA

Note:

(1) The optional acoustic inlet hood kit can reduce acoustic emissions at the front of the microturbine by up to 5 dBA.

MicroTurbine Dimensions and Weights

Table 9 summarizes approximate dimensions and weights of the C65 MicroTurbine systems.

Table 9. MicroTurbine Dimensions and Weights

Parameter	C65 CARB ICHP	All Other C65 ICHP	All Other C65
Height (1)	2,620 mm (103 inches)	2,390 mm (94 inches)	2110 mm (83 inches)
Width	762 mm (30 inches)	762 mm (30 inches)	762 mm (30 inches)
Depth (2)	2,200 mm (87 inches)	2,200 mm (87 inches)	1956 mm (77 inches)
Weight	1090 kg (2,400 lb) (Grid Connect) 1,450 kg (3,200 lb) (Dual Mode)	1000 kg (2,200 lb) (Grid Connect) 1,364 kg (3,000 lb) (Dual Mode)	758 kg (1671 lb) (Grid Connect) 1121 kg (2471 lb) (Dual Mode)

Notes:

(1) Height dimensions are to the roof line. Exhaust outlet extends at least 7 inches above the roof line.

(2) Depth includes 10 inch extension for the heat recovery module rain hood on ICHP versions.

MicroTurbine Temperature Ratings

Table 10 summarizes the temperature ratings of MicroTurbine systems. The C65 and C65 ICHP systems must be stored dry. C65 ICHP system minimum operating temperature depends on heat recovery fluid characteristics.

Table 10. MicroTurbine Temperature Ratings

Parameter	C65
Operating Temperature	-20 to 50 °C (-4 to 122 °F)
Storage Temperature	-40 to 65 °C (-40 to 149 °F)

Engine Cycling Life

Consult Capstone for specific guidance if application requires more than 10,000 onload operations from idle to full power, or repeated cycling of more than 50% of engine power range within five-minute intervals.

ICHP Version Heat Recovery

The C65 ICHP versions, in heat recovery mode, recover the exhaust energy of the C65 MicroTurbine. Tables 11 through 13 show the ICHP system heat recovery in full heat recovery mode for water at various inlet water temperatures. The minimum heat recovery is 3 kW_{th} (10 MBtu/hr) in full bypass mode.

Table 11. C65 CARB ICHP with Copper Heat Recovery Module

Water Temperature		Heat Recovery
Inlet	Outlet	
30 °C (85 °F)	42 °C (108 °F)	132 kW_{th} (450 MBtu/hr)
60 °C (140 °F)	71 °C (160 °F)	118 kW_{th} (400 MBtu/hr)
85 °C (185 °F)	95 °C (203 °F)	106 kW_{th} (360 MBtu/hr)

Table 12. All Other C65 ICHP with Copper Core Heat Recovery Module

Water Temperature		Heat Recovery
Inlet	Outlet	
30 °C (85 °F)	41 °C (106 °F)	126 kW_{th} (430 MBtu/hr)
60 °C (140 °F)	70 °C (159 °F)	112 kW_{th} (380 MBtu/hr)
85 °C (185 °F)	94 °C (202 °F)	100 kW_{th} (345 MBtu/hr)

Table 13. All Other C65 ICHP with Stainless Steel Heat Recovery Module

Water Temperature		Heat Recovery
Inlet	Outlet	
30 °C (85 °F)	37 °C (98 °F)	78 kW_{th} (265 MBtu/hr)
60 °C (140 °F)	67 °C (152 °F)	70 kW_{th} (240 MBtu/hr)
85 °C (185 °F)	91 °C (196 °F)	63 kW_{th} (215 MBtu/hr)

Conditions for Tables 11-13:

- ±10% performance range
- 2.5 l/s (40 gal/min) water flow
- Full power output @ 65 kW_e
- ISO Conditions

Certification Information

Please contact Capstone for the latest certification information.

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Technical Reference

Capstone MicroTurbine™ Systems Emissions

Summary

Capstone MicroTurbine™ systems are inherently clean and can meet some of the strictest emissions standards in the world. This technical reference is to provide customers with information that may be requested by local air permitting organizations or to compare air quality impacts of different technologies for a specific project. The preferred units of measure are "output based"; meaning that the quantity of a particular exhaust emission is reported relative to the useable output of the microturbine – typically in pounds per megawatt hour for electrical generating equipment. This technical reference also provides volumetric measurements in parts per million and milligrams per normal cubic meter. A conversion between several common units is also provided.

Maximum Exhaust Emissions at ISO Conditions

Table 1 below summarizes the exhaust emissions at full power and ISO conditions for different Capstone microturbine models. Note that the fuel can have a significant impact on certain emissions. For example landfill and digester gas can be made up of a wide variety of fuel elements and impurities, and typically contains some percentage of carbon dioxide (CO_2). This CO_2 dilutes the fuel, makes complete combustion more difficult, and results in higher carbon monoxide emissions (CO) than for pipeline-quality natural gas.

Table 1. Emission for Different Capstone Microturbine Models in [lb/MWhe]

Model	Fuel	NOx	CO	VOC (5)
C30 NG	Natural Gas (1)	0.64	1.8	0.23
CR30 MBTU	Landfill Gas (2)	0.64	22.0	1.00
CR30 MBTU	Digester Gas (3)	0.64	11.0	1.00
C30 Liquid	Diesel #2 (4)	2.60	0.41	0.23
C65 NG Standard	Natural Gas (1)	0.46	1.25	0.10
C65 NG Low NOx	Natural Gas (1)	0.17	1.30	0.10
C65 NG CARB	Natural Gas (1)	0.17	0.24	0.05
CR65 Landfill	Landfill Gas (2)	0.46	4.0	0.10
CR65 Digester	Digester Gas (3)	0.46	4.0	0.10
C200 NG	Natural Gas (1)	0.40	1.10	0.10
C200 NG CARB	Natural Gas (1)	0.14	0.20	0.04
CR200 Digester	Digester Gas (3)	0.40	3.6	0.10

Notes:

(1) Emissions for standard natural gas at 1,000 BTU/scf (HHV) or 39.4 MJ/m3 (HHV)
(2) Emissions for surrogate gas containing 42% natural gas, 39% CO2, and 19% Nitrogen
(3) Emissions for surrogate gas containing 63% natural gas and 37% CO2
(4) Emissions for Diesel #2 according to ASTM D975-07b
(5) Expressed as Methane

Table 2 provides the same output-based information shown in Table 1, but expressed in grams per horsepower hour (g/hp-hr).

Table 2. Emission for Different Capstone Microturbine Models in [g/hp-hr]

Model	Fuel	NOx	CO	VOC [5]
C30 NG	Natural Gas [1]	0.22	0.60	0.078
CR30 MBTU	Landfill Gas [2]	0.22	7.4	0.340
CR30 MBTU	Digester Gas [3]	0.22	3.7	0.340
C30 Liquid	Diesel #2 [4]	0.90	0.14	0.078
C65 NG Standard	Natural Gas [1]	0.16	0.42	0.034
C65 NG Low NOx	Natural Gas [1]	0.06	0.44	0.034
C65 NG CARB	Natural Gas [1]	0.06	0.08	0.017
CR65 Landfill	Landfill Gas [2]	0.16	1.4	0.034
CR65 Digester	Digester Gas [3]	0.16	1.4	0.034
C200 NG	Natural Gas [1]	0.14	0.37	0.034
C200 NG CARB	Natural Gas [1]	0.05	0.07	0.014
CR200 Digester	Digester Gas [3]	0.14	1.3	0.034

Notes: - same as for Table 1

Emissions may also be reported on a volumetric basis, with the most common unit of measurement being parts per million. This is typically a measurement that is corrected to specific oxygen content in the exhaust and without considering moisture content. The abbreviation for this unit of measurement is “ppmvd” (parts per million by volume, dry) and is corrected to 15% oxygen for electrical generating equipment such as microturbines. The relationship between an output based measurement like pounds per MWh and a volumetric measurement like ppmvd depends on the characteristics of the generating equipment and the molecular weight of the criteria pollutant being measured. Table 3 expresses the emissions in ppmvd at 15% oxygen for the Capstone microturbine models shown in Table 1. Note that raw measurements expressed in ppmv will typically be lower than the corrected values shown in Table 3 because the microturbine exhaust has greater than 15% oxygen.

Another volumetric unit of measurement expresses the mass of a specific criteria pollutant per standard unit of volume. Table 4 expresses the emissions in milligrams per normal cubic meter at 15% oxygen. Normal conditions for this purpose are expresses as one atmosphere of pressure and zero degrees Celsius. Note that both the ppmvd and mg/m3 measurements are for specific oxygen content. A conversion can be made to adjust either unit of measurement to other reference oxygen contents, if required. Use the equation below to convert from one reference oxygen content to another:

$$\text{Emissions at New } O_2 = \frac{(20.9 - \text{New } O_2 \text{ Percent})}{(20.9 - \text{Current } O_2 \text{ Percent})} \text{ X Emissions at Current } O_2$$

For example, to express 9 ppmvd of NOx at 15% oxygen to ppmvd at 3% oxygen:

$$\text{Emissions at 3\% } O_2 = \frac{(20.9 - 3.0)}{(20.9 - 15.0)} \text{ X } 9 = 27 \text{ ppmvd}$$

Table 3. Emission for Different Capstone Microturbine Models in [ppmvd] at 15% O_2

Model	Fuel	NOx	CO	VOC
C30 NG	Natural Gas (1)	9	40	9
CR30 MBTU	Landfill Gas (2)	9	500	40
CR30 MBTU	Digester Gas (3)	9	250	40
C30 Liquid	Diesel #2 (4)	35	9	9
C65 NG Standard	Natural Gas (1)	9	40	7
C65 NG Low NOx	Natural Gas (1)	4	40	7
C65 NG CARB	Natural Gas (1)	4	8	3
CR65 Landfill	Landfill Gas (2)	9	130	7
CR65 Digester	Digester Gas (3)	9	130	7
C200 NG	Natural Gas (1)	9	40	7
C200 NG CARB	Natural Gas (1)	4	8	3
CR200 Digester	Digester Gas (3)	9	130	7

Notes: same as Table 1

Table 4. Emission for Different Capstone Microturbine Models in [mg/m3] at 15% O_2

Model	Fuel	NOx	CO	VOC (5)
C30 NG	Natural Gas (1)	18	50	6
CR30 MBTU	Landfill Gas (2)	18	620	30
CR30 MBTU	Digester Gas (3)	18	310	30
C30 Liquid	Diesel #2 (4)	72	11	6
C65 NG Standard	Natural Gas (1)	19	50	5
C65 NG Low NOx	Natural Gas (1)	8	50	5
C65 NG CARB	Natural Gas (1)	8	9	2
CR65 Landfill	Landfill Gas (2)	18	160	5
CR65 Digester	Digester Gas (3)	18	160	5
C200 NG	Natural Gas (1)	18	50	5
C200 NG CARB	Natural Gas (1)	8	9	2
CR200 Digester	Digester Gas (3)	18	160	5

Notes: same as Table 1

The emissions stated in Tables 1, 2, 3 and 4 are guaranteed by Capstone for new microturbines during the standard warranty period. They are also the expected emissions for a properly maintained microturbine according to manufacturer's published maintenance schedule for the useful life of the equipment.

Emissions at Full Power but Not at ISO Conditions

The maximum emissions in Tables 1, 2, 3 and 4 are at full power under ISO conditions. These levels are also the expected values at full power operation over the published allowable ambient temperature and elevation ranges.

Emissions at Part Power

Capstone microturbines are designed to maintain combustion stability and low emissions over a wide operating range. Capstone microturbines utilize multiple fuel injectors, which are switched on or off depending on the power output of the turbine. All injectors are typically on when maximum power is demanded, regardless of the ambient temperature or elevation. As the load requirements of the microturbine are decreased, injectors will be switched off to maintain stability and low emissions. However, the emissions relative to the lower power output may increase. This effect differs for each microturbine model.

Emissions Calculations for Permitting

Air Permitting agencies are normally concerned with the maximum amount of a given pollutant being emitted per unit of time (for example pounds per day of NOx). The simplest way to make this calculation is to use the maximum microturbine full electrical power output (expressed in MW) multiplied by the emissions rate in pounds per MWhe times the number of hours per day. For example, the C65 CARB microturbine operating on natural gas would have a NOx emissions rate of:

NOx = .17 X (65/1000) X 24 = .27 pounds per day

This would be representative of operating the equipment full time, 24 hours per day, at full power output of 65 kWe.

As a general rule, if local permitting is required, use the published agency levels as the stated emissions for the permit and make sure that this permitted level is above the calculated values in this technical reference.

Consideration of Useful Thermal Output

Capstone microturbines are often deployed where their clean exhaust can be used to provide heating or cooling, either directly or using hot water or other heat transfer fluids. In this case, the local permitting or standards agencies will usually consider the emissions from traditional heating sources as being displaced by the useful thermal output of the microturbine exhaust energy. This increases the useful output of the microturbine, and decreases the relative emissions of the combined heat and power system. For example, the CARB version C65 ICHP system with integral heat recovery can achieve a total system efficiency of 70% or more, depending on inlet water temperatures and other installation-specific characteristics. The electric efficiency of the CARB version C65 microturbine is 28% at ISO conditions. This means that the total NOx output based emissions, including the captured thermal value, is the electric-only emissions times the ratio of electric efficiency divided by total system efficiency:

NOx = .17 X 28/70 = .068 pounds per MWh (based on total system output)

This is typically much less than the emissions that would result from providing electric power using traditional central power plants, plus the emissions from a local hot water heater or boiler. In fact microturbine emissions are so low compared with traditional hot water heaters that installing a Capstone microturbine with heat recovery can actually decrease the local emissions of NOx and other criteria pollutants, without even considering the elimination of emissions from a remote power plant.

Greenhouse Gas Emissions

Many gasses are considered "greenhouse gasses", and agencies have ranked them based on their global warming potential (GWP) in the atmosphere compared with carbon dioxide (CO_2), as well as their ability to maintain this effect over time. For example, methane is a greenhouse gas with a GWP of 21. Criteria pollutants like NOx and organic compounds like methane are monitored by local air permitting authorities, and are subject to strong emissions controls. Even though some of these criteria pollutants can be more troublesome for global warming than CO_2, they are released in small quantities – especially from Capstone microturbines. So the major contributor of concern is carbon dioxide, or CO_2. Emission of CO_2 depends on two things:

1. Carbon content in the fuel
2. Efficiency of converting fuel to useful energy

It is for these reasons that many local authorities are focused on using clean fuels (for example natural gas compared with diesel fuel), achieving high efficiency using combined heat and power systems, and displacing emissions from traditional power plants using renewable fuels like waste landfill and digester gasses.

Table 5 shows the typical CO_2 emissions due to combustion for different Capstone microturbine models at full power and ISO conditions. The values do not include CO_2 that may already exist in the fuel itself, which is typical for renewable fuels like landfill and digester gas. These values are expressed on an output basis, as is done for criteria pollutants in Table 1. The table shows the pounds per megawatt hour based on electric power output only, as well as considering total useful output in a CHP system with total 70% efficiency (LHV). As for criteria pollutants, the relative quantity of CO_2 released is substantially less when useful thermal output is also considered in the measurement.

Table 5. CO_2 Emission for Capstone Microturbine Models in [lb/MWh]

Model	Fuel	CO_2	
		Electric Only	70% Total CHP
C30 NG	Natural Gas (1)	1,690	625
CR30 MBTU	Landfill Gas (1)	1,690	625
CR30 MBTU	Digester Gas (1)	1,690	625
C30 Liquid	Diesel #2 (2)	2,400	855
C65 NG Standard	Natural Gas (1)	1,520	625
C65 NG Low NOx	Natural Gas (1)	1,570	625
C65 NG CARB	Natural Gas (1)	1,570	625
CR65 Landfill	Landfill Gas (1)	1,520	625
CR65 Digester	Digester Gas (1)	1,520	625
C200 NG	Natural Gas (1)	1,330	625
C200 NG CARB	Natural Gas (1)	1,330	625
CR200 Digester	Digester Gas (1)	1,330	625

Notes:

(1) Emissions due to combustion, assuming natural gas with CO_2 content of 117 lb/MMBTU (HHV)

(2) Emissions due to combustion, assuming diesel fuel with CO_2 content of 160 lb/MMBTU (HHV)

Useful Conversions

The conversions shown in Table 6 can be used to obtain other units of emissions outputs. These are approximate conversions.

Table 6. Useful Unit Conversions

From	Multiply By	To Get
lb/MWh	0.338	g/bhp-hr
g/bhp-hr	2.96	lb/MWh
lb	0.454	kg
kg	2.20	lb
kg	1,000	g
hp (electric)	.746	kW
kW	1.34	hp (electric)
MW	1,000	kW
kW	0.001	MW

Definitions

- ISO conditions are defined as: 15 °C (59 °F), 60% relative humidity, and sea level pressure of 101.3 kPa (14.696 psia).
- HHV: Higher Heating Value
- LHV: Lower Heating Value
- kW_{th}: Kilowatt (thermal)
- kW_e : Kilowatt (electric)
- MWh: Megawatt-hour
- hp-hr: horsepower-hour (sometimes referred to as “electric horsepower-hour”)
- Scf: Standard cubic foot (standard references ISO temperature and pressure)
- m3: Normal cubic meter (normal references 0 °C and one atmosphere pressure)

Capstone Contact Information

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

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

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

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

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

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

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

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

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

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

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

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

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

GRI-HAPCalc ® 3.01
Turbine Report

Facility ID: IACX Roswell LLC **Notes:**
Operation Type: COMPRESSOR STATION
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".

Turbine Unit

Unit Name: CAPSTONE

Hours of Operation: 8,760 Yearly
Rate Power: 87 hp
Fuel Type: NATURAL GAS
Emission Factor Set: FIELD > EPA > LITERATURE
Additional EF Set: -NONE-

Calculated Emissions (ton/yr)

Chemical Name	Emissions	Emission Factor	Emission Factor Set
HAPs			
PAHs	0.0000	0.00000970 g/bhp-hr	EPA
Formaldehyde	0.0142	0.01693680 g/bhp-hr	GRI Field
Acetaldehyde	0.0146	0.01733570 g/bhp-hr	GRI Field
1,3-Butadiene	0.0001	0.00006160 g/bhp-hr	GRI Field
Acrolein	0.0002	0.00026000 g/bhp-hr	GRI Field
Propional	0.0007	0.00086500 g/bhp-hr	GRI Field
Propylene Oxide	0.0001	0.00012730 g/bhp-hr	EPA
Benzene	0.0005	0.00053840 g/bhp-hr	GRI Field
Toluene	0.0003	0.00041100 g/bhp-hr	GRI Field
Ethylbenzene	0.0001	0.00014050 g/bhp-hr	EPA
Xylenes(m,p,o)	0.0010	0.00124410 g/bhp-hr	GRI Field
2,2,4-Trimethylpentane	0.0013	0.00160530 g/bhp-hr	GRI Field
n-Hexane	0.0013	0.00150580 g/bhp-hr	GRI Field
Phenol	0.0001	0.00011010 g/bhp-hr	GRI Field
Naphthalene	0.0000	0.00000760 g/bhp-hr	GRI Field
2-Methylnaphthalene	0.0000	0.00000130 g/bhp-hr	GRI Field
Biphenyl	0.0003	0.00033050 g/bhp-hr	GRI Field
Phenanthrene	0.0000	0.00000050 g/bhp-hr	GRI Field
Chrysene	0.0000	0.00000100 g/bhp-hr	GRI Field
Beryllium	0.0000	0.00000010 g/bhp-hr	GRI Field
Phosphorus	0.0001	0.00006520 g/bhp-hr	GRI Field
Chromium	0.0000	0.00000820 g/bhp-hr	GRI Field
Manganese	0.0000	0.00001750 g/bhp-hr	GRI Field
Nickel	0.0000	0.00000610 g/bhp-hr	GRI Field
Cobalt	0.0000	0.00000160 g/bhp-hr	GRI Field
Arsenic	0.0000	0.00000060 g/bhp-hr	GRI Field
Selenium	0.0000	0.00000030 g/bhp-hr	GRI Field

Cadmium	0.0000	0.00000020 g/bhp-hr	GRI Field
Mercury	0.0000	0.00000270 g/bhp-hr	GRI Field
Lead	0.0000	0.00000340 g/bhp-hr	GRI Field
Total	0.0349		

Criteria Pollutants

PM	0.0243	0.02897200 g/bhp-hr	EPA
CO	1.7696	2.10828420 g/bhp-hr	GRI Field
NMHC	0.1627	0.19387800 g/bhp-hr	GRI Field
NMEHC	0.0077	0.00921840 g/bhp-hr	EPA
NOx	1.0510	1.25216290 g/bhp-hr	GRI Field
SO2	0.0009	0.00102720 g/bhp-hr	GRI Field

Other Pollutants

Methane	0.8286	0.98719230 g/bhp-hr	GRI Field
Acetylene	0.0060	0.00716540 g/bhp-hr	GRI Field
Ethylene	0.0117	0.01395450 g/bhp-hr	GRI Field
Ethane	0.1260	0.15008370 g/bhp-hr	GRI Field
Propane	0.0134	0.01600000 g/bhp-hr	GRI Field
Isobutane	0.0040	0.00480000 g/bhp-hr	GRI Field
Butane	0.0044	0.00520000 g/bhp-hr	GRI Field
Cyclopentane	0.0014	0.00165110 g/bhp-hr	GRI Field
Butyrald/Isobutyraldehyde	0.0011	0.00134000 g/bhp-hr	GRI Field
n-Pentane	0.0681	0.08115000 g/bhp-hr	GRI Field
Cyclohexane	0.0051	0.00612400 g/bhp-hr	GRI Field
Methylcyclohexane	0.0074	0.00883120 g/bhp-hr	GRI Field
n-Octane	0.0027	0.00318890 g/bhp-hr	GRI Field
1,3,5-Trimethylbenzene	0.0025	0.00300000 g/bhp-hr	GRI Field
n-Nonane	0.0004	0.00053260 g/bhp-hr	GRI Field
CO2	405.2884	482.86607780 g/bhp-hr	EPA
Vanadium	0.0000	0.00000070 g/bhp-hr	GRI Field
Copper	0.0000	0.00002050 g/bhp-hr	GRI Field
Molybdenum	0.0000	0.00002030 g/bhp-hr	GRI Field
Barium	0.0000	0.00002290 g/bhp-hr	GRI Field

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 page 71950, Nov. 29, 2013]

ISSN 2167-8065

Helium Recovery Unit
Description of Representative Feed Analysis

An explanation of the gas analysis that was used is below.

The original mass balance was done using a calculated outlet gas composition from the JT skid that will be upstream feeding the NRU. From there we added in a helium estimate that is in the gas (about 0.4%) since this was not in the original gas sample that was used for the JT simulation. We removed the He increase from the methane composition. Then the data was normalized.

Next, we increased the nitrogen to 7% since that is the highest expected nitrogen composition for the site. The increase on Nitrogen was subtracted proportionally (increased slightly in the case of helium) from the remaining components. Finally the compositions were normalized to give the final result.

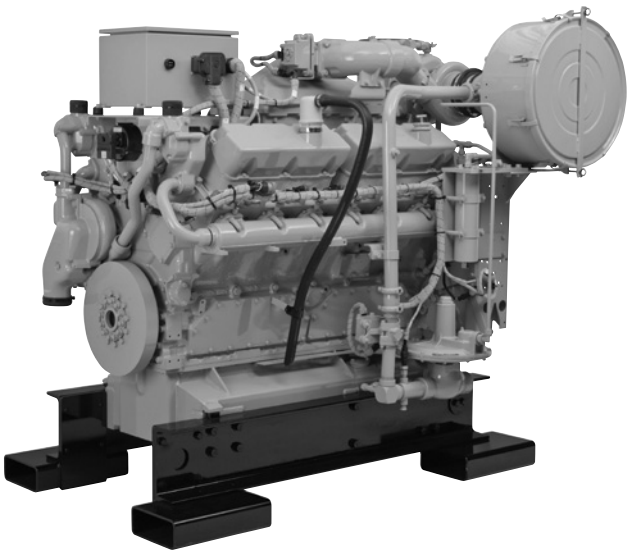
	JT Skid Outlet Gas		He Estimate Added and Methane Reduced	Normalized		N2 Increased and N2 Addition Adjusted Proportionally	Normalized
N2	4.40%		4.40%	4.40%	------>	7.00%	7.00%
CO2	0.30%		0.30%	0.30%		0.29%	0.29%
He	0.00%	------>	0.40%	0.40%		0.41%	0.41%
C1	87.71%	------>	87.31%	87.34%		85.06%	84.95%
C2	4.94%		4.94%	4.94%		4.81%	4.81%
C3	1.77%		1.77%	1.77%		1.72%	1.72%
iC4	0.25%		0.25%	0.25%		0.25%	0.24%
nC4	0.43%		0.43%	0.43%		0.42%	0.42%
iC5	0.08%		0.08%	0.08%		0.08%	0.08%
nC5	0.07%		0.07%	0.07%		0.07%	0.07%
n-C6+	0.02%		0.02%	0.02%		0.02%	0.01%
	99.96%		99.96%	100.00%		100.14%	100.00%

On the following page is the source JT skid outlet gas composition before the adjustments above. This is the calculated composition of the gas that the NRU will be processing.

CG137-12 Gas Petroleum Engine

447 bkW (600 bhp)
1800 rpm

0.5 g/bhp-hr NOx or 1.0 g/bhp-hr NOx (NTE)



CAT® ENGINE SPECIFICATIONS

V12, 4-Stroke-Cycle

Emissions	NSPS 2010
Bore	137.2 mm (5.4 in)
Stroke	152.4 mm (6 in)
Displacement	27 L (1648 in³)
Compression Ratio	8.3:1
Aspiration	Turbocharged-Aftercooled
Rotation (from flywheel end)	Counterclockwise
Flywheel & Flywheel Housing	SAE No. 0
Flywheel Teeth	136
Power per Displacement	22.2 bhp/L
Engine Weight[1]	2835 kg (6250 lb)
Catalyst Weight[2]	81.6/88.5 kg (180/195 lb)
Flywheel & Flywheel Housing	SAE No. 0
Capacity for Liquids — L (U.S. gal)	
Cooling System[3]	75 L (20 U.S. gal)
Lube Oil System (refill)	170 L (45 U.S. gal)
Oil Change Interval[4]	750 hours
Governor	Electronic ADEM™ A4
Ignition, Protection	Electronic ADEM A4
Air/Fuel Ratio Control	Electronic ADEM A4

[1]Engine only, dry
[2]1 g and 0.5 g, respectively
[3]Engine only
[4]Can be extended through S•O•S℠ program

FEATURES

Engine Design
- Tough and durable, with field-proven head design
- Caterpillar supplied air/fuel ratio control and three-way catalyst designed specifically for this engine to provide superior emissions control with NSPS and Non-Attainment zone compliance
- 0.5 g and 1 g NOx settings available
- Integrated operator interface panel, TWC and AFRC reduces hands-on time with the engine
- Operator interface panel allows setup and servicing without a laptop
- Runs on a broad range of fuels and speeds at any emissions level
- Factory installed components with single connection point eases packaging

Advanced Digital Engine Management
The ADEM A4 system represents the next generation of engine management systems while reducing the number of mechanical components and easing troubleshooting. Features include:
- Air/Fuel Ratio Control (AFRC)
- Electronic ignition
- Electronic governing/speed control
- Start/stop logic
- Engine protection & monitoring

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

Gas Engine Rating Pro (GERP)
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

Caterpillar 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.catoilandgasinfo.com.

STANDARD EQUIPMENT

Air Inlet System
Air cleaner — single element with service indicator
Optional air inlet adapter and rain cap — recommended for weather protection

Control System
ADEM A4
Class 1, Division 2, Group C&D and Zone 2

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 treated water and sea air atmosphere

Exhaust System
Exhaust manifolds — watercooled
Exhaust elbow — dry 203 mm (8 in)
Three-way catalyst — 1.0 g NOx and 0.5 g NOx NTE options

Flywheels & Flywheel Housings
Flywheel, SAE No. 0
Flywheel housing, SAE No. 0
SAE standard rotation

Fuel System
Air/fuel ratio control
Gas pressure regulator
Natural gas carburetor

Lube System
Crankcase breather — top mounted
Oil cooler
Oil filter — RH
Oil filler in valve cover, dipstick — RH

Mounting System
Engine mounting rails — 254 mm (10 in) industrial-type, entire length

Protection System
ADEM A4 protection
The following include alarm and shutdown:
- inlet manifold air temperature
- inlet manifold air pressure
- oil pressure
- oil temperature
- coolant temperature
- engine speed (overspeed)
- battery voltage
- catalyst inlet/outlet temperature (sensors shipped loose)

The following is display only
- service hours

General
Paint, Caterpillar yellow
Crankshaft vibration damper and drive pulleys
Lifting eyes
Cylinder block inspection covers

OPTIONAL EQUIPMENT

Charging Alternator
24V, 35A CSA alternator*

Exhaust System
Exhaust flex fitting
Exhaust elbow
Exhaust flange — ANSI

Instrumentation
Operator interface panel
Operator interface panel enclosure
15', 20', 50' interconnect harness

Starting System
Air pressure regulator
Air start silencer
Vane starter
Electric starter
Turbine starter

Fuel System
Fuel filter

Air Inlet System
Precleaner
Rain cap

*CSA certification pending final approval

TECHNICAL DATA

CG137-12 Gas Petroleum Engine — 1800 rpm

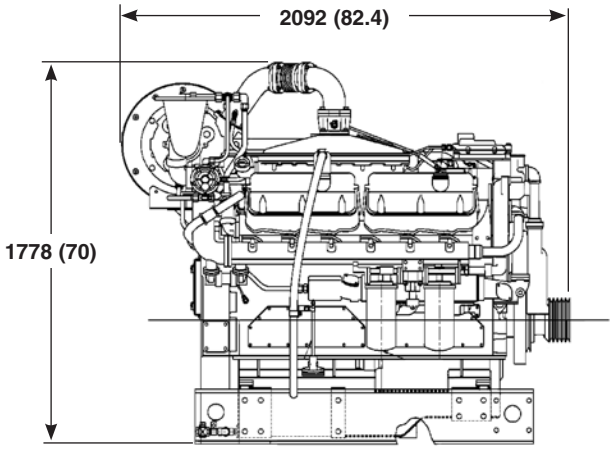
		DM9291-00 0.5 g NOx NTE	DM9292-00 1.0 g NOx NTE
Engine Power			
@ 100% Load	bkW (bhp)	448 (600)	448 (600)
Engine Speed	rpm	1800	1800
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	1524 (5000)	1524 (5000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	18	18
Aftercooler Temperature			
JW Temperature	°C (°F)	99 (210)	99 (210)
SCAC Temperature	°C (°F)	54 (130)	54 (130)
Compression Ratio		8.3:1	8.3:1
Emissions (NTE)*			
NOx	g/bkW-hr (g/bhp-hr)	1.34 (1)	.067 (0.5)
CO	g/bkW-hr (g/bhp-hr)	2.68 (2)	2.68 (2)
VOC**	g/bkW-hr (g/bhp-hr)	0.31 (0.23)	0.31 (0.23)
Fuel Consumption***			
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr	10.47 (7400)	10.47 (7400)
Heat Balance			
Heat Rejection to Jacket Water JW & OC	bkW (Btu/min)	407 (23,129)	407 (23,129)
Heat Rejection to Aftercooler @ 100% Load	bkW (Btu/min)	33 (1895)	33 (1895)
Heat Rejection to Exhaust @ 100% Load	bkW (Btu/min)	301 (17,091)	301 (17,091)
Heat Rejection to Atmosphere @ 100% Load	bkW (Btu/min)	52 (2961)	52 (2961)
Intake System			
Air Inlet Flow Rate @ 100% Load	N•m³/min (scfm)	20.73 (800)	20.73 (800)
Gas Pressure	kPag (psig)	10-34 (1.5-5.0)	10-34 (1.5-5.0)

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

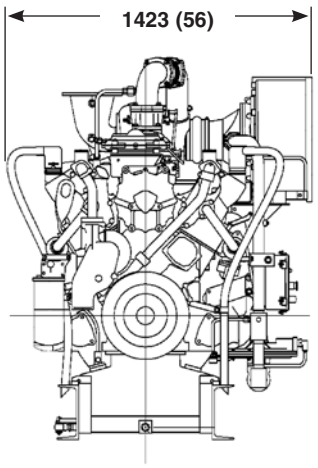
**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJ

***ISO 3046/1

GAS PETROLEUM ENGINE



RIGHT SIDE VIEW



FRONT VIEW

Note: Dimensions are in mm (inches).

DIMENSIONS		
Length	2092 mm	82.4 in
Width	1423 mm	56 in
Height	1778 mm	70 in

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.

Hague Equipment

ICE Catalyst Sizing Program

ENGINE INPUT (Manufacturer, Model, Type) - - EXPERT MODE

Input Mass Flow Rate

	lbs/hr	"scfm"	"scfh"	"acfm"	"acfh"	Estimated Exhaust Gas Composition		
lb/hr(Estimated):	4,046	884	53,032	2553	153,180	N2	74.5	vol%
Brake Horse Power:	600					O2	0.4	vol%
			Maximum Pressure Drop (in)		3	H2O	10	vol%
Molecular weight:	28.50		0.026	Exhaust Density (lbs/ft3)		CO2	10	vol%
			mol% propane in fuel gas:		0.000			

Inlet Temperature

Process Temperature (F): 1042

Enter permitted grams per brake horse power hour (g/bhp-hr)

NOx**	CO**	VOC(NMNE)**	H2CO**
0.5	0.5	.0735	

Catalyst Type

Three-way Catalyst

Catalyst Module Details

Module Shape			Module/Layer	1	Layers	1
Round		Diam (inch)	19.50		cpsi	300s
Guard Bed - No					Depth	3.5
			Part Number			

Open area for gas flow (ft2):	2.07
Linear Velocity(ft/min):	1,231
Foil thickness (inches):	0.002

Calculated Space Velocity: 87,670

Safety Value 2

Pressure Drop

300 | 2.05

Inlet Pollutants

	g/bhp-hr	lb/hr	tons/year	ppmv	ppmvd%O2*
NOx	9.97	13.19	57.76	2,048.93	655.21
CO	9.97	13.19	57.76	3,366.10	1,076.42
VOC	.35	0.46	2.03	75.03	23.99
H2CO	.07	0.09	0.41	22.06	7.05

Target Conversions

		Required Output Pollutants	g/bhp-hr	lb/hr	tons/year	ppmv	ppmvd%O2*
NOx	95.0%	NOx	0.5	0.66	2.90	102.75	32.86
CO	95.0%	CO	0.5	0.66	2.90	168.81	53.98
VOC(NMNE)	79.0%	VOC	.0735	0.10	0.43	15.76	5.04
H2CO	0%	H2CO	.07	0.00	0.00	NaN	NaN

Conversions Catalyst Design

Output Pollutants with Catalyst Sizing

			g/bhp-hr	lb/hr	tons/year	ppmv	ppmvd%O2*
NOx	95.0%	NOx	0.5	0.66	2.90	102.75	32.86
CO	95.0%	CO	0.5	0.66	2.90	168.81	53.98
VOC(NMNE)	79.0%	VOC	.0735	0.10	0.43	15.76	5.04
H2CO	0%	H2CO	.07	0.00	0.00	NaN	NaN

Notes:

Customer:	NGCSI			Project:	CG137-12 EM1986-01-001
Sales Person:	STEPHEN BUTKA	Date:	05/14/2019	Contact:	BILL JENKINS
Housing:		Element:		Description:	

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES[a]
(SCC 2-02-002-53)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Criteria Pollutants and Greenhouse Gases		
NO_x[c] 90 - 105% Load	2.21 E+00	A
NO_x[c] <90% Load	2.27 E+00	C
CO[c] 90 - 105% Load	3.72 E+00	A
CO[c] <90% Load	3.51 E+00	C
CO_2[d]	1.10 E+02	A
SO_2[e]	5.88 E-04	A
TOC[f]	3.58 E-01	C
Methane[g]	2.30 E-01	C
VOC[h]	2.96 E-02	C
PM10 (filterable)[i,j]	9.50 E-03	E
PM2.5 (filterable)[j]	9.50 E-03	E
PM Condensable[k]	9.91 E-03	E
Trace Organic Compounds		
1,1,2,2-Tetrachloroethane[l]	2.53 E-05	C
1,1,2-Trichloroethane[l]	<1.53 E-05	E
1,1-Dichloroethane	<1.13 E-05	E
1,2-Dichloroethane	<1.13 E-05	E
1,2-Dichloropropane	<1.30 E-05	E
1,3-Butadiene[l]	6.63 E-04	D
1,3-Dichloropropene[l]	<1.27 E-05	E
Acetaldehyde[l,m]	2.79 E-03	C
Acrolein[l,m]	2.63 E-03	C
Benzene[l]	1.58 E-03	B
Butyr/isobutyraldehyde	4.86 E-05	D
Carbon Tetrachloride[l]	<1.77 E-05	E

Table 3.2-3. UNCONTROLLED EMISSION FACTORS FOR 4-STROKE RICH-BURN ENGINES (Concluded)

Pollutant	Emission Factor (lb/MMBtu)[b] (fuel input)	Emission Factor Rating
Chlorobenzene[l]	<1.29 E-05	E
Chloroform[l]	<1.37 E-05	E
Ethane[n]	7.04 E-02	C
Ethylbenzene[l]	<2.48 E-05	E
Ethylene Dibromide[l]	<2.13 E-05	E
Formaldehyde[l,m]	2.05 E-02	A
Methanol[l]	3.06 E-03	D
Methylene Chloride[l]	4.12 E-05	C
Naphthalene[l]	<9.71 E-05	E
PAH[l]	1.41 E-04	D
Styrene[l]	<1.19 E-05	E
Toluene[l]	5.58 E-04	A
Vinyl Chloride[l]	<7.18 E-06	E
Xylene[l]	1.95 E-04	A

[a] Reference 7. Factors represent uncontrolled levels. For NO_x, CO, and PM-10, "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. PM10 = Particulate Matter $\leq$ 10 microns (μm) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

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

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

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

[d] Based on 99.5% conversion of the fuel carbon to CO_2. CO_2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO_2,

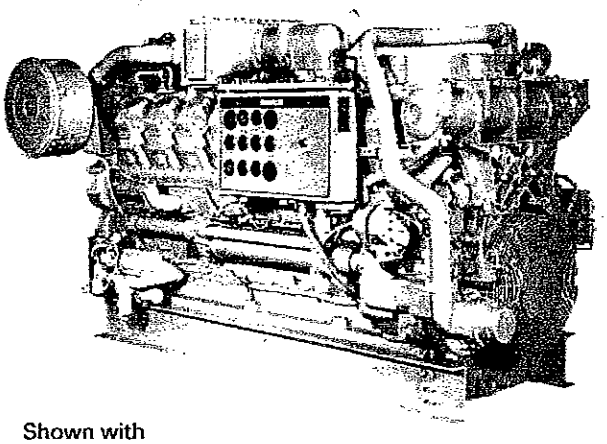
CATERPILLAR

Gas Industrial Engine

G3516

660-1340 hp

Standard and Low Emission



Shown with
Optional Equipment

SPECIFICATIONS

V-16, 4-Stroke-Cycle, Spark Ignited

Bore—in (mm)	6.7 (170)
Stroke—in (mm)	7.5 (190)
Displacement—cu in (L)	4211 (69.0)
Compression Ratio	
STD	9:1
LE	8:1
Aspiration	Naturally Aspirated or Turbocharged-Aftercooled
Lube Oil Capacity — gal (L)	
STD*	153 (580)
STD**	171 (646)
LE	106 (402)
Jacket Water System — gal (L)	
Capacity w/o Radiator	53 (205)

* Oil fill capacity with 21 elements
**Oil fill capacity without elements

CATERPILLAR ENGINE FACILITIES ISO 9001 CERTIFIED

FEATURES

■ DIESEL STRENGTH

All Caterpillar® gas engines are built on diesel frames which means greater service life. Caterpillar gas engines inherit more from their diesel counterparts than just strength. They are backed by the same support system recognized as one of the most sophisticated and dependable in the world.

■ APPLICATION FLEXIBILITY

Broad operating speed range and ability to burn a wide spectrum of gaseous fuels.

■ LOW EMISSIONS

Low emission engines are capable of NO(x) levels as low as 2.0 grams/hp-hr. Lower emissions may be achievable for selected applications. Consult your Caterpillar dealer.

■ CATERPILLAR® GAS ENGINES

Represent the latest technology in engine design. Engines are offered in both naturally aspirated and turbocharged/aftercooled configurations.

TA is offered as standard and low emission. These different configurations offer:

- High energy ignition systems for consistent firing
- High efficient combustion chamber for complete burning of the fuel.
- Modern component design such as deep cup, oil gallery piston.

■ ELECTRONIC IGNITION SYSTEM WITH DETONATION SENSITIVE TIMING

The Caterpillar electronic ignition system provides optimized spark timing for all operating conditions. Timing is automatically controlled to maintain continuous detonation protection.

CATERPILLAR®

G3516 GAS INDUSTRIAL ENGINE

STANDARD EQUIPMENT

Air cleaners
  single stage, dry, with service indicator
Breather, crankcase
Carburetor
  natural gas
Cooler
  lubricating oil
Filter
  lubricating oil, RH
Flywheel housing
  SAE No. 00
Governor
  Woodward
Ignition system
  Altronic III
Instrument panel, RH
  8 gauge panel (STD)
  12 gauge panel (LE)
  oil pressure
  coolant temperature
  oil pressure differential
  intake manifold temp (TA only)
  pressure (LE)
  service meter
  exhaust pyrometer (LE)
Lifting eyes
Manifold, exhaust
  watercooled
Pumps, gear driven
  aftercooler water (TA only)
  jacket water
Rails, mounting, 10 in.
Regulator, gas pressure
SAE standard rotation
Thermostats and housing
Torsional vibration damper

OPTIONAL EQUIPMENT

Cooling systems
  high temp (LE only)
Exhaust fittings
Muffler
Power takeoffs
Starting systems
Tachometer
Low BTU arrangements
Landfill arrangements
Air head for 3161
CSA ignition
Air-to-air aftercooler connection

CONTINUOUS RATINGS (BHP)

Aspiration	1400 rpm	1300 rpm	1200 rpm	1100 rpm	1000 rpm	900 rpm
LE-90	1340	1245	1150	1050	955	860
LE-130	1265	1175	1085	995	900	810
STD TA-90	–	–	1085	995	905	815
STD TA-130	–	–	1050	960	875	785
STD NA	–	–	660	605	585	525

PHYSICAL FACTORS

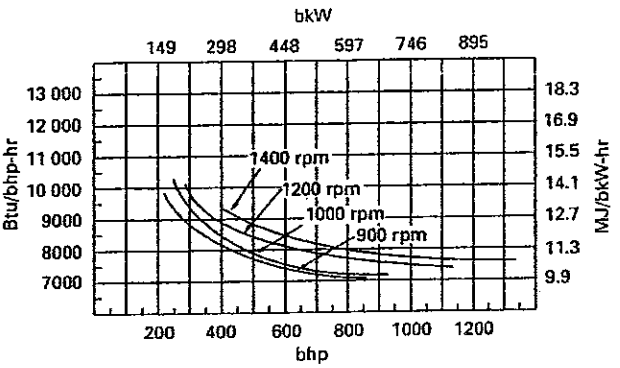
	Height in (mm)	Width in (mm)	Length in (mm)	Weight lb (kg)
LE	73.2 (1859)	67.1 (1703)	131 (3327)	17 670 (8022)
STD TA	73.2 (1859)	67.1 (1703)	131 (3327)	17 470 (7931)
STD NA	75.2 (1911)	61.6 (1564)	126.4 (3211)	16 400 (7446)

G3516 GAS INDUSTRIAL ENGINE

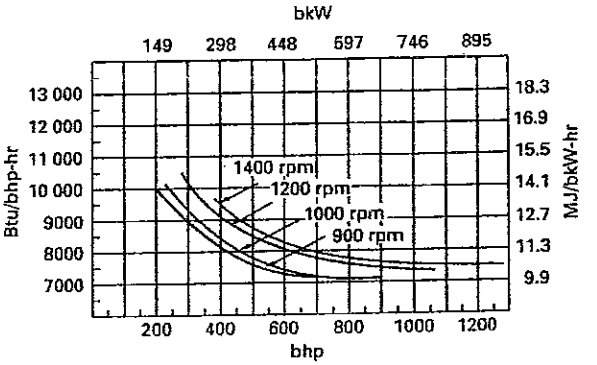
CATERPILLAR®

FUEL CONSUMPTION

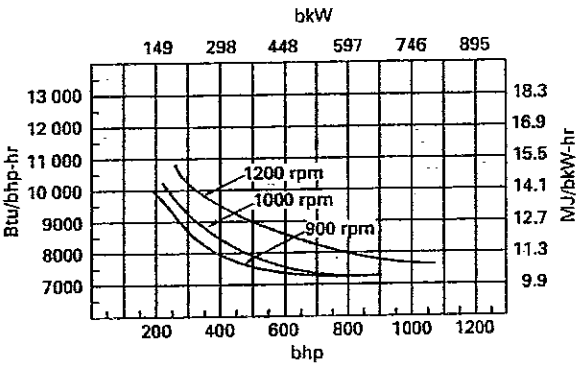
LE-90



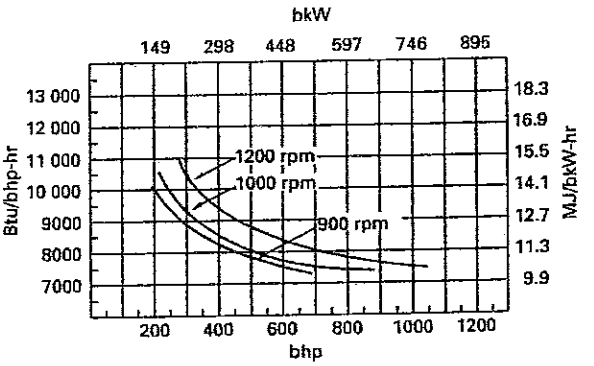
LE-130



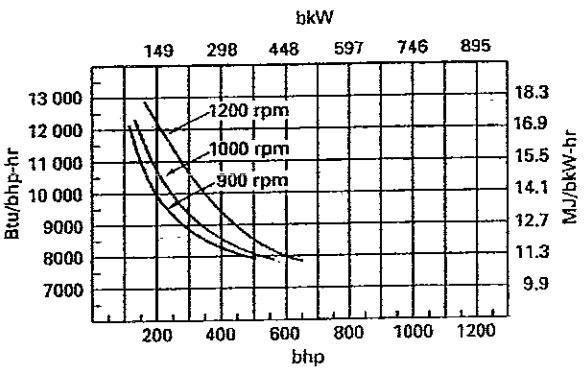
STD TA-90



STD TA-130



STD NA

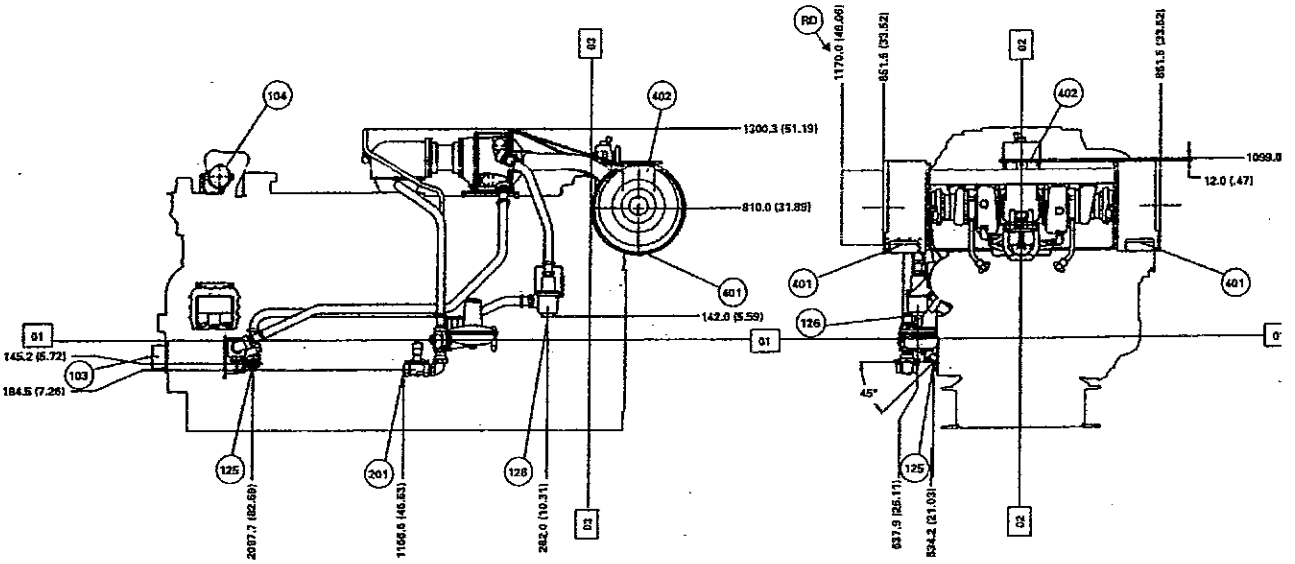


LE refers to low emission engine configuration.
STD refers to standard engine configuration.
90 refers to aftercooler water inlet temperature in 90° F (32° C).
130 refers to aftercooler water inlet temperature in 130° F (54° C).
All data is based on standard conditions. 77° F (25° C) 500 ft Alt.
These ratings do not allow for overload capability.

CATERPILLAR®

G3516 GAS INDUSTRIAL ENGINE

GAS INDUSTRIAL ENGINE PHYSICAL FACTORS



01	Centerline of Crankshaft	104	Jacket Water Outlet	401	Air Inlet
02	Centerline of Engine	125	Aftercooler water inlet	402	Exhaust
03	Rear face of Cylinder Block	126	Aftercooler water outlet	RD	Removal Distance
103	Jacket Water Inlet	201	Fuel Inlet		

See general dimension drawing 114-6637 for additional Electronic Ignition System (E.I.S.) engine detail and NA information.

For magneto ignition system engines see general dimension drawing 7W4452.

Note: General configuration not to be used for installation.

CONDITIONS AND DEFINITIONS

Ratings are based on SAE J1349 standard conditions of 29.61 in Hg (100 kPa) and 77° F (25° C). These ratings also apply at ISO3046, DIN6271, and BS5514 standard conditions of 29.61 in Hg (100 kPa), 81° F (27° C); and API 7B-11C standard conditions of 29.38 in Hg (99 kPa), 85° F (29° C).

Ratings are based on dry natural gas having a low heat value of 905 btu/ft³ (35.54 MJ/N m³). Variations in altitude, temperature, and gas composition from standard conditions may require a reduction in engine horsepower.

Turbocharged-aftercooled ratings apply to 5000 ft (1525 m) and 77° F (25° C). **Naturally aspirated** engines apply to 500 ft (150 m) and 77° F (25° C). For applications which exceed these limits, consult your Caterpillar dealer.

Additional ratings may be available for specific customer requirements. Consult your Caterpillar representative for details.

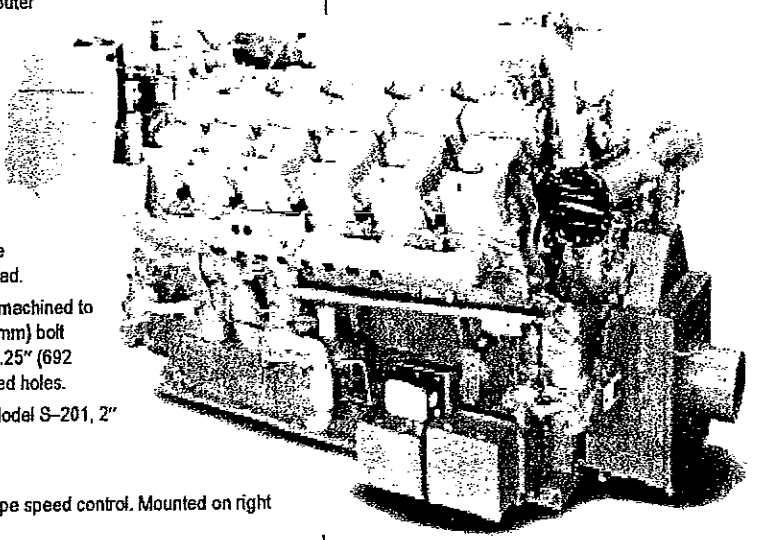
Engine Speed (rpm)	1400	Fuel	NAT GAS
Compression Ratio	8:1	LHV of Fuel (Btu/SCF)	920
Aftercooler Inlet Temperature (°F)	130	Fuel System	HPG IMPCO
Jacket Water Outlet Temperature (°F)	210		
Ignition System	EIS	Minimum Fuel Pressure (psig)	35
Exhaust Manifold	WATER COOLED	Methane Number at Conditions Shown	80
Combustion System Type	LOW EMISSION	Rated Altitude (ft) at 77°F Design Temperature	5000

Engine Rating Data	% Load	100%	75%	50%
Engine Power (w/o fan)	bhp	1265	948	632
Engine Data				
Specific Fuel Consumption (BSFC) (1)	Btu/bhp-hr	7552	7711	8255
Air Flow (Wet, @ 77°F, 28.8 in Hg)	SCFM	2666	1930	1290
Air Mass Flow (Wet)	lb/hr	11822	8557	5721
Compressor Out Pressure	in. HG (abs)	73.7	68.9	51.1
Compressor Out Temperature	°F	307	278	201
Inlet Manifold Pressure	in. HG (abs)	64.8	48	32.9
Inlet Manifold Temperature (10)	°F	141	140	136
Timing (11)	°BTDC	33	33	33
Exhaust Stack Temperature	°F	869	862	865
Exhaust Gas Flow (Wet, @ stack temperature, 29.7 in Hg)	CFM	7179	5179	3482
Exhaust Gas Mass Flow (Wet)	lb/hr	12282	8909	5973
Engine Emissions Data				
Nitrous Oxides (NO as NO2) (9)	g/bhp-hr	2.0	4.5	8.1
(Corr. 15% 02)	ppm	134	330	547
Carbon Monoxide (CO) (9)	g/bhp-hr	1.9	2.2	2.4
(Corr. 15% 02)	ppm	231	261	269
Total Hydrocarbons (THC) (9)	g/bhp-hr	2.9	2.4	2.4
(Corr. 15% 02)	ppm	620	501	476
Non-Methane Hydrocarbons (NMHC) (9)	g/bhp-hr	0.44	0.36	0.37
(Corr. 15% 02)	ppm	44	34	30
Exhaust Oxygen (9)	%	8.3	7.5	6.4
Lambda		1.58	1.50	1.40
Engine Heat Balance Data				
Input Energy LHV (1)	Btu/min	159152	121887	86992
Work Output	Btu/min	53653	40240	26826
Heat Rejection to Jacket (2) (6)	Btu/min	46771	39767	32901
Heat Rejection to Atmosphere (Radiated) (4)	Btu/min	5313	4428	3543
Heat Rejection to Lube Oil (5)	Btu/min	0	0	0
Total Heat Rejection to Exhaust (to 77°F) (2)	Btu/min	45181	32359	21902
Heat Rejection to Exhaust (LHV to 350°F) (2)	Btu/min	28575	20502	13904
Heat Rejection to Aftercooler (3) (7) (8)	Btu/min	8235	5094	1820

Waukesha VHP

L7042G/GSI

VHP Series Gas Engine
748 - 1920 BHP



Model L7042G Naturally Aspirated
Model L7042GSI Turbocharged
and Intercooled, Twelve Cylinder, Four-Cycle
Gas Engine

STANDARD EQUIPMENT

AIR CLEANER – Two, dry type with rain shield and service indicator.

BARRING DEVICE – Manual.

BEARINGS – Heavy duty, replaceable, precision type.

BREATHER – Closed system.

CONNECTING RODS – Drop forged steel, rifle drilled.

CONTROL SYSTEM – Pneumatic. Includes pilot operated valves for air start and prelube. Engine mounted control panel with two push button valves. Pilot operated air start valves omitted when starter is not furnished by Waukesha. Includes engine On/Off push button. One mounted on either side of the engine.

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 wet type cylinder liners, chrome plated on outer diameter. Induction hardened.

CYLINDER HEADS – Twelve interchangeable, valve-in-head type. 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.

ENGINE ROTATION – Counterclockwise when facing flywheel.

ENGINE MONITOR DEVICES – Engine thermocouples, K-type, for jacket water temperature and lube oil temperature. Magnetic pickup wired for customer supplied tachometer. Lube oil pressure and intake manifold pressure sensing lines are terminated in a common bulk head.

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.

FUEL SYSTEM – Dual, natural gas, 4" (102 mm) updraft. Two Fisher Model S-201, 2" (51 mm) gas regulators, 12 psi (83 kPa) maximum inlet pressure.

FLYWHEEL HOUSING – No. 00 SAE.

GOVERNOR – Woodward UG-8 LD hydraulic lever type, with friction type speed control. Mounted on right hand side.

IGNITION – Waukesha Custom Engine Control® Ignition Module. Electronic digital ignition system. 24V DC power required.

LEVELING BOLTS

LIFTING EYES

LUBRICATION – Full pressure. Gear type pump. Full flow filter, 36 gallon (136 litres) capacity, not mounted. Includes flexible connections. Includes lube oil strainer, mounted on engine. Air/gas motor driven prelube pump. Requires final piping.

MANIFOLDS – Exhaust, (2) water cooled with single vertical 8 inch (203 mm) flange at rear, and flexible stainless steel exhaust connection.

OIL COOLER – With thermostatic temperature controller and pressure regulating valve. Not mounted.

OIL PAN – Base type. 78 gallon (295 litres) capacity including filter.

PAINT – Oilfield orange primer.

PISTONS – Aluminum with floating pin. Standard 8:1 compression ratio. Oil cooled.

SHIPPING SKID – Steel for domestic truck or rail.

VIBRATION DAMPER – Viscous type. Guard included with remote mounted radiator or no radiator.

WATER CIRCULATING SYSTEM

Auxiliary Circuit – For oil cooler. Pump is belt driven from crankshaft pulley.

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.

WAUKESHA CUSTOM ENGINE CONTROL®, DETONATION SENSING MODULE (DSM) – Includes individual cylinder sensors, Detonation Sensing Module, filter and cables. Device is compatible with Waukesha CEC Ignition Module only. Sensors are mounted and wired to engine junction box. Detonation Sensing Module and filter are shipped loose. One 11 ft. cable provided for connection between engine junction box and filter. One each 15 ft. cable provided for connection between filter and DSM and Ignition Module and DSM. One 20 ft. cable provided for power and ground for filter. All cables are shipped loose. Packager is responsible for power supply and ground to the DSM. 24V DC power is required. The DSM meets Canadian Standards Association Class 1, Group D, Division 2, hazardous location requirements.

SPECIFICATIONS

Cylinders
V 12

Piston Displacement
7040 cu. in.
(115 L)

Bore & Stroke
9.375" x 8.5"
(238 x 216 mm)

Compression Ratio
8.2:1

Jacket Water System Capacity
73 gal.
(276 L)

Lube Oil Capacity
73 gal.
(276 L)

Starting System
125 - 150 psi air/gas
24/32 V electric

Dry Weight
G Models
20,500 lb.
(9300 kg)
GSI Models
21,000 lb.
(9525 kg)

Waukesha Engine ISO 9001 CERTIFIED

POWER RATINGS: L7042G/GSI VHP SERIES GAS ENGINES

Model	I.C. Water Inlet Temp.	C.R.	Bore & Stroke in.(mm)	Displ. cu. in. (litres)	Brake Horsepower 700 rpm I C	800 rpm I C	900 rpm I C	1000 rpm I C	1100 rpm I C	1200 rpm I C
L7042GSI	85° F	8:1	9.375x8.5(238x216)	7040 (115)	1120 902	1280 1031	1440 1160	1600 1289	1760 1418	1920 1547
L7042GSI	130° F	8:1	9.375x8.5(238x216)	7040 (115)	1070 862	1223 985	1376 1108	1528 1232	1681 1355	1834 1478
L7042G	—	10:1	9.375x8.5(238x216)	7040 (115)	722 642	824 732	920 818	1008 896	1087 966	1152 1024
L7042G	—	8:1	9.375x8.5(238x216)	7040 (115)	671 597	760 675	842 748	912 810	974 866	1026 912

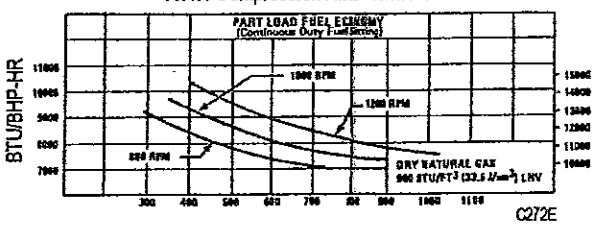
Rating Standard: All models: Ratings are based on ISO 3046/1-1995 with mechanical efficiency of 90% and Tcra (clause 10.1) as specified above limited to + 10° F (5° C). Ratings are also valid for SAE J1349, BS5514, DIN6271 and AP17B-11C standard atmospheric conditions.

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

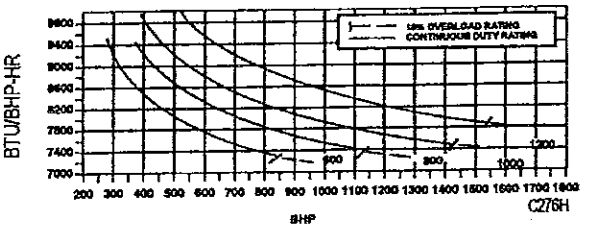
ISO Standard Power/Continuous Power Rating: The highest load and speed which can be applied 24 hours a day, seven days a week, 365 days per year except for normal maintenance. It is permissible to operate the engine at up to 10% overload, or maximum load indicated by the intermittent rating, whichever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

All natural gas engine ratings are based on a fuel of 900 Btu/ft³ (35.3 MJ/nm³) SLHV value, with a 119 octane (per ASTM D-2700 test method).

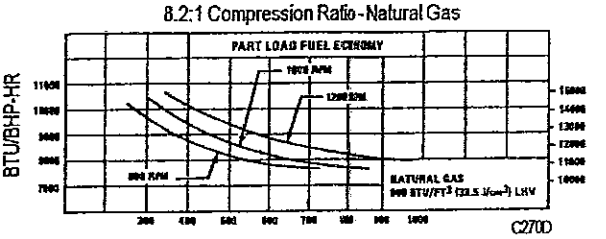
L7042G Engine
Naturally Aspirated
10.1:1 Compression Ratio - Natural Gas



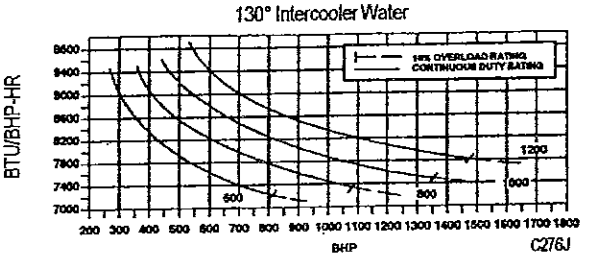
L7042GSI Engine
Turbocharged-Intercooled - 8:1 Compression Ratio
85° Intercooler Water

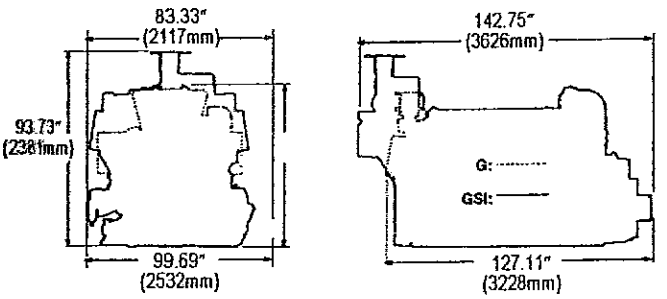


8.2:1 Compression Ratio - Natural Gas



130° Intercooler Water





DRESSER Waukesha

WAUKESHA ENGINE DIVISION
DRESSER EQUIPMENT GROUP, INC.
1000 West St. Paul Avenue
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Phone: (414) 547-3311 Fax: (414) 549-2795
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WAUKESHA ENGINE DIVISION
A DIVISION OF DRESSER INDUSTRIAL PRODUCTS, B.V.
Farmsumerweg 43, Postbus 330
9900 AH Appingedam, The Netherlands
Phone: (31) 596-652269 Fax: (31)596-624217

Bulletin 7011 0799

HEAT BALANCE 3

HEAT REJECTION AND OPERATING DATA
MODEL L7042GSI
130° F INTERCOOLER WATER
STOICHIOMETRIC AIR/FUEL RATIO

	BMEP (psi)	ENGINE SPEED – RPM						
		600	700	800	900	1000	1100	1200
POWER (BHP)	172	917	1070	1223	1376	1528	1681	1834
	152	811	946	1081	1216	1351	1486	1621
	138	739	862	985	1108	1232	1355	1478
	125	667	778	889	1000	1111	1222	1333
	100	533	622	711	800	889	978	1067
	75	400	467	533	600	667	733	800
	50	267	311	356	400	444	489	533
BRAKE SPECIFIC FUEL CONSUMPTION (BTU/BHP–HR)	172	7123	7160	7197	7282	7366	7484	7502
	152	7249	7285	7320	7401	7482	7603	7721
	138	7355	7390	7424	7502	7581	7703	7824
	125	7484	7517	7550	7625	7700	7824	7948
	100	7815	7844	7873	7940	8006	8135	8265
	75	8367	8389	8412	8464	8517	8655	8792
	50	9471	9480	9489	9513	9538	9693	9846
FUEL CONSUMPTION (BTU/HR x 1000)	172	6530	7585	8800	10030	11255	12500	13940
	152	5875	6895	7915	9010	10110	11315	12520
	138	5435	6370	7310	8320	9335	10445	11560
	125	4990	5850	6710	7635	8555	9575	10595
	100	4170	4885	5600	6360	7115	7965	8815
	75	3345	3915	4485	5080	5680	6355	7035
	50	2525	2950	3375	3805	4240	4745	5250
HEAT TO JACKET WATER (BTU/HR x 1000)	172	1760	2155	2550	2965	3280	3755	4125
	152	1625	1980	2330	2700	3075	3410	3745
	138	1530	1855	2185	2525	2865	3175	3490
	125	1439	1725	2035	2345	2565	2945	3230
	100	1267	1510	1750	2015	2270	2515	2755
	75	1095	1289	1483	1685	1885	2080	2275
	50	923	1065	1207	1354	1500	1650	1800
HEAT TO LUBE OIL (BTU/HR x 1000)	172	231	264	296	317	338	360	382
	152	215	246	277	298	319	341	363
	138	204	234	264	285	306	328	349
	125	193	222	251	272	293	315	336
	100	173	200	227	248	269	290	312
	75	153	178	203	224	245	266	287
	50	133	156	179	200	222	242	263
HEAT TO INTERCOOLER (BTU/HR x 1000)	172	53	38	122	167	212	307	403
	152	32	58	83	117	151	231	291
	138	21	41	61	88	116	171	225
	125	11	26	42	63	85	127	169
	100	–2	8	18	28	41	64	86
	75	–5	–3	–1	6	13	23	33
	50	–7	–7	–5	–3	1	5	10

HEAT BALANCE 3

HEAT REJECTION AND OPERATING DATA
MODEL L7042GSI
130° F INTERCOOLER WATER
STOICHIOMETRIC AIR/FUEL RATIO

	BMEP (psi)	ENGINE SPEED – RPM						
		600	700	800	900	1000	1100	1200
HEAT TO RADIATION (BTU/HR x 1000)	172	548	568	588	600	611	646	681
	152	480	509	539	562	584	622	660
	138	446	479	511	538	566	605	645
	125	420	453	487	517	546	588	631
	100	385	417	448	479	509	555	601
	75	355	386	413	441	469	517	566
	50	330	353	376	400	425	473	521
TOTAL ENERGY IN EXHAUST (BTU/HR x 1000)	172	1970	1940	2210	2545	2880	3290	3705
	152	1391	1660	1925	2240	2550	2945	3335
	138	1242	1496	1750	2040	2335	2710	3085
	125	1112	1347	1585	1850	2120	2475	2825
	100	900	1093	1286	1505	1725	2050	2335
	75	702	847	993	1162	1331	1580	1825
	50	495	597	699	814	930	[illegible]	1292
EXHAUST TEMP. AFTER TURBINE — 50° F	172	1054	1070	1086	1091	1096	1121	1145
	152	980	1007	1035	1053	1072	1104	1135
	138	942	974	1006	1030	1055	1090	1125
	125	911	946	980	1009	1037	1075	1113
	100	867	903	938	969	1000	1042	1085
	75	829	862	895	926	956	1003	1049
	50	793	814	845	875	905	955	1005
INDUCTION AIR FLOW (SCFM)	172	1240	1460	1675	1905	2140	2295	2550
	152	1110	1300	1495	1700	1910	2135	2365
	138	1020	1195	1375	1565	1750	1960	2170
	125	930	1095	1255	1425	1600	1790	1980
	100	770	905	1035	1175	1315	1475	1630
	75	615	715	820	930	1040	1165	1290
	50	460	535	610	690	[illegible]	860	950
EXHAUST GAS FLOW (LBS/HR)	172	5635	5635	7520	8685	9745	10910	12070
	152	5050	5925	6800	7745	8680	9730	10785
	138	4650	5450	6255	7120	7985	8935	9890
	125	4245	4980	5715	6500	7285	8150	9020
	100	3515	4120	4720	5360	6005	6720	7435
	75	2795	3275	3750	4245	4745	5310	5880
	50	2090	2440	2795	3150	3510	3930	4350

NOTES:

1. All data are based on standard conditions of 100 kPa (29.54 inches Hg.) barometric pressure, 25° C (77° F) ambient and induction air temperature, 30% relative humidity (1 kPa/0.3 inches Hg. water vapor pressure) and 82° C (180° F) engine jacket water outlet temperature.
2. Data are average values at the standard conditions and will vary for individual engines and with operating and ambient conditions. An adequate reserve should be used for cooling system or heat recovery calculations. See also Cooling System Guidelines S-6695-4.
3. For heat rejection changes due to engine jacket water outlet temperature different from standard (Note 1), refer to S-7613-2.
4. Exhaust flow, ACFM = $\frac{\text{Exh. Flow, lb/hr} \times \text{Exh. Temp. °F} + 460}{2250}$
5. Stoichiometric, Lambda = 1.0, air/fuel ratio.
6. Reference C-273-4.

EMISSION LEVELS

VHP:

MODEL	CARBURETOR SETTING	GRAMS/HP-HR NOX*	CO	NMHC	THC	% OBSERVED DEV CO	O2	MASS AFR**	VOLUME AFR**	EXCESS AIR RATIO
G.GSI	Lowest Manifold (Best Power)	7.0	29.0	0.30	2.0	1.15	0.30	15.5:1	9.2:1	0.97
G.GSI	Equal NOx & CO	10.0	10.0	0.30	2.0	0.45	0.30	15.8:1	9.5:1	0.99
G.GSI	Catalytic Conv. Incl. (3-way***)	11.0	6.0	0.25	1.7	0.38	0.30	15.95:1	9.6:1	0.99
G.GSI	Normal (Best Economy)	18.0	1.0	0.20	1.0	0.02	1.35	17.0:1	10.2:1	1.06
GL	Normal	1.5	2.55	1.0	6.5	0.06	9.3	28.0:1	16.8:1	1.74

ATGL:

MODEL	CARBURETOR SETTING	GRAMS/HP-HR NOX*	CO	NMHC	THC	% OBSERVED DEV CO	O2	MASS AFR**	VOLUME AFR**	EXCESS AIR RATIO
AT25GL	Normal	1.0	2.25	1.0	8.0	0.06	9.3	28.0:1	16.8:1	1.74
AT27GL	Normal	1.5	1.70	0.5	6.0	0.06	9.8	29.0:1	16.8:1	1.74
AT27GL	Ultra Lean	1.5	2.0	0.5	6.0	.305	11.4	32.0:1	19.2:1	2.00

COOPER ENERGY SERVICES
AJAX COOPER-BESSEMER PENN PUMP SUPERIOR

March 18, 1982

Texas Eastern Transmission Corporation
Post Office Box 2511
Houston, Texas 77001

Attention: Mr. Willard T. Young
Manager Environmental Protection

Reference: Specification #1601 for Gas Engine Driven Reciprocating Gas Compressor for Transwestern Pipeline Company

Gentlemen:

I am pleased to submit the following emission and fuel rate data for our CES Superior engines as requested by your Mr. A. Gill. This data is based upon engines operated at 100% speed and 100% torque.

Model	Fuel BTU/HP-HR	NOx GM/HP-HR	CO GM/HP-HR	NMHC GM/HP-HR
8GTLA	7400	5.0	3.0	.75
16SGTA	7150	5.0	2.0	.60

The emissions values are guaranteed with no tolerances. Fuel rates are subject to a 1% tolerance on factory tests and 3% tolerance on field tests.

The data is also based upon constant supply of 120°F maximum cooling water to the combustion air aftercoolers.

We trust this provides all required information, however if additional data is needed, please contact Mr. C. W. Woltz of this office.

Yours very truly,

A. J. Campbell
Regional Sales Manager

AJC:sw

cc: C. W. Woltz

6740 HARWIN DRIVE HOUSTON, TEXAS 77036 PHONE 713/782-7040

GRI-HAPCalc® 3.0
Engines Report

Facility ID:	**RB3**	**Notes:**
Operation Type:	**COMPRESSOR STATION**	
Facility Name:	**RED BLUFF #3**	
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: C-865

Hours of Operation: 8,760 Yearly
Rate Power: 1,265 hp
Fuel Type: NATURAL GAS
Engine Type: 4-Stroke, Lean 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	1.2338	0.10110000 g/bhp-hr	GRI Literature
Acetaldehyde	0.2063	0.01690000 g/bhp-hr	GRI Literature
Acrolein	0.0903	0.00740000 g/bhp-hr	GRI Literature
Benzene	0.0525	0.00430000 g/bhp-hr	GRI Literature
Toluene	0.3283	0.02690000 g/bhp-hr	GRI Literature
Xylenes(m,p,o)	0.0110	0.00090000 g/bhp-hr	GRI Literature
Total	1.9222		

Unit Name: C-867

Hours of Operation: 8,760 Yearly
Rate Power: 1,195 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	0.7182	0.06230000 g/bhp-hr	GRI Literature
Acetaldehyde	0.0450	0.00390000 g/bhp-hr	GRI Literature

Acrolein	0.0392	0.00340000 g/bhp-hr	GRI Literature
Benzene	0.0530	0.00460000 g/bhp-hr	GRI Literature
Toluene	0.0184	0.00160000 g/bhp-hr	GRI Literature
Xylenes(m,p,o)	0.0161	0.00140000 g/bhp-hr	GRI Literature
Total	0.8899		

Unit Name: C-868

Hours of Operation: 8,760 Yearly
Rate Power: 1,195 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	0.7182	0.06230000 g/bhp-hr	GRI Literature
Acetaldehyde	0.0450	0.00390000 g/bhp-hr	GRI Literature
Acrolein	0.0392	0.00340000 g/bhp-hr	GRI Literature
Benzene	0.0530	0.00460000 g/bhp-hr	GRI Literature
Toluene	0.0184	0.00160000 g/bhp-hr	GRI Literature
Xylenes(m,p,o)	0.0161	0.00140000 g/bhp-hr	GRI Literature
Total	0.8899		

Unit Name: C-878

Hours of Operation: 8,760 Yearly
Rate Power: 1,073 hp
Fuel Type: NATURAL GAS
Engine Type: 4-Stroke, Lean 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	1.0466	0.10110000 g/bhp-hr	GRI Literature
Acetaldehyde	0.1749	0.01690000 g/bhp-hr	GRI Literature
Acrolein	0.0766	0.00740000 g/bhp-hr	GRI Literature
Benzene	0.0445	0.00430000 g/bhp-hr	GRI Literature
Toluene	0.2785	0.02690000 g/bhp-hr	GRI Literature
Xylenes(m,p,o)	0.0093	0.00090000 g/bhp-hr	GRI Literature
Total	1.6304		

Unit Name: C-880

Hours of Operation:	8,760	Yearly
Rate Power:	1,265	hp
Fuel Type:	NATURAL GAS	
Engine Type:	4-Stroke, Lean 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	1.2338	0.10110000 g/bhp-hr	GRI Literature
Acetaldehyde	0.2063	0.01690000 g/bhp-hr	GRI Literature
Acrolein	0.0903	0.00740000 g/bhp-hr	GRI Literature
Benzene	0.0525	0.00430000 g/bhp-hr	GRI Literature
Toluene	0.3283	0.02690000 g/bhp-hr	GRI Literature
Xylenes(m,p,o)	0.0110	0.00090000 g/bhp-hr	GRI Literature
Total	1.9222		

Section 8

Map(s)

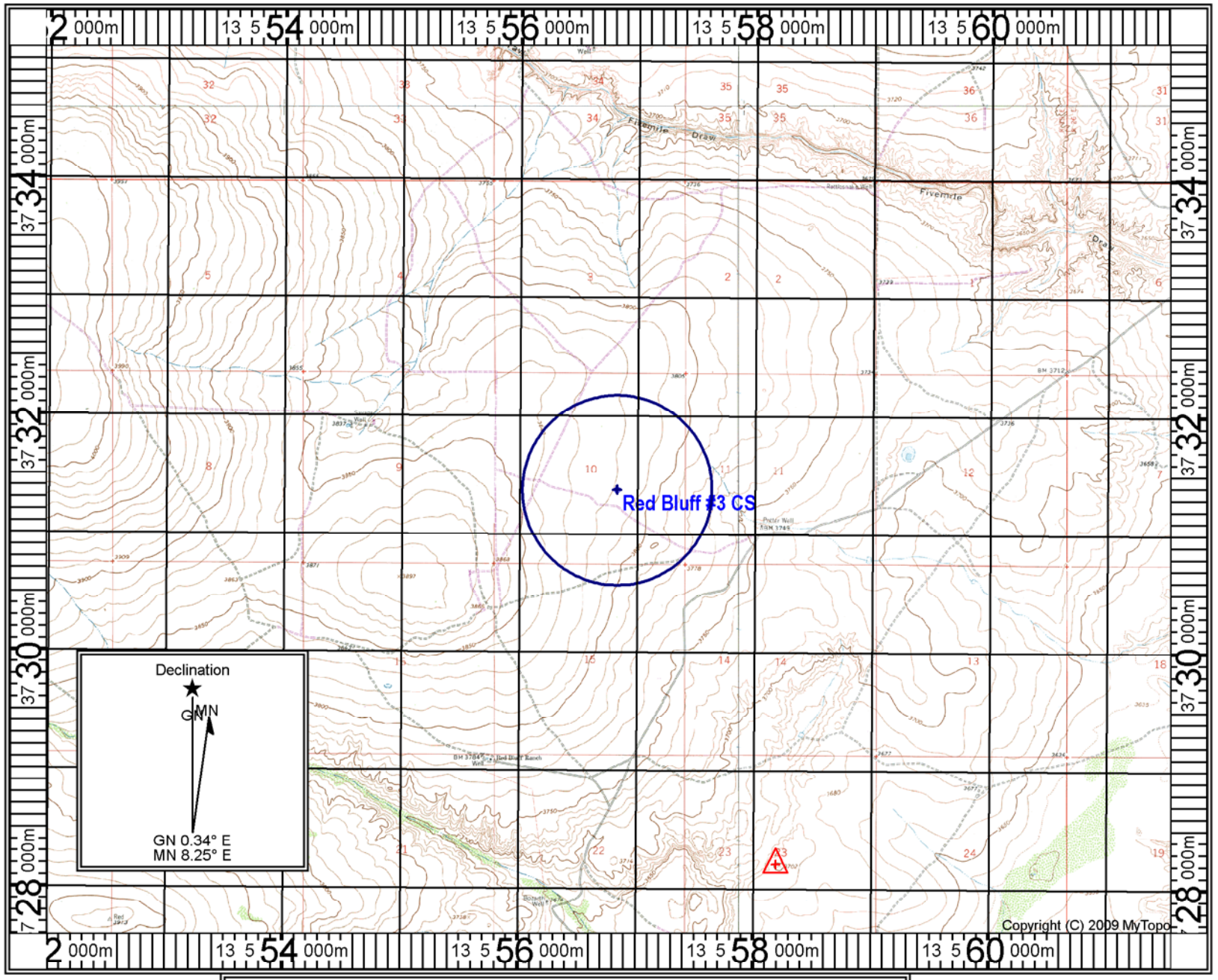
A map such as a 7.5 minute topographic quadrangle showing the exact location of the source. The map shall also include the following:

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	

A map is attached.

Map Name: COYOTE DRAW (NM)
Print Date: 02/25/20
Scale: 1 inch = 4,000 ft.

Map Center: 13 0556750 E 3731381 N
Horizontal Datum: WGS84



SCALE 1:48000

0 10000

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")

☑ **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.

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

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

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

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

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

N/A – Public Notice is not required for applications being submitted under 20.2.70 NMAC.

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.

The Red Bluff No. 3 natural gas compressor station is part of a localized gas gathering system that gathers sweet field gas from multiple wells in the area. The SIC code for the facility is 4922. The facility is located in Section 10, Township 7 South, Range 25 East in Chaves County.

Equipment currently authorized at the site includes the following:

- Two (2) Caterpillar G3516 compressor engines (Units C-865 and C-880);
- Two (2) Waukesha L7042GSI compressor engines (Units C-867 and C-868);
- One (1) Superior 8GTLA compressor engine (Unit C-878);
- One (1) rinse compressor engine (Unit C-320);
- Two (2) Capstone C65 microturbines (Units CAP-1 and CAP-2);
- One glycol dehydration contactor (unit Dehy-1); and
- Two (2) condensate storage tanks (Units TK-1 and TK-2);

Additional emissions at the facility result from startup, shutdown, maintenance, and malfunction (Unit SSM/M) and facility-wide fugitive component emissions (FUG).

The following insignificant activities and equipment are located at Red Bluff No. 3:

- One (1) glycol dehydration unit reboiler (Unit Rebl-1);
- Five (5) nitrogen rejection units (Unit NRU-1);
- One (1) helium recovery unit (Unit HRU).
- Five (5) miscellaneous storage tanks for lube oil, glycol, etc. (Units T-1 through T-5);
- Loadout emissions from truck loadout of condensate and NGL (Units Load and NGL Load); and
- Unpaved haul road emissions (Unit Haul).

Each compressor engine at the site is authorized to operate continuously at the design maximum capacity horsepower listed in the application. These engines will provide a maximum production capacity that is dependent upon the suction and discharge pressures at the facility, the number of wells connected to the facility, and the gas deliverability that each well provides the site. The Waukesha engines and the Caterpillar CG137-12 engine are equipped with catalytic converters. All of the compressor engines are turbocharged and are not derated per current NMED policy.

The facility is authorized to operate continuously (8,760 hr/yr) at design maximum capacity processing rates. IACX will minimize startup and shutdown activities at the facility in accordance with good operating principles and business objectives. This practice will serve to minimize total annual excess emissions from the facility due to startup, shutdown, and maintenance activities.

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)**:**
See 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)

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

A. **This facility is:**

- ☐ a minor PSD source before and after this modification (if so, delete C and D below).
- ☐ a major PSD source before this modification. This modification will make this a PSD minor source.
- ☐ an existing PSD Major Source that has never had a major modification requiring a BACT analysis.
- ☐ an existing PSD Major Source that has had a major modification requiring a BACT analysis
- ☐ a new PSD Major Source after this modification.

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

a. NOx: XX.X TPY
b. CO: XX.X TPY
c. VOC: XX.X TPY
d. SOx: XX.X TPY
e. PM: XX.X TPY
f. PM10: XX.X TPY
g. PM2.5: XX.X TPY
h. Fluorides: XX.X TPY
i. Lead: XX.X TPY
j. Sulfur compounds (listed in Table 2): XX.X TPY
k. GHG: XX.X TPY

C. **Netting [is required, and analysis is attached to this document.] OR [is not required (project is not significant)] OR [Applicant is submitting a PSD Major Modification and chooses not to net.]**

D. **BACT** is **[not required for this modification, as this application is a minor modification.] OR [required, as this application is a major modification. List pollutants subject to BACT review and provide a full top down BACT determination.]**

If this is an existing PSD major source, or any facility with emissions greater than 250 TPY (or 100 TPY for 20.2.74.501 Table 1 – PSD Source Categories), determine whether any permit modifications are related, or could be considered a single project with this action, and provide an explanation for your determination whether a PSD modification is triggered.

N/A – This application is being submitted under 20.2.70 NMAC. A PSD applicability determination was performed as part of the application for NSR Permits 0412-M4.

Section 13

Determination of State & Federal Air Quality Regulations

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

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

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

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

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

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

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

INCLUDE ANY OTHER INFORMATION NEEDED TO COMPLETE AN APPLICABILITY DETERMINATION OR THAT IS 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 REGU-LATIONS 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	Red Bluff No. 3 operates under NSR Permit 0412-M4 and therefore this regulation applies.
20.2.3 NMAC	Ambient Air Quality Standards NMAAQS	Yes	Facility	20.2.3 NMAC is a SIP approved regulation that limits the maximum allowable concentration of Total Suspended Particulates, Sulfur Compounds, Carbon Monoxide and Nitrogen Dioxide. The facility meets maximum allowable concentrations of the TSP, SO_2, H_2S, NO_x, and CO under this regulation.
20.2.7 NMAC	Excess Emissions	Yes	Facility	This regulation establishes requirements for the facility if operations at the facility result in any excess emissions. The owner or operator will operate the source at the facility having an excess emission, to the extent practicable, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions. The facility will also notify the NMED of any excess emission per 20.2.7.110 NMAC.
20.2.23 NMAC	Fugitive Dust Control	No	Facility	This regulation does not apply as this application is submitted under 20.2.70 NMAC and therefore exempt of this requirement. Sources exempt from 20.2.23 NMAC are activities and facilities subject to a permit issued pursuant to the NM Air Quality Control Act, the Mining Act, or the Surface Mining Act (20.2.23.108.B NMAC.
20.2.33 NMAC	Gas Burning Equipment - Nitrogen Dioxide	No	N/A	This facility does not have existing gas burning equipment 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 facility does not have oil burning equipment 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 facility is not a natural gas processing plant, as defined in the regulation [20.2.35.7 NMAC]. This regulation is to establish sulfur emissions standards for natural gas processing plants [20.2.35.6 NMAC]. As this facility is not defined as a natural gas processing plant under this regulation, the facility is not subject to this regulation.
20.2.37 and 20.2.36 NMAC	Petroleum Processing Facilities and Petroleum Refineries	No	N/A	This facility not a natural gas or petroleum processing facility, as defined in the regulation [20.2.37.7 NMAC]. This regulation is to minimize emissions from petroleum or natural gas processing facilities [20.2.37.6 NMAC]. As this facility is not defined as a natural gas or petroleum processing facility, the facility is not subject to this regulation.
20.2.38 NMAC	Hydrocarbon Storage Facility	No	N/A	There are no tanks or tank batteries that meet the storage capacity and weekly throughput requirements that would trigger this requirement. The throughput for this facility is less than the 10,000 barrel per year threshold. There are also no tank batteries having a capacity greater than 50,000 barrels or new tank batteries with a capacity greater than 65,000 gallons. [20.2.38.109 NMAC][20.2.38.110 NMAC] [20.2.38.111 NMAC] [20.2.38.112 NMAC].
20.2.39 NMAC	Sulfur Recovery Plant - Sulfur	No	N/A	This regulation establishes sulfur emission standards for sulfur recovery plants which are not part of petroleum or natural gas processing facilities. This regulation does not apply to this facility because it does not have elements of a sulfur recovery plant present.
20.2.61.109 NMAC	Smoke & Visible Emissions	Yes	C-865, C-867, C-868, C-878, C-880, C-320, FUG, CAP-1, CAP-2	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 facility has engines and turbines which meet the definition of stationary combustion equipment as defined in 20.2.61.7.D and are therefore subject to this regulation.

STATE REGU-LATIONS 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.)
20.2.70 NMAC	Operating Permits	Yes	Facility	Red Bluff No. 3 operates under TV P073-R3M2 and is a major source for NO_X and CO. Therefore, the facility is subject to this regulation and 20.2.71 NMAC.
20.2.71 NMAC	Operating Permit Fees	Yes	Facility	Red Bluff No. 3 is subject to 20.2.70 NMAC, therefore it is subject to 20.2.71 NMAC.
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 great 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. The facility has a construction permit (NSR Permit) 0412-M4 to meet the requirements of this regulation.
20.2.73 NMAC	NOI & Emissions Inventory Requirements	Yes	Facility	This regulation establishes emission inventory requirements. The facility meets the applicability requirements of 20.2.73.300 NMAC. The facility will meet all applicable reporting requirements under 20.2.73.300.B.1 NMAC.
20.2.74 NMAC	Permits – Prevention of Significant Deterioration (PSD)	No	N/A	This regulation establishes requirements for obtaining a prevention of significant deterioration permit. Facility-wide emission rates are below PSD-major thresholds. This regulation does not apply.
20.2.75 NMAC	Construction Permit Fees	Yes	Facility	This regulation establishes the guidelines and requirements for construction permitting fees. This facility is subject to this regulation as 20.2.72 NMAC also applies.
20.2.77 NMAC	New Source Performance	Yes	C-320	This regulation establishes state authority to implement NSPS for stationary sources subject to 40 CFR 60. Unit C-320 is subject to NSPS JJJJ and Subpart A.
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, as amended through December 31, 2010. This facility does not emit hazardous air pollutants which are subject to the requirements of 40 CFR Part 61 and is therefore not subject to this regulation.
20.2.79 NMAC	Permits – Nonattainment Areas	No	N/A	This regulation establishes the requirements for obtaining a 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	C-865, C-867, C-868, C-878, C-880, C-320, Dehy-1	This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63. Units C-865, C-867, C-868, C-878, C-880 are subject to MACT ZZZZ. Unit C-320 complies with MACT ZZZZ by being complying with NSPS JJJJ requirements. The dehydrator still vent/flash tank is subject to MACT HH.

Table for Applicable FEDERAL REGULATIONS:

FEDERAL REGU-LATIONS 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 NO_x, CO, SO_2, H_2S, PM_{10}, and $PM_{2.5}$ under this regulation.
NSPS 40 CFR 60, Subpart A	General Provisions	Yes	C-320, FUG	This regulation defines general provisions for relevant standards that have been set under this part. NSPS 40 CFR 60, Subpart A applies to Unit C-320 because the engine is subject to NSPS JJJJ requirements. Additionally, the compressor associated with C-320 and fugitives are subject to NSPS OOOOa.
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**	No	N/A	This regulation establishes standards of performance for industrial-commercial-institutional steam generating units. There are no steam generating units that commenced construction, modification, or reconstruction after June 19, 1984, and that have a heat input capacity greater than 100 MMBtu/hr at the facility.
40 CFR 60.40c, Subpart Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	No	N/A	This regulation establishes standards of performance for small industrial-commercial-institutional steam generating units. This facility does not have steam-generating units and therefore this subpart does not apply.
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. There are no regulated tanks at the facility; therefore, this subpart does not apply.
NSPS 40 CFR 60, Subpart Kb	Standards of Performance for **Volatile Organic Liquid Storage Vessels** (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced **After** July 23, 1984	No	N/A	This facility does not have storage vessels with a capacity greater than or equal to 75 cubic meters (m^3) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. Therefore, this subpart does not apply.
NSPS 40 CFR 60.330 Subpart GG	**Stationary Gas Turbines**	No	N/A	This regulation establishes standards of performance for certain stationary gas turbines. The Capstone C65 microturbines have a calculated heat input of 0.84 MMBtu/hr which is less than the 10 MMBtu/hour threshold. This regulation does not apply.

FEDERAL REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
NSPS 40 CFR 60, Subpart KKK	Leaks of VOC from **Onshore Gas Plants**	No	N/A	This regulation establishes standards of performance for equipment leaks of VOC from onshore natural gas processing plants for which construction, reconstruction, or modification commenced after January 20, 1984, and on or before august 23, 2011. The facility is not a natural gas processing plant as defined in this regulation [40 CFR Part 60.631]. This regulation does not apply because this facility does not meet the definition of a natural gas processing plant as stated in the regulation.
NSPS 40 CFR Part 60 Subpart LLL	Standards of Performance for **Onshore Natural Gas Processing**: SO_2 Emissions	No	N/A	This regulation does not apply because this facility does not meet the definition of a natural gas processing plant as stated in the regulation.
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	No	N/A	This regulation establishes standards of performance for crude oil and natural gas production, transmission and distribution. The facility does not have any affected units that have been modified or reconstructed on or after August 23, 2011 and before September 18, 2015. [40 CFR 60.5360 (Subpart OOOO)]
NSPS 40 CFR Part 60 Subpart OOOOa	Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015	Yes	C-320 (compressor), FUG	This regulation establishes standards of performance for crude oil and natural gas production, transmission and distribution. The reciprocating compressor associated with unit C-320 was constructed after September 18, 2015 and is therefore subject to this subpart. The collection of fugitive emissions at the compressor station are additionally subject to this subpart. [40 CFR 60.5365a (Subpart OOOOa)]
NSPS 40 CFR Part 60 Subpart JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines	Yes	C-320	This regulation establishes standards of performance for stationary spark ignition combustion engines. Unit C-320 commenced construction after June 12, 2006; therefore, this regulation applies.
NESHAP 40 CFR 61 Subpart A	General Provisions	No	N/A	NESHAP 40 CFR 61 does not apply to the facility because the facility does not emit or have the triggering substances on site and/or the facility is not involved in the triggering activity. The facility is not subject to this regulation. None of the subparts of Part 61 apply to the facility.
NESHAP 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 REGU-LATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
MACT 40 CFR 63, Subpart A	General Provisions	Yes	C-865, C-867, C-868, C-878, C-880, C-320, Dehy-1	This regulation applies to all sources emitting hazardous air pollutants, which are subject to the requirements of 40 CFR Part 63. Units C-865, C-867, C-868, C-878, C-880 are subject to MACT ZZZZ. Unit C-320 is in compliance with MACT ZZZZ by being subject to NSPS JJJJ requirements. The dehydrator still vent/flash tank is subject to MACT HH.
MACT 40 CFR 63.760 Subpart HH	**Oil and Natural Gas Production Facilities**	Yes	Dehy-1	This subpart applies to owners and operators of emissions points including glycol dehydration units, and storage vessels with the potential for flash emissions This facility is subject to the requirements of 40 CFR 63 Subpart HH, which includes requirements applicable to area sources with TEG Dehydrators. The site is not a major source of hazardous air pollutants (HAPs) but an area source of HAPs and therefore subject to this subpart.
MACT 40 CFR 63 Subpart ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (**RICE MACT**)	Yes	C-865, C-867, C-868, C-878, C-880, C-320	This subpart establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. There are six internal combustion engines at this facility; therefore, this subpart applies.
40 CFR 64	**Compliance Assurance Monitoring**	Yes	C-867, C-868	Red Bluff No. 3 is a major source for NO_X and CO and therefore this regulation applies. Both units are installed with a catalytic converter.
40 CFR 68	**Chemical Accident Prevention**	No	N/A	The facility is not an affected facility because it does not have quantities of materials regulated by 40 CFR Part 68 that are in excess of the triggering threshold.
Title IV – Acid Rain 40 CFR 72	**Acid Rain**	No	N/A	This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation [40 CFR Part 72.6].
Title IV – Acid Rain 40 CFR 73	**Sulfur Dioxide** Allowance Emissions	No	N/A	This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation.
Title IV-Acid Rain 40 CFR 75	**Continuous Emissions Monitoring**	No	N/A	This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation.
Title IV – Acid Rain 40 CFR 76	**Acid Rain** Nitrogen Oxides **Emission Reduction Program**	No	N/A	This part establishes the acid rain program. This part does not apply because the facility is not covered by this regulation.
Title VI – 40 CFR 82	Protection of **Stratospheric Ozone**	No	N/A	The facility does not "service", "maintain" or "repair" class I or class II appliances nor "disposes" of the appliances. Note: Disposal definition in 82.152: Disposal means the process leading to and including: (1) The discharge, deposit, dumping or placing of any discarded appliance into or on any land or water; (2) The disassembly of any appliance for discharge, deposit, dumping or placing of its discarded component parts into or on any land or water; or (3) The disassembly of any appliance for reuse of its component parts. "Major maintenance, service, or repair means" any maintenance, service, or repair that involves the removal of any or all of the following appliance components: compressor, condenser, evaporator, or auxiliary heat exchange coil; or any maintenance, service, or repair that involves uncovering an opening of more than four (4) square inches of "flow area" for more than 15 minutes.

Section 14

Operational Plan to Mitigate Emissions

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

☑ **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.

Startup and shutdown procedures are either based on manufacturer's recommendations or based on IACX'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 IACX will submit the required Excess Emissions Report per 20.2.7 NMAC if any emissions occur beyond the requested total SSM emission limit. 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)

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: https://www.env.nm.gov/aqb/permit/aqb_pol.html. 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.

N/A – There are no alternative operating scenarios for this facility.

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.

This application is submitted pursuant to 20.2.70 NMAC. Air dispersion modeling for this facility was last submitted with the revision application of NSR permit No. 0412-M3R10.

Section 17

Compliance Test History

(Submitting under 20.2.70, 20.2.72, 20.2.74 NMAC)

To show compliance with existing NSR permits conditions, you must submit a compliance test history. The table below provides an example.

Compliance Test History Table

Unit No.	Test Description	Test Date
C-867	Tested in accordance with EPA test methods for NOx and CO as required by NSR permit 0412-M4.	5/3/2021, 12/15/2020, 8/11/2020, 12/16/2019, 10/8/2019, 5/28/2019, 2/4/2019, 8/14/2018, 5/17/2018, 3/21/2018
C-868	Tested in accordance with EPA test methods for NOx and CO as required by NSR permit 0412-M4.	5/3/2021, 12/9/2020, 8/11/2020, 10/10/2019, 5/28/2019, 6/22/2018, 3/21/2018
C-880	Tested in accordance with EPA test methods for NOx and CO as required by NSR permit 0412-M4.	5/19/2020, 2/5/2019
C-865	Tested in accordance with EPA test methods for NOx and CO as required by NSR permit 0412-M4.	2/4/2020 10/24/2018
C-320	Tested in accordance with EPA test methods for NOx and CO as required by NSR permit 0412-M4.	5/3/2021
C-878	Tested in accordance with EPA test methods for NOx and CO as required by NSR permit 0412-M4.	10/25/2018

Section 19

Requirements for Title V Program

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 http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are encouraged to submit both applications simultaneously.
* Any source in a source category designated by the EPA Administrator ("Administrator"), in whole or in part, by regulation, after notice and comment.

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

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

IACX's units C-867 and C-868 are subject to this requirement and are monitored to remain in compliance according to the outlined measurement procedures of this requirement. A CAM plan for these units is attached in this section.

Monitoring Protocols

40 CFR 64.2 states that the requirements of this part shall apply to an emissions unit at a major source if the unit satisfies all of the following criteria:

1)The unit is subject to an emission limitation or standard for the applicable regulated air pollutant;
2)The unit uses a control device to achieve compliance with any such emission limitation or standard; and
3)The unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

The Waukesha L7042GSI compressor engines are subject to the CAM requirement.

Compliance Assurance Monitoring Plan for the Waukesha L7042GSI compressor engines:

Both Waukesha L7042GSI compressor engines are equipped with Johnson-Matthey QXC60-12 catalytic converters and Continental Controls ECV 5C AFR controllers. The two units are identical with dual exhaust manifolds that merge prior to the catalyst housing. Unit 868 is identical to Unit 867. The following approach will be applicable to both units.

Justification

Based on manufacturer data, operation of the catalytic converters within the temperature and oxygen ranges outlined below provides a reasonable assurance of compliance and hence complies with CAM requirements.

Catalyst Performance Indicator [64.4(a)(1)]	Exhaust temperature and exhaust O2 content
Measurement Approach	Exhaust temperature is measured using an in-line thermocouple. Exhaust O2 is measured with an O2 sensor that translates the O2 reading into a volt reading.
Indicator Range [64.4(a)(2)]	Acceptable temperature range is 550 °F to 1300 °F. This range has been selected based on the catalyst manufacturer recommendation. An acceptable O2 reading is 0% to 0.75% O2, also based on catalyst manufacturer recommendations. This translates into a volt range of 0.5 to 1.0. Excursions out of this range will alarm as part of the SCADA system.
Data Representativness [64.3(b)(1)]	Temperature is measured at the inlet of the catalyst housing by a thermocouple. The minimum accuracy is ± 2.5°C. Oxygen is measured in each exhaust manifold prior to the turbo and prior to the catalyst housing by an O2 sensor.
Verification of Operational Status [64.3(b)(2)]	Quarterly emissions tests are performed on both units following CTM-34. Agave will also maintain records of O2 sensor and catalyst replacement.
QA/QC Practices and Criteria [64.3(b)(3)]	The thermocouple is not calibrated. However, the transmitter is calibrated annually and records will be kept of calibration. The oxygen sensors are replaced on a regular basis and so calibration of the O2 sensors are not necessary. Calibration of the AFR is performed as needed i.e. replacement of the fuel valve.
Monitoring Frequency [64.3(b)(4)]	The SCADA system will record the temperature and O2 volt readings a minimum of four times per day.
Data Collection Procedures [64.3(b)(4)]	Temperature and O2 voltage readings are electronically recorded a minimum of four times per day.
Averaging Period [64.3(b)(4)]	None, not to exceed minimum and maximum values in the range specified.

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.

Based on information and belief formed after reasonable inquiry, IACX believes that the Red Bluff No. 3 Compressor Station is in compliance with each applicable requirement identified in Section 13. In the event that IACX discovers new information affecting the compliance status of the facility, IACX will make appropriate notifications and/or take corrective actions.

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.

Based on information and belief formed after reasonable inquiry, IACX states that the Red Bluff No. 3 Compressor Station will continue to be operated in compliance with each applicable requirement identified in Section 13.

In addition, IACX will meet new applicable requirements that become effective during the permit term in a timely manner or consistent with such schedule as expressly required by the applicable requirement. In the event that IACX discovers new information affecting the compliance status of the facility, IACX will make appropriate notifications and/or take corrective actions.

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.

IACX will submit a compliance certification for the Red Bluff #3 Compressor Station by January 30 of each year. This statement will document the compliance status of the facility with respect to each applicable air quality regulation and permit condition. A responsible official will sign and certify this document.

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).

---

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.)

N/A – No air conditioners or refrigeration exists at this facility.

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 http://www.env.nm.gov/aqb/index.html. Sources that are subject to both the Title V and Acid Rain regulations are **encouraged** to submit both applications **simultaneously**.

Based on information and belief formed after reasonable inquiry and as described in Section 19.2, IACX states that Red Bluff No. 3 Compressor Station is in compliance with applicable requirements. No compliance plan, compliance schedule, or compliance reports are required. IACX further states that Red Bluff No. 3 Compressor Station is not an acid rain source as defined at 40 CFR 72.6.

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.

Red Bluff No. 3 does not store any chemical above the threshold quantity but is subject to the General Duty Clause of 112(r).

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.)

N/A – This facility is not located closer than 80 km to other states, Bernalillo, Indian Tribes, or pueblos.

19.9 - Responsible Official

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

Tony Hines, Senior Vice President of Operations
IACX Roswell LLC
5001 LBJ Freeway, Suite 300, Dallas, Texas 75244
972-960-3219

Section 20

Other Relevant Information

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.

There is no other relevant information.

Section 22: Certification

Company Name: IACX ROSWELL LLC

I, TONY HINES, 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 22 day of June, 2021, upon my oath or affirmation, before a notary of the State of New Mexico.

*Signature

Date 22/6/21

TONY HINES
Printed Name

SR. V.P. of OPS
Title

Scribed and sworn before me on this 22nd day of June, 2021.

My authorization as a notary of the State of New Mexico expires on the 8th day of December, 2024.

Notary's Signature

Date 6/22/2021

Selma Brown
Notary's Printed Name

Official Seal
SELMA BROWN
Notary Public
State of New Mexico
My Comm. Expires 12/8/24

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