ADMINISTRATIVE RECORD

Par Hawaii Refining, LLC

Application for Significant Modification No. 0088-33

Par West Refinery

Located At: 91-480 Makakole Street CCB, Kapolei, Oahu

CSP No. 0088-01-C

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Public Notice

REQUEST FOR PUBLIC COMMENTS
ON DRAFT AIR PERMITS
REGULATING THE EMISSIONS OF AIR POLLUTANTS

(Docket No. 20-CA-PA-13)

Pursuant to Hawaii Revised Statutes (HRS), Chapter 342B-13, and Hawaii Administrative Rules (HAR), Chapter 11-60.1, the Department of Health, State of Hawaii (DOH), is requesting public comments on the following **DRAFT PERMITS** presently under review for:

(1) Amendment of Covered Source Permit (CSP) No. 0212-01-C
Application for Significant Modification No. 0212-57
Par Hawaii Refining, LLC
Par East Refinery
Located At: 91-325 Komohana Street, Kapolei, Oahu

(2) Amendment of Covered Source Permit (CSP) No. 0088-01-C
Application for Significant Modification No. 0088-33
Par Hawaii Refining, LLC
Par West Refinery
Located At: 91-480 Malakole Street, Kapolei, Oahu

The **DRAFT PERMITS** are described as follows:

The permit amendments incorporate GHG emission caps in accordance with HAR, Chapter 11-60.1, Subchapter 11, to limit greenhouse gas (GHG) emissions from affected facilities. Affected facilities are permitted covered sources with potential carbon dioxide equivalent (CO_2e) emissions (biogenic plus nonbiogenic) equal to or greater than 100,000 short tons per year.

Pursuant to HAR, Chapter 11-60.1, Subchapter 11, the amendments incorporate provisions for partnering between the Par East and Par West Refineries to combine emissions for flexibility in achieving the GHG reductions. Individual and total combined GHG emission caps in each facility's GHG emission reduction plan are specified in the permits. Each facility may exceed its individual cap as long as the total combined emissions are reduced sixteen percent (16%) or more from the total combined CO_2e baseline emissions level. Calendar year 2007 emissions were used for the baseline to establish a GHG emissions cap for the Par East Refinery. For the Par West Refinery, calendar year 2009 emissions were used for the baseline to establish the GHG emissions cap. Biogenic carbon dioxide emissions are excluded in determining compliance with the CO_2e emissions caps.

(1) The significant modification of **CSP No. 0212-01-C** will grant conditional approval to incorporate an individual CO_2e emissions cap of 616,288 metric tons (679,341 short tons) per calendar year that applies specifically to the Par East Refinery and a total combined CO_2e emissions cap of 908,837 metric tons (1,001,821 short tons) per calendar year in partnering with Par West Refinery. The amendment designates CSP No. 0212-01-C for the Par East Refinery as the main permit to specify individual and total combined GHG emission caps. This will enable modification of a single permit if

the GHG emission caps need to be revised and reduce the burden of modifying all partnering facility permits had the caps been incorporated into each facility's permit separately.

(2) The significant modification of **CSP No. 0088-01-C** will grant conditional approval to incorporate an individual CO_2e emissions cap of 292,549 metric tons (322,480 short tons) per calendar year that applies specifically to the Par West Refinery and a total combined CO_2e emission cap in partnering with the Par East Refinery of 908,837 metric tons (1,001,821 short tons) per calendar year. The Par West Refinery permit will reference permit conditions in the Par East Refinery permit for its individual and the total combined CO_2e emission caps.

The **ADMINISTRATIVE RECORDS**, consisting of the **APPLICATIONS, GHG EMISSION REDUCTION PLANS** and non-confidential supporting material from the applicant, the permit review summary, and the **DRAFT PERMITS**, are available for public inspection during regular office hours, Monday through Friday, 7:45 a.m. to 4:15 p.m., at the following location:

Oahu:

State of Hawaii
Clean Air Branch
2827 Waimano Home Road #130
Pearl City, HI 96782

All comments on the draft permits and any request for a public hearing must be in writing, addressed to the Clean Air Branch at the above address on Oahu and must be postmarked or received by **January 26, 2021**.

Any person may request a public hearing by submitting a written request that explains the party's interest and the reasons why a hearing is warranted. The DOH may hold a public hearing if a hearing would aid in DOH's decision. If a public hearing is warranted, a public notice for the hearing will be published at least thirty (30) days in advance of the hearing.

Interested persons may obtain copies of the administrative record or parts thereof by paying **five (5) cents per page copying costs**. Please send written requests to the Oahu office of the Clean Air Branch listed above or call Mr. Mike Madsen at the Clean Air Branch office at (808) 586-4200. Electronic copies of the draft permits, permit application reviews, permit applications, and GHG emission reduction plans may be found online at http://health.hawaii.gov/cab/public-notices/.

Comments on the draft permits should address, but need not be limited to, the permit conditions and the facility's compliance with federal and state air pollution laws, including: (1) the National and State Ambient Air Quality Standards; and (2) HRS, Chapter 342B and HAR, Chapter 11-60.1.

DOH will make a final decision on the permits after considering all comments and will send notice of the final decision to each person who has submitted comments or requested such notice.

Elizabeth A. Char, M.D.
Director of Health

Draft Permit

DRAFT

ISSUE DATE

CERTIFIED MAIL 21-xxxE CAB
RETURN RECEIPT REQUESTED File No. 0088-01
(xxxx xxxx xxxx xxxx xxxx)

Mr. Richard L. Creamer
Vice President and General Manager
Par Hawaii Refining, LLC
91-325 Komohana Street
Kapolei, Hawaii 96707-1713

Dear Mr. Creamer:

SUBJECT: Amendment of Covered Source Permit (CSP) No. 0088-01-C
Application for Significant Modification No. 0088-33
Par Hawaii Refining, LLC
Par West Refinery
Located At: 91-480 Malakole Street, Kapolei, Oahu
Date of Expiration: December 17, 2025

In accordance with Hawaii Administrative Rules (HAR), Chapter 11-60.1, and pursuant to your application for a significant modification dated November 19, 2020, and greenhouse gas (GHG) emission reduction plan revision dated September 24, 2019, the Department of Health, Clean Air Branch (herein after referred to as Department), hereby amends CSP No. 0088-01-C issued to Par Hawaii Refining, LLC for the Par West Refinery on December 18, 2020.

In accordance with HAR, Chapter 11-60.1, Subchapter 11, the amendment incorporates provisions for partnering between Par West Refinery and Par East Refinery under CSP No. 0088-01-C to combine emissions for flexibility in achieving GHG reductions. Individual and total combined GHG emission caps established in each facility's GHG emission reduction plan are incorporated in the amendment with associated provisions pursuant to HAR §11-60.1-204(d)(6)(C).

This amendment designates CSP No. 0212-01-C for the Par East Refinery as the main permit to specify the individual and total combined GHG emission caps for the partnering facilities. This will enable the modification of a single permit if the GHG emission caps need to be revised and reduce the burden of modifying all partnering permits had the caps been incorporated separately into each facility's permit.

The following enclosed Attachment II – GHG and monitoring report form are hereby added to CSP No. 0088-01-C issued on December 18, 2020, to incorporate the GHG permitting provisions:

Attachment II - GHG: Special Conditions – GHG Reduction Requirements
Monitoring Report Form: GHG Emissions

All other permit conditions of CSP No. 0088-01-C issued on December 18, 2020, shall not be affected and shall remain valid.

If there are any questions regarding these matters, please contact Mr. Michael Madsen of the Clean Air Branch at (808) 586-4200.

Sincerely,

_____, P.E., ACTING CHIEF
Environmental Management Division

MM:tkg

Enclosures

ATTACHMENT II - GHG: SPECIAL CONDITIONS
GHG REDUCTION REQUIREMENTS
COVERED SOURCE PERMIT NO. 0088-01-C

Amended Date: DATE **Expiration Date: December 17, 2025**

In addition to the standard conditions of the CSP, the following state enforceable special conditions shall apply to the permitted facility:

Section A. Equipment Description

1. Attachment II - GHG of this permit encompasses equipment, plants, and associated appurtenances for the following source categories:

Stationary Combustion	
Unit No.	**Description**
F-5103	151 MMBtu/hr (LHV) Atmospheric Furnace with Low NO_X Burners
F-5153	62.5 MMBtu/hr (LHV) Vacuum Furnace with Low NO_X Burners
---	Catalytic Oxidizer
F-5205 F-5206	Two (2) 99 MMBtu/hr Boilers, Foster Wheeler, Model No. AG-5060, Serial Nos. 7414 and 7415, National Board Nos. 585 and 586
F-5930	4 MMBtu/hr Isomerization Unit Furnace
F-5950	1.6 MMBtu/hr Isomerization Unit Furnace
F-6200	Acid Plant Combustion Chamber
F-6260	Acid Plant Pre-heater
K-6701 K-6702 K-6703 K-6704	Four (4) 46 MMBtu/hr (HHV) Gas Turbines, Solar Centaur 40, Model No. 40-4701, each equipped with a 49 MMBtu/hr (HHV) gas-fired Duct Buner, Heat Recovery Steam Generator (HRSG), water injection, and low NO_X Burners
BSG	Black Start Diesel Engine Generator, Model No. DFEG, Tier 2 Rated
---	Transfer Pump, Tier 3 or Higher Rated, Not to Exceed 175 hp
---	Sand Filter Pump No. 2, Tier 3 or Higher Rated, Not to Exceed 175 hp
---	Sand Filter Pump No. 1, Tier 3 or Higher Rated, Not to Exceed 175 hp
Note: Heat Recovery Steam Generator (HRSG), High Heating Value (HHV), Horsepower (hp), Hour (hr), Low Heating Value (LHV), Million British Thermal Units (MMBtu), and Nitrogen Oxide (NO_X).	

Hydrogen Production	
Unit No.	**Description**
F-5600	9 MMBtu/hr Hydrogenation Unit Furnace
F-5700	24.3 MMBtu/hr Hydrogen Unit Furnace
HMU	Feedstock for Hydrogen Manufacturing Unit
Note: Hour (hr), Hydrogen Manufacturing Unit (HMU), Million British Thermal Units (MMBtu). Note: Units F-5600 and F-5700 are subject to monitoring and recordkeeping requirements from the stationary combustion source category.	

Petroleum Refineries	
Unit No.	**Description**
F-2301	20” Diameter Steam Assisted Crude/Sweet Flare
F-2302	42” Diameter Steam Assisted FCC/Sour Flare
----------	Acid Plant
----------	Equipment Leaks
Note: Fluid Catalytic Cracker (FCC).	

(Auth.: HAR §11-60.1-3)

2. The equipment is subject to GHG emission reduction requirements of HAR, Chapter 11-60.1, Subchapter 11, and associated permit conditions based on information from the GHG emission reduction plan and permit application for significant modification. The GHG emission reduction plan shall become a part of the CSP application process for renewals and any required modifications pursuant to HAR, Chapter 11-60.1, Subchapter 5. With each subsequent GHG reduction plan submittal, the permittee shall report:

   a. The GHG emission reduction status;
   b. Factors contributing to the emission changes;
   c. Any control measure updates; and
   d. Any new developments or changes that would affect the basis of the facility-wide GHG emissions cap.

   (Auth.: HAR §11-60.1-5, §11-60.1-204(g))

Section B. GHG Permit Conditions

1. Permit conditions specified in Attachment II – GHG, including provisions to limit maximum potential GHG emissions, are state-only enforceable requirements which are not federally enforceable under the federal Clean Air Act.

   (Auth.: HAR §11-60.1-3, §11-60.1-90, 11-60.1-161; 40 CFR §70.6)[1]

2. The permittee shall comply with all applicable provisions of these conditions, including all emission limits, notification, testing, monitoring, and reporting requirements. The major requirements of these provisions are detailed in the special conditions of this attachment.

   (Auth.: HAR §11-60.1-3, §11-60.1-90, 11-60.1-161)[1]

Section C. GHG Emission Limitations

1. GHG Emission Caps

   a. Par West Refinery shall not emit or cause to be emitted carbon dioxide equivalent (CO_2e) emissions in excess of its individual GHG emissions cap specified in Attachment II – GHG, Special Condition No. C.1a of CSP No. 0212-01-C for Par East Refinery, except as specified in Attachment II – GHG, Special Condition No. C.1.c.iv of this permit.
   b. Par West Refinery combined with all partnering facilities shall not emit or cause to be emitted total combined CO_2e emissions in excess of the combined limit specified in Attachment II – GHG, Special Condition No. C.1.b of CSP No. 0212-01-C for the Par East Refinery.
   c. For purposes of the CO_2e emission limits in Attachment II - GHG, Special Condition Nos. C.1.a and C.1.b:

      i. The CO_2e emissions shall have the same meaning as that specified in HAR §11-60.1-1;
      ii. In accordance with HAR §11-60.1-204(d)(6)(B), biogenic CO_2 emissions shall not be included when determining compliance with the emissions limit;
      iii. The permittee shall be in compliance with the emissions limits by the end of 2019 and each calendar year thereafter;
      iv. The permittee may exceed the emissions cap specified in Attachment II - GHG, Special Condition No. C.1.a, if the GHG emissions limit specified in Attachment II - GHG, Special Condition No. C.1.b, is met; and
      v. At no time shall the permittee exceed Attachment II - GHG, Special Condition Nos. C.1.a and C.1.b, simultaneously over a calendar year. For incidences when Attachment II - GHG, Special Condition Nos. C.1.a and C.1.b, are exceeded simultaneously, emissions in excess of the total combined cap shall be allocated according to the following equation for compliance purposes:

$$X = XG \frac{(A - C)}{\sum_{A_i > C_i}(A_i - C_i)}$$

Where:
X = Adjusted portion in metric tons or short tons of GHG emissions that are in excess of total combined cap specified in Special Condition No. C.1.b. The equation applies to all affected facilities that do not meet the individual and total combined GHG emission caps specified in Special Condition Nos. C.1.a and C.1.b, respectively.
XG = Total combined actual GHG emissions from affected facilities minus total combined GHG emissions cap. Total combined emissions cap shall be sixteen percent (16%) below the total combined baseline emission level less biogenic CO_2 emissions.
A = Actual GHG emissions from the affected facility.
C = GHG emissions cap for the affected facility.
$\sum_{Ai>ci}(Ai - Ci)$ = The sum of the difference between the actual emissions and cap emissions for all facilities that did not achieve the individual facility-wide GHG emissions cap.

(Auth.: HAR §11-60.1-3, §11-60.1-90, §11-60.1-204)

2. GHG Emission Cap Revisions

   a. The facility-wide GHG emissions cap may be re-evaluated and revised by the Department in accordance with HAR §11-60.1-204(h).
   b. Any revision to the facility-wide GHG emissions caps shall be considered a significant modification subject to the application and review requirements of HAR §11-60.1-104. For each GHG emission cap revision, the Department may impose additional emission limits or requirements, or limit the time-frame allowed for the revised GHG emissions cap.

   (Auth.: HAR §11-60.1-3, §11-60.1-90, §11-60.1-204)

Section D. Monitoring and Record Keeping Requirements

1. GHG Emissions (Stationary Combustion Sources)

   For calculating GHG emissions from stationary combustion and quality assurance (QA)/ quality control (QC) requirements, the permittee shall:

   a. Monitor mass emissions data for stationary source combustion units with the appropriate methods specified in 40 Code of Federal Regulations (CFR) §98.34;
   b. Estimate missing data in accordance with the applicable procedures in 40 CFR §98.35; and
   c. Determine the metric tons of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) in accordance with the appropriate calculation methodology in 40 CFR §98.33.

   (Auth.: HAR §11-60.1-3, §11-60.1-90; 40 CFR §98.33, §98.34, §98.35)

2. GHG Emissions (Hydrogen Production)

   For calculating GHG emissions from hydrogen production and QA/QC requirements, the permittee shall:

   a. Monitor the GHG emissions data in accordance with 40 CFR §98.164;
   b. Estimate missing data in accordance with the applicable procedures in 40 CFR §98.165; and
   c. Calculate the CO_2 emissions for hydrogen manufacturing with the appropriate methods specified in 40 CFR §98.163.

   (Auth.: HAR §11-60.1-3, §11-60.1-90; 40 CFR §98.163, §98.164, §98.165)

3. GHG Emissions (Petroleum Refineries Source Category)

   For calculating GHG emissions from sources in the petroleum refineries source category and QA/QC requirements, the permittee shall:

   a. Monitor the GHG emissions data in accordance with the applicable procedures of 40 CFR §98.254;
   b. Estimate missing data in accordance with the applicable procedures in 40 CFR §98.255; and
   c. Calculate the CO_2, CH_4, and N_2O emissions with the appropriate methods specified in 40 CFR §98.253.

   (Auth.: HAR §11-60.1-3, §11-60.1-90; 40 CFR §98.253, §98.254, §98.255)

4. Total CO_2e Emissions

   For determining compliance with the CO_2e emission caps and assessing fees, the permittee shall:

   a. Sum the emission estimates from Attachment II – GHG, Special condition Nos. D.1, D.2, and D.3 using Equation A-1 of 40 CFR §98.2;
   b. Convert the metric tons of CO_2e emissions to short tons for monitoring and annual emissions reporting as applicable. For the conversion, one (1) short ton is equal to 0.90718474 metric tons; and
   c. Report the total combined CO_2e emissions in accordance with Attachment II – GHG, Special Condition No. E.4.

   (Auth.: HAR §11-60.1-3, §11-60.1-90; 40 CFR §98.2)

5. Records

   All records, including support information, shall be maintained for **at least five (5) years** from the date of the monitoring sample, measurement, test, report, or applications. Support information includes all maintenance, inspection, and repair records, and copies of all reports required by this permit. These records shall be true, accurate, and maintained in a permanent form suitable for inspection and be made available to the Department or authorized representative(s) upon request.

   (Auth.: HAR §11-60.1-3, §11-60.1-11, §11-60.1-90)

Section E. Notification and Reporting Requirements

1. Standard Condition Reporting

   Notification and reporting pertaining to the following events shall be done in accordance with Attachment I, Standard Condition Nos. 17 and 24, respectively:

   a. Emissions of air pollutants in violation of HAR, Chapter 11-60.1 or this permit (excluding technology-based emission exceedances due to emergencies); and
   b. Permanent discontinuance of construction, modification, relocation, or operation of the facility covered by this permit.

   (Auth.: HAR §11-60.1-8, §11-60.1-15, §11-60.1-16, §11-60.1-90; SIP §11-60-10, SIP §11-60-16)[2]

2. Deviations

   The permittee shall report in writing **within five (5) working days** any deviations from permit requirements, including those attributed to upset conditions, the probable cause of such deviations, and any corrective actions or preventive measures taken. Corrective actions may include a requirement for testing, or more frequent monitoring, or could trigger implementation of a corrective action plan.

   (Auth.: HAR §11-60.1-3, §11-60.1-15, §11-60.1-16, §11-60.1-90)

3. Compliance Certification

   a. During the permit term, the permittee shall submit at least **annually** to the Department and U.S. Environmental Protection Agency, Region 9, the attached **Compliance Certification Form** pursuant to HAR, Subsection 11-60.1-86. The permittee shall indicate whether or not compliance is being met with each term or condition of this permit. The compliance certification shall include, at a minimum, the following information:

      i. The identification of each term or condition of the permit that is the basis of the certification;
      ii. The compliance status;
      iii. Whether compliance was continuous or intermittent;
      iv. The methods used for determining the compliance status of the source currently and over the reporting period;
      v. Any additional information indicating the source's compliance status with any applicable enhanced monitoring and compliance certification, including the requirements of Section 114(a)(3) of the Clean Air Act or any applicable monitoring and analysis provisions of Section 504(b) of the Clean Air Act;

vi. Brief description of any deviations including identifying as possible exceptions to compliance any periods during which compliance is required and which the excursion or exceedances as defined in 40 CFR Part 64 occurred; and
vii. Any additional information as required by the Department, including information to determine compliance.

b. The compliance certification shall be submitted within **sixty (60) days after** the end of each calendar year and shall be signed and dated by a responsible official.
c. Upon the written request of the permittee, the deadline for submitting the compliance certification may be extended, if the Department determines that reasonable justification exists for the extension.

(Auth.: HAR §11-60.1-4, §11-60.1-86, §11-60.1-90)

4. Monitoring Reports

a. The permittee shall complete and submit **semi-annual** monitoring reports to the Department that provide the metric tons and short tons of CO_2e emitted by all partnering facilities, except that biogenic CO_2 shall be excluded from the total CO_2e emissions. All reports shall be submitted **within sixty (60) days after** the end of each semi-annual calendar period (January 1 – June 30 and July 1 – December 31). The following enclosed form, or equivalent form, shall be used for reporting and shall be signed and dated by a responsible official:

Monitoring Report Form: GHG Emissions

b. For calendar year 2019 and 2020, the permittee shall report the CO_2e emissions **within sixty (60) days after** the issuance of this permit. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2019 and 2020 calendar years shall be used for reporting and shall be signed and dated by a responsible official.
c. For calendar year 2021, the permittee shall report the CO_2e emissions **within sixty (60) days** after the issuance of this permit or **within sixty (60) days** after the end of the semi-annual calendar period, whichever is later. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2021 calendar year shall be used for reporting and shall be signed and dated by a responsible official.
d. Upon written request by the permittee, the deadline for submitting the monitoring report may be extended, if the Department determines that reasonable justification exists for the extension.

(Auth.: HAR §11-60.1-3, §11-60.1-5, §11-60.1-90)

Section F. Agency Notification

Any document (including reports) required to be submitted by this permit shall be done in accordance with Attachment I, Standard Condition No. 28.

(Auth.: HAR §11-60.1-4, §11-60.1-90)

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[1]The citations to the CFR identified under a particular condition indicate that the permit condition complies with the specified provision(s) of the CFR. Due to the integration of the preconstruction and operating permit requirements, permit conditions may incorporate more stringent requirements than those set forth in the CFR.

[2]The citations to the State Implementation Plan (SIP) identified under a particular condition indicate that the permit condition complies with the specified provision(s) of the SIP.

MONITORING REPORT FORM
GHG EMISSIONS
COVERED SOURCE PERMIT NO. 0088-01-C
(PAGE 1 OF 2)

Amended Date: DATE **Expiration Date: December 17, 2025**

In accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control, the permittee shall report to the Department of Health the following information semi-annually:

(Make Copies for Future Use)

For Period: _____ Date: _____

Facility Name: _____

Location: _____

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate, and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record.

Responsible Official (Print): _____

Title: _____

Responsible Official (Signature): _____

1. Report the CO_2e emitted by Par West Refinery during each reporting period for purposes of the facility's individual GHG emissions cap:

Emission Year Reporting For _____					
Reporting Period	Par West Refinery Emissions (Metric Tons of CO_2e)			Par West Refinery Emissions (Total CO_2e)	
	CO_2 (Non-Biogenic)	CH_4	N_2O	Metric Tons	Short Tons
January 1 – June 30 (1st Semi-Annual Period)					
July 1 – December 31 (2nd Semi-Annual Period)					
Total Emissions →					

MONITORING REPORT FORM
GHG EMISSIONS
COVERED SOURCE PERMIT NO. 0088-01-C
(CONTINUED, PAGE 2 OF 2)

Amended Date: DATE **Expiration Date: December 17, 2025**

2. Report the total combined CO_2e emitted by all partnering facilities during each reporting period for purposes of the total combined GHG emissions cap for these facilities:

Emission Year Reporting For_____					
Reporting Period	Total Combined Emissions from all partnering facilities (Metric Tons of CO_2e)			Total CO_2e	
	CO_2 (Non-Biogenic)	CH_4	N_2O	Metric Tons	Short Tons
January 1 – June 30 (1st Semi-Annual Period)					
July 1 – December 31 (2nd Semi-Annual Period)					
Total Emissions →					

3. For incidences when the individual cap for Par West Refinery and total combined cap for all partnering facilities is exceeded, report the emissions in excess of the total combined cap using the following equation:

$$X = XG \frac{(A-C)}{\sum_{A_i>C_i}(A_i-C_i)} = \_\_\_\_\_$$

Where:

X = Adjusted portion in metric tons of GHG emissions that are in excess of total combined cap specified in Attachment II (GHG, Special Condition No. C.1.b. The equation applies to all affected facilities that do not meet the individual and total combined GHG emission caps specified in Attachment II – GHG, Special Condition Nos. C.1.a and C.1.b, respectively.

XG = Total combined actual GHG emissions from affected facilities minus total combined GHG emissions cap. Total combined emissions cap shall be sixteen percent (16%) below the total combined baseline emission level less biogenic CO_2 emissions.

A = Actual GHG emissions from the affected facility.

C = GHG emissions cap for the affected facility.

$\sum_{Ai>ci}(Ai - Ci)$ = The sum of the difference between the actual emissions and cap emissions for all facilities that did not achieve the individual facility-wide GHG emissions cap.

Draft Review Summary

PERMIT APPLICATION REVIEW
GREENHOUSE GAS (GHG) REDUCTION PLAN
Covered Source Permit (CSP) No. 0088-01-C
Application for Significant Modification No. 0088-33

Applicant:	Par Hawaii Refining, LLC
Facility Title:	Par West Refinery (formerly the Kapolei Refinery) Located At: 91-480 Malakole Street, Kapolei, Oahu UTM: 2,356,430 m N, 591,900 m E, Zone 4, NAD-83
Mailing Address:	Par Hawaii Refining, LLC 91-325 Komohana Street Kapolei, Hawaii 96707
Responsible Official:	Mr. Richard L. Creamer Vice President and General Manager Par Hawaii Refining, LLC (808) 547-3841
Point of Contact:	Ms. Benton Widlansky Environmental Manager Par Hawaii Refining, LLC (808) 547-3993 Mr. Theodore K. Metrose Environmental Director (808) 479-9886
Application Dates:	Significant permit modification application dated November 19, 2020 (CSP No. 0088-01-C)

Background:

Par Hawaii Refining, LLC has applied for a significant modification to CSP No. 0088-01-C for the Par West Refinery to incorporate individual and total combined GHG emission caps for partnering with the Par East Refinery that operates under CSP No. 0212-02-C. Site specific emission limits were previously established in the GHG emission reduction plans updated on September 24, 2019, for modifying permits to incorporate GHG emission caps. Affected facilities subject to GHG reductions are existing covered sources with maximum potential carbon dioxide equivalent (CO_2e) emissions (biogenic plus non-biogenic) equal to or greater than 100,000 short tons per year. The GHG reductions are specified in Hawaii Administrative Rules (HAR), Subchapter 11 pursuant to Hawaii Act 234, 2007 which required the Department of Health to develop rules for regulating GHGs. Partnering between the Par West and Par East Refineries will be used to comply with the GHG emission caps in accordance with HAR §11-60.1-204(d)(6)(A).

The former refinery owner (IES Downstream, LLC) submitted a minor modification application for CSP No. 0088-01-C to separate the fluid catalytic cracking unit (FCCU), dimersol plant, and alkylation plant (the alkylation plant does not include the deisobutanizer and depropanizer systems) from the existing refinery operations as part of the sales agreement with Par Hawaii Refining, LLC, in which Par Hawaii Refining, LLC would acquire the refinery (Par West Refinery) except for the FCCU, dimersol plant, and alkylation plant. IES Downstream, LLC also submitted an application for an initial CSP for the FCCU, dimersol plant, and alkylation plant (Permit Application No. 0863-02).

The GHG emission reduction plan establishes the following for the significant permit modification to CSP No. 0088-01-C to incorporate individual and total combined GHG emission caps:

1. A total combined limit on CO_2e emissions from the Par East Refinery and Par West Refinery not to exceed 1,001,821 short tons (908,837 metric tons) per calendar year;
2. Individual facility-wide cap on CO_2e emissions from Par West Refinery not to exceed 322,480 short tons (292,549 metric tons) per calendar year that will not apply as long as the total combined cap among partnering facilities is met; and
3. An equation allocating GHG emissions in excess of the total combined cap for facilities violating the individual and total combined GHG emission caps.

CSP No. 0212-01-C for the Par East Refinery will be the main permit to specify individual and total combined GHG emission caps for the partnering facilities. This will enable the modification of a single permit if CO_2e emission caps need to be revised and reduce the burden of modifying all of the permits had the caps been incorporated separately into each facility's permit.

According to the GHG emission reduction plan, the refinery obtained from the previous owner (IES Downstream, LLC) for the Par West Refinery began operation in 1960 with the capacity of processing up to 57,000 barrels of crude oil per day. The facility consisted of numerous operational units, including crude and vacuum distillation units, a fluid catalytic cracker, dimersol, hydrogen manufacturing, alkylation, and isomerization units. It also operated boilers, cogeneration units, an effluent treatment plant, and tank farms providing storage, blending, and shipping capability.

An opportunity for public comment on the draft GHG emissions reduction plans and revised permits for the Par West and East Refineries will be provided in accordance with HAR §11-60.1-205.

The Standard Industrial Classification Code (SICC) for this facility is 2911 - Petroleum Refining

Equipment Description:

Refinery equipment consists of units, processes, and plants subject to 40 Code of Federal Regulations (CFR) §98 Subparts C, P, and Y for estimating emissions and to determine compliance with the facility-wide GHG emission caps. For purposes of the CSP, facility equipment is grouped according to the common applicable requirements for estimating GHGs, as follows:

1. 40 CFR §98 Subpart C, Stationary Combustion Sources:

Stationary Combustion	
Unit No.	**Description**
F-5103	151 MMBtu/hr (LHV) Atmospheric Furnace with Low NO_X Burners
F-5153	62.5 MMBtu/hr (LHV) Vacuum Furnace with Low NO_X Burners
---	Catalytic Oxidizer
F-5205 F-5206	Two (2) 99 MMBtu/hr Boilers, Foster Wheeler, Model No. AG-5060, Serial Nos. 7414 and 7415, National Board Nos. 585 and 586
F-5930	4 MMBtu/hr Isomerization Unit Furnace
F-5950	1.6 MMBtu/hr Isomerization Unit Furnace
F-6200	Acid Plant Combustion Chamber
F-6260	Acid Plant Pre-heater
K-6701 K-6702 K-6703 K-6704	Four (4) 46 MMBtu/hr (HHV) Gas Turbines, Solar Centaur 40, Model No. 40-4701, each equipped with a 49 MMBtu/hr (HHV) gas-fired Duct Buner, Heat Recovery Steam Generator (HRSG), water injection, and low NO_X Burners
BSG	Black Start Diesel Engine Generator, Model No. DFEG, Tier 2 Rated
---	Transfer Pump, Tier 3 or Higher Rated, Not to Exceed 175 hp
---	Sand Filter Pump No. 2, Tier 3 or Higher Rated, Not to Exceed 175 hp
---	Sand Filter Pump No. 1, Tier 3 or Higher Rated, Not to Exceed 175 hp
Note: Heat Recovery Steam Generator (HRSG), High Heating Value (HHV), Horsepower (hp), Hour (hr), Low Heating Value (LHV), Million British Thermal Units (MMBtu), and Nitrogen Oxide (NO_X).	

2. 40 CFR §98 Subpart P, Hydrogen Production Sources:

Hydrogen Production	
Unit No.	**Description**
F-5600	9 MMBtu/hr Hydrogenation Unit Furnace
F-5700	24.3 MMBtu/hr Hydrogen Unit Furnace
HMU	Feedstock for Hydrogen Manufacturing Unit
Note: Hour (hr) and Hydrogen Manufacturing Unit (HMU). Note: Units F-5600 and F-5700 are subject to monitoring and recordkeeping requirements from the stationary combustion source category. Pursuant to 40 CFR §98.162, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions from each stationary unit other than hydrogen production process units mut be calculated under 40 CFR Part 98, Subpart C.	

3. 40 CFR §98 Subpart Y, Sources in the Petroleum Refineries Source Category:

Petroleum Refineries	
Unit No.	**Description**
F-2301	20” Diameter Steam Assisted Crude/Sweet Flare
F-2302	42” Diameter Steam Assisted FCC/Sour Flare
---	Acid Plant
---	Equipment Leaks
Note: Fluid Catalytic Cracker (FCC).	

Applicable Requirements:

Hawaii Administrative Rules (HAR)
Title 11, Chapter 59 - Ambient Air Quality Standards
Title 11, Chapter 60.1 - Air Pollution Control
- Subchapter 1 - General Requirements
- Subchapter 2 - General Prohibition
  - HAR 11-60.1-31: Applicability
  - HAR 11-60.1-32: Visible Emissions
  - HAR 11-60.1-38: Sulfur Oxides from Fuel Combustion
  - HAR 11-60.1-40: Volatile Organic Compound (VOC) Water Separation
  - HAR 11-60.1-41: Pump and Compressor Requirements
  - HAR 11-60.1-42: Waste Gas Disposal
- Subchapter 5 - Covered Sources
- Subchapter 6 - Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
  - HAR 11-60.1-111: Definitions
  - HAR 11-60.1-112: General Fee Provisions for Covered Sources
  - HAR 11-60.1-113: Application Fees for Covered Sources
  - HAR 11-60.1-114: Annual Fees for Covered Sources
  - HAR 11-60.1-115: Basis of Annual Fees for Covered Sources
- Subchapter 8 - Standards of Performance for Stationary Sources
  - HAR 11-60.1-161: New Source Performance Standards
- Subchapter 9 - Hazardous Air Pollutant Sources
  - HAR 11-60.1-174: Maximum Achievable Control Technology Standards
  - HAR 11-60.1-180: National Emission Standards for Hazardous Air Pollutants
- Subchapter 11 – Greenhouse Gas Emissions

HAR, Chapter 11-60.1, Subchapter 11, §11-60.1-204 GHG Emissions Reduction Plan

1. Applicability to HAR, Chapter 11-60.1, Subchapter 11 pursuant to HAR §11-60.1-204(a)

   HAR §11-60.1-204 is applicable to the Par West Refinery since this facility is a permitted covered source with potential CO_2e emissions (biogenic plus non-biogenic) equal to or above 100,000 short tons per year.

2. Baseline Emission Rate and Cap

   Pursuant to HAR §11-60.1-204(b) and (c), Par Hawaii Refining, LLC is proposing to establish an annual facility-wide GHG emissions cap for the Par West Refinery. As provisioned in HAR §11-60.1-204(d)(6)(A), Par Hawaii Refining, LLC is proposing to combine Par West Refinery's GHG emissions cap with Par East Refinery's GHG emission cap for partnering these facilities to leverage emission reductions. The combined emissions cap was determined by multiplying total combined baseline GHG emissions (less any biogenic CO_2 emissions) for the partnering facilities by 0.84 (1.0-0.16).

Previously, calendar year 2009 was used as the baseline year to establish the individual GHG emissions cap for the IES Downstream, LLC refinery that would be partially acquired by Par Hawaii, LLC in 2018 for a Par West Refinery. Although HAR §11-60.1-204 specifies to use calendar year 2010 as the baseline year for the facility-wide GHG emission cap, HAR §11-60.1-204(d)(1) allows an alternate baseline emission year if 2010 is deemed unrepresentative of normal operations. Calendar year 2010 did not meet the criteria of normal operation because there was an extended shutdown of the FCC unit due to equipment malfunction and reduced complexity weighted barrels (CWB) throughput due to lower marked demands driven by poor economic conditions. Calendar year 2009 was considered the most representative of normal operations, as no significant shutdowns occurred and refinery CWB throughput was within normal range. Par Hawaii, LLC agreed to use 2009 as the baseline year for its Par West Refinery based on criteria from HAR §11-60.1-204(d)(1)(A)(i) that this is the most recent representative year of normal operations during the five (5) year period between 2006 and 2010. Calendar year 2009 CO_2e emissions for the IES Downstream, LLC refinery were 577,945 metric tons (637,075 short tons).

On December 18, 2018, IES Downstream, LLC transferred the refinery topping plant assets and CSP Nos. 0088-01-C, 0088-02-C, and 0088-03-C to Par Hawaii Refining, LLC which involved a split in the total baseline emissions of 577,945 metric tons (637,075 short tons) established for the IES Downstream, LLC refinery using the 2009 emissions year. Additional information on the baseline split is provided in Enclosure 1. The baseline split is as follows:

Calendar Year 2009 Baseline GHG Emission Split				
40 CFR §98	**Unit**	**GHG Emissions (Metric tons)**		
		Total Emissions	**Par West Refinery (topping plant)**	**IES Downstream, LLC Facility**
Subpart C	$CatO_X$ Combustion	--------	--------	
	Fuel Gas Combustion	103,990	100,767	3,223
	WSR Combustion	44,986	44,986	--------
	Diesel Combustion	--------	--------	--------
	Fuel Oil Combustion	193,346	193,346	--------
Subpart P	Hydrogen Manufacturing	7,247	7,247	--------
Subpart Y	FCC Coke Combustion	226,349	--------	226,349
	Flare P1 (FCC/Sour)	1,017	1,017	--------
	Flare P2 (Crude/Sweet)	117	117	--------
	Acid Plant	485	485	--------
	Fugitive Venting (Columns)	363	308	55
	Loading Vent (Crude Receipts)	45	---------	45
	Total->	577,945	348,273	229,672

Baseline GHG emissions for equipment at the Par West Refinery are shown in the table below for calendar year 2009.

Calendar Year 2009 Par West Refinery Baseline GHG Emissions				
40 CFR §98	**Unit**		**CO_2e Emission**	
			Metric Tons	**Short Tons[1]**
Subpart C	F-5201 - Boiler	Fuel Gas Combustion	24,168	26,641
	F-5202 - Boiler			
	F-5203 - Boiler			
	F-5600 - Hydrogenation Furnace		43,967	48,465
	F-5700 - Hydrogen Furnace			
	F-5930 - Isomerization Furnace			
	F-5950 - Isomerization Furnace			
	F-6200 - Acid Plant Combustion Chamber			
	F-6260 - Acid Plant Pre-heater			
	K-6701 – Cogen & HRSG		32,632	35,971
	K-6702 - Cogen & HRSG			
	K-6703 - Cogen & HRSG			
	K-6704 - Cogen & HRSG			
	K-6701 - Cogen & HRSG	WSR Combustion	44,986	49,589
	K-6702 - Cogen & HRSG			
	K-6703 - Cogen & HRSG			
	K-6704 - Cogen & HRSG			
	F-5103 - Crude Atm Furnace	Fuel Oil Combustion	103,699	114,309
	F-5153 - Crude Vac Furnace			
	F-5201 - Boiler		89,647	98,819
	F-5202 - Boiler			
	F-5203 - Boiler			
Subpart P	Hydrogen Manufacturing	----------	7,247	7,988
Subpart Y	F-2301 - Flare	----------	1,017	1,121
	F-2302 - Flare	----------	117	129
	Acid Plant	----------	485	535
	Equipment Leaks	Fugitive Venting Columns	308	340
		Total	348,273	383,905

[1]Totals may not sum due to independent rounding. Metric Tons = Short Tons x 0.90718474.

The Par East Refinery used 2007 as the baseline year to establish the individual and total combined GHG emissions caps. According to the GHG emission reduction plan for the Par East Refinery, 2007 is the most recent year within the period from 2006 to 2010 specified in HAR §11-60.1-204(d)(1) which excludes the effects of the recession and the refinery-wide turn-around of year 2010. Baseline emissions for the Par East Refinery are shown in the table below for calendar year 2007.

Calendar Year 2007 Par East Refinery Baseline GHG Emissions				
40 CFR §98	**Unit**		**CO_2e Emission**	
			Metric Tons	**Short Tons[1]**
Subpart C	Refinery Fuel Gas	Fuel Combustion	302,901	333,891
	Fuel Oil No. 4		169,922	187,307
	Jet Fuel		113,617	125,241
	Propane		170	187
	Natural Gas (SNG)		0	0
	Naphtha		0	0
Subpart P	Refinery Fuel Gas	----------	44,961	49,561
	F-2002 (LPG)	Feedstock	87,046	95,952
	F-2001 (Recycle Stream)		5,714	6,299
	F-2010 (Recycle Stream)		145	160
	CRU	Coke Burn-off	8	9
	Equipment Leaks		300	331
	Loading Emissions		0	0
	Storage Tanks		0	0
	SRU	Amine Acid Off-gas	3,184	3,510
	Refinery Flare Gas		5,708	6,292
		Total -->	733,676	808,739

[1]Totals may not sum due to independent rounding. Metric Tons = Short Tons x 0.90718474.

The CO_2e emission baselines and GHG emission caps are provided in the following table based on the GHG emission reduction plans submitted by the partnering facilities:

CO_2e Facility Emission Caps and Actual GHG Baseline						
Plant	CSP Permit No.	Emissions (short tons)				% Reduction
		Baseline CO_2e	Baseline Biogenic CO_2	Baseline CO_2e Less Biogenic CO_2	CO_2e Cap	
		(a)	(b)	(c)=(a)-(b)	Proposed	
Par West Refinery	0088-01-C	383,905	0	383,905	322,480	16.0%
Par East Refinery	0212-01-C	808,739	0	808,739	679,341	16.0%
Combined Emissions ->		1,192,644	0	1,192,644	1,001,821	16.0%

The combined emissions cap will be made part of the permit for each partnering facility in accordance with HAR §11-60.1-204(d)(6)(C). Pursuant to HAR §11-60.1-202, a "facility-wide GHG emissions cap" means a permit emissions limitation, applicable to a covered source, limiting the entire source's annual non-biogenic GHG, and biogenic N_2O and CH_4 emissions. In accordance with HAR §11-60.1-202, a facility-wide GHG emissions cap may also be defined in multiple CSPs to identify partnering facilities with an approved combined GHG emissions cap as described in HAR §11-60.1-204(d)(6)(A).

The total combined GHG emissions cap is a sixteen percent (16%) reduction from the total combined baseline emissions established for the partnering facilities. Each facility may exceed its individual cap as long as the total combined cap is met.

3. Proposed Control Strategy

Par Hawaii Refining, LLC will use control measures from the previous owner of the refinery that occurred after the baseline year of 2009 for the Par West Refinery which includes new equipment for an energy project in the Hybrid Energy Plant. The energy project involved motorization of the Alky Plant compressor in April 2013 which enabled full utilization of four (4) cogeneration units. The project also included replacement of three (3) existing boilers with two (2) energy efficient boilers.

In addition to the energy project, Par Hawaii Refining, LLC has elected and will reduce GHG emissions by suspending operation of the following combustion units and GHG generators:

40 CFR §98 Subpart C Equipment

1. F-5700 – Hydrogen Furnace
2. F-5930 – Isomerization Furnace
3. F-5950 – Isomerization Furnace
4. F-5600 – Hydrogen Furnace
5. F-6200 – Acid Plant Combustion Chamber
6. F-6260 – Acid Plant Pre-heater

40 CFR §98 Subpart P Equipment

1. Hydrogen Plant (with CO_2 vent)

40 CFR §98 Subpart Y Equipment

1. Acid Plant
2. Fugitive Venting from Columns

Federal Requirements

40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS)

- Subpart A: General Provisions
- Subpart Dc: Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units (applies to Boilers)
- Subpart J: Standards of Performance for Petroleum Refineries (applies to the Flares, Atmospheric and Vacuum Furnaces F-5103 and F-5153, Process Unit Furnaces F-5600, F-5700, F-5930, and F-5950, Acid Plant Preheater, Gas Turbines with HRSGs in the Cogeneration Plant, Cogeneration Unit K-6704, and Boilers)
- Subpart Ja: Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007 (applies to the Catalytic Oxidation Unit and Flares)
- Subpart GG: Standards of Performance for Stationary Gas Turbines (applies to the Gas Turbines with HRSGs in the Cogeneration Plant)
- Subpart GGG: Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After January 4, 1983, and On or Before November 7, 2006 (applies to Process Units, Flares, and Flare Vapor Recovery Unit)
- Subpart GGGa: Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006 (applies to Process Units, Flares, and Flare Vapor Recovery Unit)
- Subpart QQQ: Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems (applies to Cogeneration Units, Crude Unit, Vacuum Unit, Crude Desalter, Boiler Plant, Flare Vapor Recovery Unit, API Separators, and Catalytic Oxidation Unit)
- Subpart IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (applies to black start DEG and diesel engine pumps)
- Subpart KKKK: Standards of Performance for Stationary Combustion Turbines (applies to Cogeneration Unit K-6704)

40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP)

- Subpart A: General Provisions
- Subpart FF: National Emission Standard for Benzene Waste Operations (applies to the API Separators, Benzene Recovery Unit, Recovered Oil Sump, Skim Oil Tank, Wastewater Surge Tank, Recovered Oil Tank, Foul Water Treatment Plant, and Catalytic Oxidation Unit)

40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories (MACT)

- Subpart A: General Provisions
- Subpart CC: National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries (applies to Process Units, Flares, and Flare Vapor Recovery Unit, except for the Boiler Plant; Cooling Tower, API Separators, Benzene Recovery Unit, Recovered Oil Sump, Skim Oil Tank, Wastewater Surge Tank, Recovered Oil Tank, Foul Water Treatment Plant, and Catalytic Oxidation Unit)

Subpart YYYY: National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines (applies to the Combustion Turbine in Cogeneration Unit K-6704)

Subpart ZZZZ: National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (applies to black start DEG and diesel engine pumps)

Subpart DDDDD: National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial and Institutional Boilers and Process Heaters (applies to Atmospheric and Vacuum Furnaces F-5103 and F-5153, Process Unit Furnaces F-5600, F-5700, F-5930, and F-5950, Acid Plant Preheater, and Boilers)

40 CFR Part 68 - Chemical Accident Prevention Provisions (applies to the storage and use of flammable substances in the refinery)

40 CFR Part 98 – Mandatory Greenhouse Gas Reporting

40 CFR Part 63, Subpart DDDDD Applicability						
Unit	**Description**	**Heat Capacity (MMBtu/hr)**	**Fuel Type**	**MACT DDDDD Tuneup Requirement**	**MACT DDDDD Energy Assessment Requirement**	**MACT DDDDD Emission Limits Requirement**
F-5700	Hydrogen Unit Furnace	24.3	RFG	Annual[1]	yes	NA
F-5103	Atmospheric Furnace	151.5	LSFO, RFG	Annual[1]	yes	Table 2, #17
F-5153	Vacuum Furnace	62.5	LSFO, RFG	Annual[1]	yes	Table 2, #17
F-5600	Hydrogenation Unit Furnace	9	RFG	Biennial[2]	yes	NA
F-6262	Acid Plant Preheater	5.1	RFG, propane	Biennial[2]	yes	NA
F-5930	Isomerization Unit Furnace	4	RFG	Every five years[3]	yes	NA
F-5950	Isomerization Unit Furnace	1.6	RFG	Every five years[3]	yes	NA
F-5205	Boiler	99	LSFO, RFG	Annual[1]	yes	Table 2, #17
F-5206	Boiler	99	LSFO, RFG	Annual[1]	yes	Table 2, #17

[1]Existing process heater without a continuous oxygen trim system and with a heat input capacity of 10 MMBtu/hr or greater.
[2]Existing process heater with a heat input capacity of less than 10 MMBtu/hr, but greater than 5 MMBtu/hr designed to burn RFG.
[3]Existing process heater with a heat input capacity of less than or equal to 5 MMBtu/hr designed to burn RFG.

Non-Applicable Requirements:

Hawaii Administrative Rules (HAR)
Title 11, Chapter 60.1 - Air Pollution Control
Subchapter 7 - Prevention of Significant Deterioration Review

Federal Requirements
40 CFR Part 52.21 – Prevention of Significant Deterioration of Air Quality

GHG Control Assessment
Par Hawaii Refining, LLC has determined that a total combined GHG reduction of sixteen percent (16%) is achievable by 2020 using the total combined baseline emissions for the partnering facilities. Pursuant to HAR §11-60.1-202, a facility-wide GHG emissions cap may be defined in multiple CSPs to identify partnering facilities with an approved combined GHG emissions cap as described in HAR §11-60.1-204(d)(6)(A). As specified in HAR §11-60.1-204(d)(2), if the required GHG emissions cap requiring a sixteen percent (16%) GHG reduction from baseline year is deemed unattainable, the permittee shall conduct a GHG control assessment. Since the facility-wide GHG emissions cap (total combined GHG cap for partnering facilities) is sixteen percent (16%) below the total combined baseline GHG emissions level, Par Hawaii Refining, LLC is not required to perform a GHG control assessment as specified in HAR §11-60.1-204(d)(2) for determining whether the required GHG emissions cap is attainable.

Best Available Control Technology (BACT):

A BACT analysis is applicable only to new covered sources and significant modifications to covered sources that have the potential to emit or increase emissions above significant levels as defined in HAR §11-60.1-1. A BACT analysis is not applicable since the modification to incorporate GHG emission caps does not result in emission increases for an existing covered source.

Prevention of Significant Deterioration (PSD):

A PSD major modification is defined as a project at an existing major stationary source that will result in a significant emissions increase and a significant net emissions increase of any pollutant subject to regulations approved pursuant to the Clean Air Act as defined in 40 CFR §52.21. Since there are no significant emission increases for this modification, PSD is not triggered.

Air Emissions Reporting Requirements (AERR):

40 CFR Part 51, Subpart A – AERR, is based on the emissions of criteria air pollutants from Type A and B point sources (as defined in 40 CFR Part 51, Subpart A), that emit at the AERR triggering levels as shown in the table below:

Pollutant	Type A Triggering Levels[1,2,3] (Short Tons per Year)	Type B Triggering Levels[1] (Short Tons per Year)	Pollutant	In-house Total Facility Triggering Levels[1] (Short Tons per Year)	Potential Emissions (Short Tons per Year)
NO_x	≥2,500	≥100	NO_x	≥25	1,008.8
SO_2	≥2,500	≥100	SO_2	≥25	2,482.5
CO	≥2,500	≥1,000	CO	≥250	367.8
$PM_{10}/PM_{2.5}$	≥250/250	≥100/100	PM/PM_{10}	≥25/25	92.9
VOC	≥250	≥100	VOC	≥25	399.2
Pb		≥0.5 (actual)	Pb	≥5	0
			HAPS	≥5	22.059

[1]Based on potential emissions from the most recent permit renewal application.
[2]Type A sources are a subset of Type B sources and are the larger emitting sources by pollutant.
[3]Nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOCs), and lead (Pb).

The petroleum refinery exceeds the Type A triggering levels. Therefore, AERR requirements are applicable.

The Clean Air Branch also requests annual emissions reporting from those facilities that have facility-wide emissions of a single air pollutant exceeding in-house triggering levels or is a covered source. Annual emissions reporting for the facility will be required for in-house recordkeeping purposes since this is a covered source.

Compliance Assurance Monitoring (CAM):

40 CFR Part 64

Applicability of the CAM rule is determined on a pollutant specific basis for each affected emission unit. Each determination is based upon a series of evaluation criteria. In order for a source to be subject to CAM, each source must:

- Be located at a major source per Title V of the Clean Air Act Amendments of 1990;
- Be subject to federally enforceable applicable requirements;
- Have pre-control device potential emissions that exceed applicable major source thresholds;
- Be fitted with an “active” air pollution control device; and
- Not be subject to certain regulations that specifically exempt it from CAM.

Emission units are any part or activity of a stationary source that emits or has the potential to emit any air pollutant.

1. CAM requirements are applicable to the cogeneration units, identified as K-6701, K-6702, and K-6703. The units have existing monitoring devices including, fuel oil and fuel gas non-resetting fuel meters, a continuous monitoring system to record the water-to-fuel ratio and a NO_x continuous emission monitoring system (CEMS) that serves all three cogeneration units sequentially. The indicator to be monitored to demonstrate that the water injection control device is working properly is the NO_x CEMS.
2. CAM requirements are applicable to the Catalytic Oxidation Unit and Foul Water Treatment Plant for NO_x and VOC emissions. The indicators to be monitored to demonstrate that the Catalytic Oxidation Unit and selective catalytic redution are working properly are one NO_x analyzer and one NH_3 analyzer continuous process monitoring system (CPMS) downstream of the Catalytic Oxidation Unit.
3, As shown in the table below, CAM for the Cogeneration Unit CGT-6704 and Steam Boilers F-5205 and F-5206 are not applicable. Please note that the Cogeneration Unit CGT-6704 has a NO_x CEMS in addition to the continuous monitoring system for the water-to-fuel ratio required by NSPS Subpart KKKK.

CAM APPLICABILITY		
CAM Criteria	**Combustion Turbine/HRSG**	**Boilers**
Be located at a major source per Title V of the Clean Air Act Amendments of 1990	Yes	Yes
Be subject to federally enforceable applicable requirements	Yes	Yes
Have pre-control device potential emissions that exceed applicable major source thresholds	Yes	Yes
Be fitted with an “active” air pollution control device	Yes	No
Not be subject to certain regulations that specifically exempt it from CAM.	No[1]	No[2]
Subject to CAM?	No	No

[1]The combustion turbine/HRSG is subject to a post 11/15/90 NSPS, i.e., 40 CFR Part 60, Subpart KKKK, which exempts it from CAM. The combustion turbine is also subject to a post 11/15/90 NESHAP, i.e., 40 CFR Part 63, Subpart YYYY, which exempts it from CAM.

[2]The boilers are subject to a post 11/15/90 NESHAP, i.e., 40 CFR Part 63, Subpart DDDDD, which exempts them from CAM.

Insignificant Activities:

Per HAR §11-60.1-82(f)(1).

1. Portable chemical tanks.

Per HAR §11-60.1-82(f)(7).

1. Meter stations, sampling points and filters.
2. Pump and tank degassing operations.
3. Training fires.
4. Process upset vents.
5. Mercury in instrument and gauge repair.
6. Oily sewer and storm water vents.
7. Maintenance and cleaning activities, including housekeeping, black oil tank sludge removal, and process unit shutdown and turnaround activities.
8. Additives, promoters, passivators, and anti-foam agents.
9. Insignificant heavy liquids. Tank ID Nos. 350 and 351.
10. Storage of regulated pollutants not in VOC service. Tank ID Nos. 5211, 5197, AP-4, AP-5, 62AP2, and 2301.
11. Storage of spent sulfuric acid. Tank ID Nos. 62AP1 and 62AP3.
12. Storage of non-regulated pollutants, including water, condensate, caustic, and catalyst.
13. Miscellaneous diesel powered equipment for emergency, maintenance, security, and facility purposes: EP-2077 Tank 352 Firewater Pump, EP-2083 Brine Firewater Pump.

Project Emissions:

Emissions from refinery combustion units (including flares, furnaces, boilers, turbines, and duct burners) will consist of SO_2, NO_X, CO, PM_{10}, VOCs and hazardous air pollutants (HAPs). A summary of the potential total annual emissions of criteria pollutants and hazardous air pollutants expected from the refinery are shown below. The refinery may process up to 65,000 barrels of crude oil per day and operates up to a maximum of 8,760 operating hours/year. These emissions represent only an estimate of the potential emissions assuming the refinery operates at its full capacity for the entire year. Actual emissions in any given operating year may be significantly less than those presented in this table.

SUMMARY OF POTENTIAL POLLUTANT EMISSIONS (Tons/Year)							
Sources	**SO_2**	**NO_X**	**CO**	**PM_{10}**	**VOC**	**Total HAPs**	**CO_2e**
CatOx Unit		14.7	17.0		1.3	0	845.850
Cogen Turbines	27.9	193.2	52.5	11.7	2.3	0.688	165,662.729
Crude Furnaces	482.0	302.9	75.0	44.5	5.1	0.253	170,485.608
Isomerization Furnaces	0.7	2.5	2.1	0.2	0.1	0.046	2,853.713
Hydrogenation & Hydrogen Furnaces	3.9	14.5	12.1	1.1	0.8	0.272	16,816.524
Acid Plant Preheater & Combustion Chamber	1.5	5.7	4.8	0.4	0.3	0.107	6,647.744
Cooling Tower				3.2	9.2		
Acid Plant	1,405.3						
Wastewater Treatment		14.7	17.0		74.9	5.623	

SUMMARY OF POTENTIAL POLLUTANT EMISSIONS (Tons/Year)							
Sources	**SO_2**	**NO_X**	**CO**	**PM_{10}**	**VOC**	**Total HAPs**	**CO_2e**
Process Fugitives					210.5	13.943	338.961
Tanks (301 and 302)					32.0		
Refinery Flares	319.1	224.2	51.0		9.5	0.002	845.850
Hybrid Energy Plant - Cogen with HRSG	10.06	60.0	50.8	4.68	30.4	0.486	116,596.128
Hybrid Energy Plant - Boilers	232.0	159.6	66.6	26.0	3.9	0.626	61,046.460
Cogen Black Start Generator	0.001	1.62	0.17	0.03	1.62	0.001	138.0
Sand Filter Pump Diesel Engine #1	0.01	5.07	6.25	0.37	5.76	0.004	1007.4
Sand Filter Pump Diesel Engine #2	0.01	5.07	6.25	0.37	5.76	0.004	1007.4
Transfer Pump	0.01	5.07	6.25	0.37	5.76	0.004	1007.4
Totals[1]	2,482.5	1,008.8	367.8	92.9	399.2	22.059	545,299.77

[1]Maximum potential CO_2e emissions for the Par West Refinery without a cap are 545,300 short tons per year. Par Hawaii Refining, LLC proposes an individual CO_2e cap for the Par West Refinery of 322,480 short tons per year that is a forty percent (40%) reduction in maximum potential CO_2e emissions.

Alternate Operating Scenarios:

There are no alternate operating scenarios proposed for this facility.

Ambient Air Quality Impact Assessment (AAQIA):

An AAQIA was not performed since there are no increases in emissions for the modification to incorporate GHG emission caps.

Significant Permit Conditions:

1. The following individual CO_2e cap will be specified in Attachment II – GHG, Special Condition No. C.1.a of CSP No. 0212-01-C for the Par East Refinery and referenced in Attachment II – GHG, Special Condition No. C.1.a of CSP No. 0088-01-C for the Par West Refinery:

   The Par West Refinery shall not emit or cause to be emitted CO_2e emissions in excess of 322,480 short tons (292,549 short tons) per calendar year except as specified in Attachment II – GHG, Special Condition No. C.1.c.iv of the permit.

   Reason: HAR §11-60.1-204(d)(6)(A).

2. The following total combined CO_2e emissions cap will be specified in Attachment II – GHG Special Condition No. C.1.b of CSP No. 0212-01-C for the Par East Refinery and referenced in Attachment II – GHG, Special Condition No. C.1.b of CSP No. 0088-01-C for the Par West Refinery:

   All partnering facilities shall not emit or cause to be emitted total combined CO_2e emissions in excess of 1,001,821 short tons (908,837 metric tons) per calendar year

   Reason: HAR §11-60.1-204(d)(6)(A).

3. For purposes of the CO_2e emission limits in Attachment II – GHG Special Condition Nos. C.1.a and C.1.b for the Par West Refinery:

   a. The CO_2e emissions shall have the same meaning as that specified in HAR §11-60.1-1;
   b. In accordance with HAR §11-60.1-204(d)(6)(B), biogenic carbon dioxide (CO_2) emissions are not included when determining compliance with the emissions limit;
   c. The permittee shall be in compliance with the emissions limits by the end of 2019 and each calendar year thereafter;
   d. The permittee may exceed the emissions cap specified in Attachment II – GHG, Special Condition No. C.1.a, if the GHG emissions limit specified in Attachment II – GHG Special Condition No. C.1.b. is met; and
   e. At no time shall the permittee exceed Attachment II – GHG Special Condition Nos. C.1.a and C.1.b simultaneously over a calendar year. For incidences when Attachment II – GHG Special Condition Nos C.1.a and C.1.b of this permit are exceeded simultaneously, emissions in excess of the total combined cap shall be allocated according to the following equation for compliance purposes:

$$X = XG \frac{(A - C)}{\sum_{A_i > C_i}(A_i - C_i)}$$

Where:

X = Adjusted portion in metric tons or short tons of GHG emissions that are in excess of total combined cap specified in Attachment II – GHG, Special Condition No. C.1.b. The equation applies to all affected facilities that do not meet the individual and total combined GHG emission caps specified in Attachment II – GHG, Special Condition Nos. C.1.a and C.1.b, respectively.

XG = Total combined actual GHG emissions from affected facilities minus total combined GHG emissions cap. Total combined emissions cap cannot be less than sixteen percent (16%) of total combined baseline emission.

A = Actual GHG emissions from the affected facility.

C = GHG emissions cap for the affected facility.

$\sum_{Ai>ci}(Ai - Ci)$ = The sum of the difference between the actual emissions and cap emissions for all facilities that did not achieve the individual facility-wide GHG emissions cap.

Reason: Required by HAR §11-60.1-3, §11-60.1-5, §11-60.1-90, §11-60.1-204.

4. Semi-annual monitoring report submittals for the GHG emission caps are as follows:

   a. The permittee shall complete and submit **semi-annual** monitoring reports to the Department. All reports shall be submitted **within sixty (60) days after** the end of each semi-annual calendar period (January 1 – June 30 and July 1 – December 31), be signed and dated by a responsible official, except that biogenic CO_2 emissions shall be excluded from the total CO_2e emissions.
   b. For calendar years 2019 and 2020, the permittee shall report the CO_2e emissions **within sixty (60) days** after the issuance of this permit. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2019 and 2020 calendar years shall be used for reporting and shall be signed and dated by a responsible official.
   c. For calendar year 2021, the permittee shall report the CO_2e emissions **within sixty (60) days** after issuance of this permit or **within sixty (60) days** after the end of the semi-annual calendar period, whichever is later. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2021 calendar year shall be used for reporting and shall be signed and dated by a responsible official.
   d. Upon written request by the permittee, the deadline for submitting the monitoring report may be extended, if the Department determines that reasonable justification exists for the extension.

   Reason: HAR §11-60.1-3, §11-60.1-5, and §11-60.1-90.

Conclusion and Recommendations:

Recommend issuance of the significant modification of existing CSP No. 0088-01-C, subject to the significant permit conditions above. This permit to incorporate GHG emission caps for the Par East and Par West partnering refineries amends CSP No. 0088-01-C issued on December 18, 2020. A thirty (30) day public comment period and forty-five (45) day Environmental Protection Agency review period are also required.

Reviewer: Mike Madsen
Date: 12/2020

Enclosure 1: Par West Refinery 2009 Baseline			
Subpart	**Unit**	**CO_2e Emissions (metric tons)**	Notes
Subpart C	***CatO $_x$ Combustion***		
	Catalytic Oxidizer	N/A	Catalytic Oxidizer was not operating in 2009. Unit was permitted in 2015 and began operating in 2016.
	Fuel Gas Combustion		
	F-5103 - Crude Atm Furnace (pilot light)	N/A	
	F-5153 - Crude Vac Furnace (pilot light)		
	F-5201 - Boiler (permanently Shutdown)	24,168	Boilers F-5205 and F-5206 replaced Boilers F-5201, F-5202, F-5203. The three (3) old boilers were permanently shutdown and removed from the permit. Par Hawaii Refining, LLC purchased the old and new boilers and will use GHG emissions from the old boilers in its 2009 baseline emissions.
	F-5201 - Boiler (permanently Shutdown)		
	F-5203 - Boiler (permanently Shutdown)		
	F-5205 – Boiler	N/A	
	F-5206 – Boiler		
	F-5600 - Hydrogenation Furnace	43,967	
	F-5700 - Hydrogen Furnace		
	F-5930 - Isomerization Furnace		
	F-5950 - Isomerization Furnace		
	F-6200 - Acid Plant Combustion Chamber		
	F-6260 - Acid Plant Pre-heater		
	K-6701 - Cogen & HSRG	32,632	
	K-6702 - Cogen & HSRG		
	K-6703 - Cogen & HSRG		
	K-6704 - Cogen & HSRG		Combustion turbine unit is not a permitted covered source, the fore, this unit was excluded from the baseline.
	WSR Combustion		
	K-6701 - Cogen & HSRG	44,986	
	K-6702 - Cogen & HSRG		
	K-6703 - Cogen & HSRG		
	K-6704 - Cogen & HSRG	N/A	Was not operating in 2009. Combustion turbine unit is not a permitted covered source, the fore, this unit was excluded from the baseline.
	Diesel Combustion		
	F-5205 – Boiler	N/A	Old boilers are now owned by Par Hawaii Refining, LLC. Boilers F-5205 and F-5206 replaced Boilers F-5201, F-5202, and F-5203.
	F-5206 – Boiler		
	Black Start Generator		
	RICE-110		
	RICE-1233		
	RICE-1522		
	Fuel Oil Combustion		
	F-5103 - Crude Atm Furnace	103,699	
	F-5153 - Crude Vac Furnace		
	F-5201 - Boiler (permanently shutdown)	89,647	Par Hawaii Refining, LLC purchased the old boilers from IES Downstream, LLC. Boilers F-5205 and F-5206 replaced Boilers F-5201, F- 5202, and F-5203. The old boilers are part of the baseline GHG emissions for the Par West Refinery.
	F-5202 - Boiler (permanently shutdown)		
	F-5203 - Boiler (permanently shutdown)		
	F-5205 – Boiler	N/A	New boilers are owned and operated by Par Hawaii Refining, LLC which replace Boilers F-5201, F-5202, and F-5203 owned by Island Energy Services, LLC. The three (3) old boilers were permanently shut down.
	F-5206 – Boiler		
Subpart P	Hydrogen Manufacturing	7,247	
Subpart Y	FCC Coke Combustion	N/A	Equipment is under CSP No. 0863-02-C for Island Energy Services, LLC.
	Flare P1 (FCC/sour) F-2302	1,017	
	Flare P2 (crude/sweet) F-2301	117	
	Acid Plant	485	
	Fugitive Venting Columns		
	C-5100 - Crude Unit	308	Units referred to as equipment leaks on equipment list.
	C-5150 - Crude Unit		
	C-5170 - Crude Unit		
	C-5830 - Alkylation Unit		
	C-5840 - Alkylation Unit		
	C-5940 - Isomerization Unit		
	C-6101 - Amine/Acid Unit		
	C-6660 - Dimersol Unit	TBD	This is equipment under CSP No. 0863-02-C for IES Downstream, LLC.
	C-5850 - Alkylation Unit	TBD	
	C-5860 - Alkylation Unit	TBD	
	C-5330 - FCC Unit	TBD	
	C-5340 - FCC Unit	TBD	
	C-5350 - FCC Unit	TBD	
	C-5400 - FCC Unit	TBD	
	C-5405 - FCC Unit	TBD	
	C-5410 - FCC Unit	TBD	
	C-5420 - FCC Unit	TBD	
	C-5450 - FCC Unit	TBD	
	Total >	**348,273**	

Application
and
Supporting Information

Par Hawaii Refining

Greenhouse Gas Emission Reduction Plan

Par West Refinery
91-480 Malakole Street, Bldg. CCB
Kapolei, HI 96707

Covered Source Permit Nos. 0088-01-C
0088-02-C
0088-03-C

September 24 2019

Par Hawaii Refining

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Par Hawaii Refining

APPENDICES

A – 2009 Baseline Emission Calculations
B – Chevron Notification of Permanent Shutdown of Existing Boilers Letter dated June 24, 2016
C – GHGERP Change Log

1.0 Introduction

The state's Greenhouse Gas ("GHG") rule[1] sets forth the regulatory program for meeting the state's goal of lowering GHG emissions equal to or below the 1990 statewide GHG emission levels. To meet the 1990 goal, the state's GHG rule requires that each facility that emits more than 100,000 tons per year of GHG must reduce GHG emissions by 16% from 2010 levels. The facility-wide GHG emission cap is to be met by no later January 1, 2020 and maintained thereafter. Subject to the approval of the Hawaii Department of Health (DOH), the regulation also provides the flexibility to use an alternate emission baseline (year) and an alternate GHG emission cap if the facility can demonstrate that the 16% reduction is not attainable.

The refinery located at 91-480 Malakole Street, Kapolei, Hawaii is subject to provisions and requirements of the GHG rule. While the Hawaii Refinery was owned and operated by Chevron for many years, ownership of the refinery is now split between IES Downstream, LLC (IES) and Par Hawaii Refining, LLC (Par) and is currently operated under several Covered Source Permits (CSP Nos. 0088-01-C, 0088-02-C, 0088-03-C, and 0863-01-C) issued by the DOH Clean Air Branch (CAB). The facility began operation in 1960 with the capacity of processing up to 57,000 barrels of crude oil per day. The facility consisted of numerous operational units, including crude and vacuum distillation units, a fluid catalytic cracker, and dimersol, hydrogen manufacturing, alkylation, and isomerization units. It also operated utilities including boilers, cogeneration units, an effluent treatment plant, and tank farms for storage, blending, and shipping capability in support of its operations.

An initial Greenhouse Gas Emission Reduction Plan (GHGERP) was submitted by Chevron on June 30, 2015 for the Hawaii Refinery to comply with requirements of the Hawaii Greenhouse Gas Emissions law[2] and the implementing regulations adopted by the DOH[3]. Chevron's original plan (which was never approved by the DOH) proposed a reduction of 2.2% from the alternative baseline year of 2009 and represented that additional reductions were not attainable based on the criteria specified by the GHG regulation. On November 1, 2016, IES acquired the Hawaii Refinery from Chevron and assumed responsibility for complying with the state's GHG rule (in accord with the GHG plan submitted by Chevron on June 30, 2015). After IES announced that it had suspended refining operations, Par acquired a portion of the refinery assets, which included the crude and vacuum units, steam and power generators, and associated permits from IES. On December 19, 2018, IES transferred the refinery topping plant assets and permits (CSP Nos. 0088-01-C, 0088-02-C and 0088-03-C) to Par. Although Par ultimately became the permit holder of record, prior to closing, IES submitted several permit applications to revise CSP 0088-01-C to segregate and permit separately units which were retained by IES (including the tank farm, fluid catalytic cracker, dimersol and alkylation plants and load rack). To reflect the change, mainly the

[1] HAR §11-60.1-201, Purpose.
[2] HRS §§ 342B *et seq.*, enacted by Act 234, 2007 Hawaii Session Laws.
[3] HAR § 11-60.1-204, "Greenhouse gas emission reduction plan." Hereinafter, the "GHG rule."

split ownership arrangement and change in refinery's operating configuration, IES submitted a revised GHGERP on December 14, 2018 and Par submitted a revised GHGERP on April 4, 2019.

This GHGERP is being updated to meet the requirements of §11-60.1-204(a) for the Par West Refinery which now functions principally as a topping plant. The baseline year of 2009, upon which this GHGERP is based, is (for the most part) unchanged from the original GHG Plan submitted by Chevron on June 30, 2015. This update also provides the baseline year analysis requested by the CAB that was used to justify 2009 as the baseline year. Moreover, this plan also splits the 2009 baseline GHG emissions according to the revised estimates that were previously submitted to the CAB on October 28, 2016 by Chevron. Much like its predecessor this plan splits the GHG baseline between Par and IES in alignment with the topping plant purchase agreement which included the crude and vacuum units and supporting infrastructure support systems, such as steam, power and wastewater treatment. This plan provides greater clarity around the Hybrid Energy Plant permit (CSP 0088-02-C) which is integral to the facility's operation as a topping plant and was acquired by Par.

The main emphasis of this revision of the GHGERP is to reaffirm and further support Par's assertion that the 2009 baseline associated with the operation of 3 older boilers (F-5201, F-5202, and F-5203) should be allocated to Par Hawaii Refining to authorize operation of the Hybrid Energy Plant, which replaced the 3 older boilers.

However, this revision also includes a separate proposal in Section 6.0 to use an alternative/hybrid baseline to account for the construction of the Hybrid Energy Plant (which includes 2 boilers and one cogeneration unit) as a new permitted covered source. The Hybrid Energy Plant commenced construction prior to the effective date of the rule (June 30, 2014) and became fully operational in 2016. Subject to the director's approval, the GHG rule allows special consideration for alternative baselines (and emission caps). This alternative/hybrid baseline approach is aligned with the rule language and the intent of the regulation. Although planned many years in advance, the Hybrid Energy Plant was not in operation during the GHG baseline period of 2006-2010.

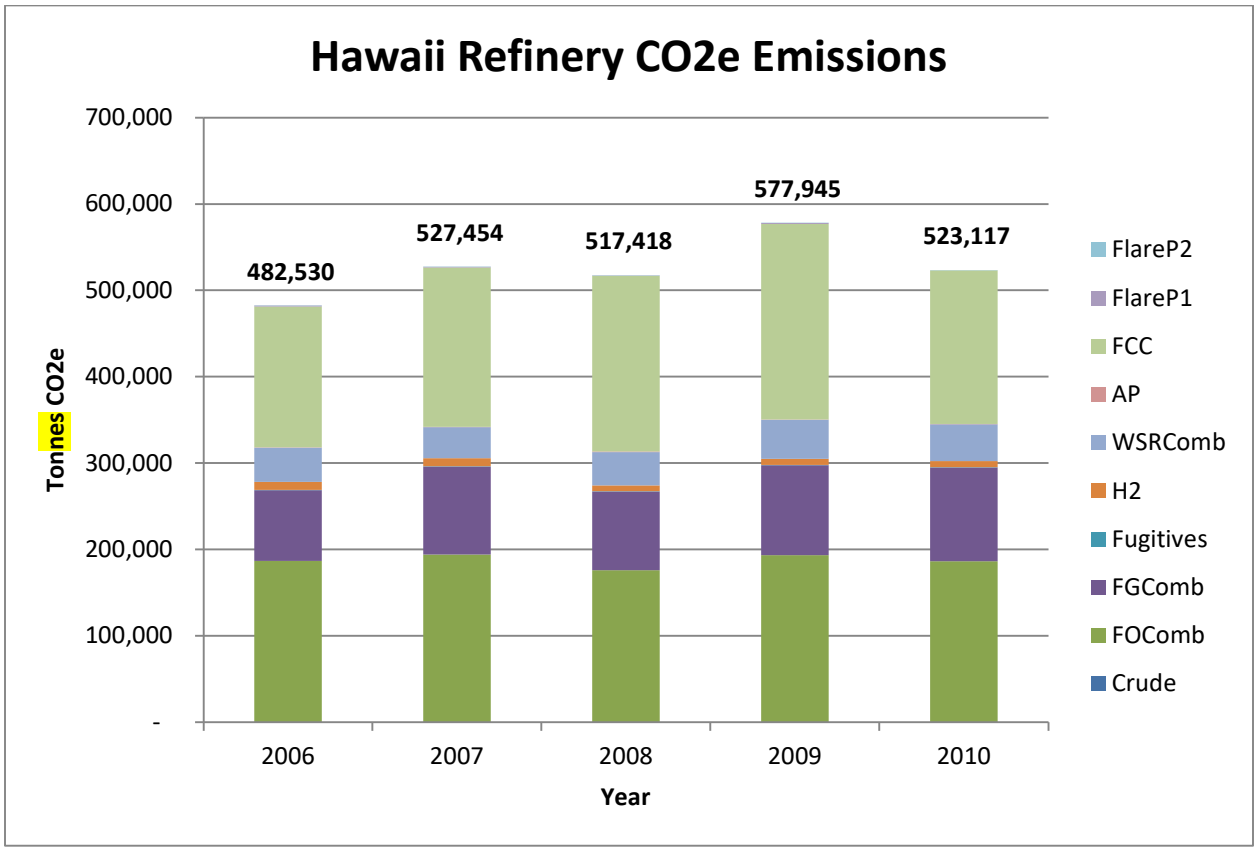
This plan consists of 6 sections. Section 2 presents the proposed baseline emission year for the entire facility and split of the baseline between the Par and IES. References to "Refinery" are for the entire facility prior to the split of assets by IES and sale to Par. Section 3 discusses the proposed 2020 facility-wide direct GHG Emissions cap. Section 4 discusses the GHG Control Assessment, Section 5 discusses the Proposed Control Strategy and Section 6 discusses the Alternate/Hybrid Baseline and GHG Emission Cap.

Appendices of this plan contain supporting data for the selected baseline.

2.0 Request for Alternate Baseline Annual Emission Year

Section 11-60.1-204(d) (1) generally requires regulated sources to use CY 2010 to compute the GHG baseline emissions. Even though 2010 was the first year in which GHG were reported pursuant to 40 CFR 98, the state's GHG regulations allowed an owner or operator to propose an alternate GHG emission baseline. Several alternatives were available which allowed an owner or operator to use emissions from the years 2006-2010 in various formulations, if the owner or operator documents that 2010 is "not representative of normal source operations." A chart of the estimated refinery GHG emissions from these years is provided below.

Figure 1. 2006 – 2010 GHG Emissions and Unit Breakdown



LEGEND:

- Combustion Emissions from Fuel Oil, Fuel Gas and Whole Straight Run Fuels: FO Comb, FG Comb, and WSR Comb
- Coke Combustion Emissions from Fluid Catalytic Cracking (FCC) Unit: FCC
- Hydrogen Manufacturing Vent Emissions: H2
- Crude Storage Emissions: Crude
- Fugitive Emissions from Process Piping: Fugitives
- Flaring Emissions: Flare P1 and Flare P2
- Acid Gas Processing Emissions: AP

The estimates of carbon dioxide equivalent emissions (CO_2e) provided in the graph above were recalculated in 2016 by Chevron utilizing the calculation methodologies prescribed in 40 CFR 98 Subparts A, C, P and Y along with 2015 emission and global warming potential (GWP) factors. The calculation summary is presented in Appendix A.

2.1 ALTERNATE BASELINE YEAR - 2009

Per §11-60.1-204(d)(1)(A)(i), the GHG Plan submitted on June 30, 2015 by Chevron requested that the Director approve an alternative baseline year of 2009 based on the criteria that it is the most representative year during the five-year period between 2006 and 2010. The GHG Annual Emission Summary, presented in Table 1 provides the direct GHG emissions estimated for the 1990 calendar year as well as estimates for the 2009 and 2010 calendar years. The emission estimates for 1990, 2009, and 2010 calendar years were calculated using the methodologies as required by the GHG Reporting Rule in 40 CFR Part 98; however, estimates were used for some operational data that was unavailable for the 1990 calendar year.

Table 1. GHG Annual Emission Summary

Calendar Year	Direct emissions reported in tonnes per year of CO_2e
1990	613,900 (estimated)
2009 (baseline year)	577,945
2010	523,117

To provide context for the refinery's request to use alternative baseline year, the table above was also shows that the refinery had already taken significant measures to reduce energy consumption and CO2 emissions well below the levels that had been established back in 1990, which was the stated purposed of both the Act and the GHG regulation.

2.2 JUSTIFICATION

On February 10, 2016 the CAB requested additional documentation to support Chevron's selection of 2009 as the baseline year. In response Chevron submitted two separate letters on October 28, 2016, one with non-confidential business information ("CBI") and the other with CBI information. The non-CBI letter contained the calculations for the estimated GHG emissions presented in Figure 1. and Appendix A. The CBI letter, which included confidential throughput information, explained the criteria used for determining normal source operations. Process unit shutdown periods and utilization-related data were analyzed to determine the most representative year during the five-year period ending in 2010. Three alternatives for the baseline were

presented for consideration with 2009 emissions selected as the most recent representative year and are discussed below. Par Hawaii endorses the selection of 2009 as the most representative year to establish a baseline, as well as the justification originally provided by Chevron.

2.2.1 Unit Downtime

Refinery GHG emissions occur from the processing of crude oil to produce high value products that are distributed in commerce for fuels. GHG emissions from normal operations are generated from the following sources:

1. Combustion of fuels supplying heat to the Refinery processes (account for approximately 60% of total GHG emissions from the Refinery)
2. Coke combustion in the Fluid Catalytic Cracking ("FCC") Unit (account for approximately 35% of total GHG emissions from the Refinery)
3. Hydrogen Plant
4. Crude Storage
5. Fugitives (piping)
6. (Emissions from) Flaring Events
7. Acid Gas Production (<5% of total GHG emissions from the Refinery).

Normal source operations are characterized by crude and process unit throughputs (utilization) and continuous operation that allow the Refinery to meet the fuel market demands.

Factors that can impact normal operations include:

1. Unit downtime, whether planned or unplanned, including crude supply interruptions and turnaround years;
2. External factors that reduce utilization, including widespread economic downturns impacting fuel market demands;
3. Periods of malfunction resulting in excess emissions, including force majeure events.

In the Refinery, planned maintenance is required for each unit. Short-term shutdowns to service equipment in each process unit occur regularly during the year and typically only last hours. Approximately every five years the units have scheduled long-term shutdowns that can last weeks or months, which all occur in a "turnaround ("TA") year". A TA year differs on average 12% of CO2e GHG emissions from the year before it and can vary up to 19%. TA years are not considered representative of normal operation due to this impact.

2.2.2 Refinery Utilization

A second quantitative marker of "normal source operations" is Refinery utilization. Utilization can be described in several ways including crude throughput, process unit feed rates, product output, and Complexity Weighted Barrels ("CWB") throughput.

Throughput is typically measured in barrels or barrels per day. For benchmarking comparison of multiple facilities in the refining industry, California Air Resources Board has standardized on Complexity Weighted Barrels, CWB, as a Refinery's throughput measurement in their Regulation for the Mandatory Reporting of Greenhouse Emissions.[4]

In determining the CWB throughput, the actual crude and individual process unit throughputs, in barrels, are weighted by factors that equalize the number and complexity differences in process units found at different facilities. For the same crude throughput, a Refinery with more processing will have a higher CWB.

CWB is correlated with GHG emissions, because more processing generally leads to higher GHG emissions. Thus, CWB is a throughput measurement normalized for the complexity of the Refinery that is a reasonable metric for discussing GHG emissions.

2.2.3 Procedures for Determining Alternative Baseline Year

2.2.3.1 HAR §11-60.1-204 (d)(1)(A)(i)

HAR §11-60.1-204 (d)(1)(A)(i) allows a facility to determine alternative facility-wide GHG emissions (less biogenic CO2) based on the most recent representative year during the five-year period ending 2010. The Refinery considers representative operation to be periods with (1) no significant process unit shutdowns and (2) a CWB throughput that reflects normal fuel markets and falls within the normal operating window.

No significant process unit shutdowns are a measure of normal operation because during extended periods of shutdown or shutdowns of the large process units such as the Crude Unit or the Fluid Catalytic Cracker, the emissions are low to zero, and do not represent emissions when the units are operating. Refinery CWB throughput is determined by the fuel markets that the Refinery supplies and relates to Actual GHG emissions because firing rates of Refinery heaters and boilers are determined by the feed to the Refinery and process units.

CWB throughput for years 2002 through 2015 were evaluated by Chevron to determine a typical operating window that is representative of normal operation for GHG emissions evaluation. The operating window was established based on the 14-yr mean with a standard deviation of +/- 6%.

<u>2010</u>
The 2010 calendar year does not meet the criteria of normal operation because there was extended unplanned shutdown of the FCC Unit due to equipment malfunction and reduced CWB throughput due to lower fuel market demands driven by poor economic conditions.

<u>2009</u>
The 2009 calendar year meets the criteria of normal operation, as no significant shutdowns occurred and Refinery CWB throughput was within the normal range.

<u>2008</u>

[4] Title 17, California Code of Regulations, Section 95100 et seq, (MRR)

2008 was a turnaround year, in which the Refinery executed a planned Refinery-wide shutdown that lasted 31 days (8% of the year) at the Crude Unit and 41 days (11% of the year) for the FCCU. The CWB throughput for the year was significantly impacted by this downtime. The combined influence of these two criteria makes the 2008 calendar year non-representative of normal operation.

2007

The 2007 calendar year meets the criteria of normal operation, as no significant shutdowns occurred and Refinery CWB throughput was within the normal range.

2006

In calendar year 2006, two external events occurred that resulted in significant unit downtime and had some impact on the Refinery CWB throughput. On February 21, 2006, a Refinery-wide shutdown unexpectedly occurred as a result of an island-wide power outage. The FCC downtime was extended in order to internally inspect equipment. On October 15, 2006, a second Refinery-wide shutdown occurred as a result of an island-wide power outage following an earthquake off the island of Hawaii. These two events resulted in 30 days of FCC downtime, or 8% of the year. It also resulted in a 1% overall downtime for the Crude Unit. This significant downtime also lowered the Refinery CWB. The combined influence of these two events makes the 2006 calendar year non-representative of normal operation. An assessment of the 2006-2010 calendar years based on the CWB is summarized below.

Table 2. Normal Operation Analyses Summary

Year	Direct Estimated GHG Emissions (tonnes)	Refinery Operation Impacted by Shutdowns	Refinery Throughput	CWB Throughput % of Mean (+/-6%)	Representative Year?
2010	523,117	Refinery Actual GHG emissions reduced due to an unplanned FCC shutdown	Refinery Actual GHG emissions reduced due to lower Refinery throughput	-8%	No
2009	577,945	No impact	No impact	-1%	Yes
2008	517,418	Planned Refinery turnaround (TA)	Not estimated due to impact from TA	-10%	No
2007	527,454	No impact	No impact	4%	Yes
2006	482,530	Refinery Actual GHG emissions reduced due to an unplanned Refinery-wide shutdown	No impact	-2%	No

2.2.3.2 HAR §11-60.1-204 (d)(1)(A)(ii)

The next method allowed by HAR §11-60.1-204 (d)(1)(A)(ii) is to average facility-wide Actual GHG emissions (less biogenic CO2) over any consecutive two-year period during the five-year period ending in 2010. As described in the previous section, there are no representative consecutive two-year periods; therefore, this method is not feasible.

However, averaging the two years with Actual GHG emissions representative of normal operation, 2009 and 2007, does reflect emissions that could be considered representative. The average Actual GHG emissions for 2007 and 2009 are 552,700 tonnes CO2e.

2.2.3.3 HAR §11-60.1-204 (d)(1)(A)(iii)

The third method allowed by HAR §11-60.1-204 (d)(1)(A)(iii) is to average facility-wide GHG emissions (less biogenic CO2) for the five-year period ending in 2010. As described in the previous section, the five-year period ending in 2010 includes three years that are not representative of normal operation for GHG emissions; therefore, this method is not feasible.

2.2.3.4 HAR §11-60.1-204 (d)(1)(A)(iv)

The fourth method allowed by HAR §11-60.1-204 (d)(1)(A)(iv) is to utilize comparable methods as approved by the director. As noted in the regulation, the director will not consider the use of periods greater than five years from 2010, except for extreme cases such as where an affected source may not have been fully operational for an extended period of time.

A comparable method for determining an alternative baseline year, is to adjust the actual emissions of a non-representative year to reflect expected emissions from restored operation. Chevron adjusted the 2010 calendar year emissions to include the GHG emissions for the FCC shutdown days and unrealized Refinery throughput (adjusted to mean CWB value). Data showed that 2010 GHG CO2e emissions would have been at most 2.5% greater than years 2007 and 2009 emissions and 2010 CWB varied between 2% and 4% of years 2007 and 2009 throughput which had throughput within normal the range.

2.2.4 Baseline Year Determination Alternatives

Following the procedures set forth in HAR §11-60.1-204 (d)(1)(A)(i-iv), to evaluate alternative baseline year emissions, the Refinery has determined:

1. Calendar year 2009 Actual GHG emissions are the most recent representative of normal operations. These emissions are 577,945 tonnes CO2e per year.

2. The average of Actual GHG emissions for calendar years 2009 and 2007 is the second most representative baseline emissions. These emissions are 552,700 tonnes CO2e per year.

3. The adjusted 2010 calendar year Actual GHG emissions estimated to remove the impacts of downtime and lost CWB throughput could be considered feasible and is the third most representative baseline emissions. These emissions are ~0.3% greater than 2009 emissions.

2.2.5 Conclusion

Based on detailed reviews of historical operation, 2006-2010 GHG input data and emissions recalculations, and computational comparisons between eGGRT and SLEIS data done in cooperation with the CAB, 2009 is the most recent representative year for the facility-wide baseline annual emission rate. Although GHG emissions were somewhat higher in 2009, most of that increase was associated with the FCC (which Par did not acquire). As depicted in Figure 1 (above), aside from the FCC, the GHG emissions from other sources in 2009 were quite similar to those reported in 2007 and 2010. Appendix A contains the computational worksheets supporting the 2009 baseline emission rate previously provided to the DOH by Chevron in 2016.

2.3 BASELINE AND EMISSION SPLIT

Par proposes to split the 2009 baseline emissions between the Par West Refinery topping plant and IES' facility as shown in Table 3. The split is based on the topping plant purchase agreement which included the Hybrid Energy Plant and much of the refinery but not did not include the tank farms, fluid catalytic cracker, dimersol and alkylation plants in the sale to Par, and associated permits.

Table 3. Baseline Emission Split

		Total Emissions (tonnes)	Par Topping Plant (tonnes)	IES Facility (tonnes)
		2009	2009	2009
Subpart C	CatOx Combustion	-	-	
	Fuel Gas Combustion	103,990	100,767	3,223
	WSR Combustion	44,986	44,986	-
	Diesel Combustion	-	-	-
	Fuel Oil Combustion	193,346	193,346	-
	Total Subpart C	**342,322**	**339,099**	**3,223**
Subpart P	**Hydrogen Mfg**	**7,247**	**7,247**	**-**
Subpart Y	FCC Coke Combustion	226,349	-	226,349
	Flare P1	1,017	1,017	-
	Flare P2 (Crude/Sweet)	117	117	-
	Acid Plant	485	485	-
	Fugitive Venting (Columns)	363	308	55
	Loading Vent (Crude Receipts)	45	-	45
	Total Subpart Y	**228,376**	**1,927**	**226,449**
	Total Direct CO2e (tonnes)	**577,945**	**348,273**	**229,672**

Table 4. lists all permitted equipment, permit numbers, current owners, and changes in equipment operational status between Par and IES. It also compares the equipment and associated 2009 baseline emissions to 2017 emissions, the first report submitted to the EPA via eGGRT with a full year's worth of measured fuel consumption for the Hybrid Energy Permit (CSP 0088-02-C).

Table 4. 2009 Baseline Emissions/Equipment Split and Current Equipment Status Comparison

			Baseline Analysis			Current Equipment Comparison		
			Total	Split		Total Emissions	Equipment Status as of March 2019	
				Par	IES			
		Permit Number	2009	2009	2009	2017	Owner	Status
Subpart C	**CatOx Combustion**							
	Catalytic Oxidizer	0088-01-C	-	-	-	106	Par	Operating
		SubTotal	**-**	**-**	**-**	**106**		
	Fuel Gas Combustion							
	F-5103 - Crude Atm Furnace (pilot light)	0088-01-C	-	-	-	-	Par	Operating
	F-5153 - Crude Vac Furnace (pilot light)	0088-01-C						
	F-5201 - Boiler[5]	0088-01-C	24,168	24,168	-	-	Chevron/IES	Permanently Shut down
	F-5202 - Boiler[5]	0088-01-C						
	F-5203 - Boiler[5]	0088-01-C						
	F-5205 - Boiler	0088-02-C	-	-	-	23,320	Par	Operating
	F-5206 - Boiler	0088-02-C						
	F-5300 - FCC Furnace	TBD	3,223	-	3,223	6,832	IES	Idle
	F-5310 - FCC Startup Air Heater	TBD						
	F-5700 - Hydrogen Furnace	0088-01-C	43,967	43,967	-	32,374	Par	Idle
	F-5930 - Isomerization Furnace	0088-01-C						
	F-5950 - Isomerization Furnace	0088-01-C						
	F-5600 - Hydrogenation Furnace	0088-01-C						
	F-6200 - Acid Plant Combustion Chamber	0088-01-C						
	F-6260 - Acid Plant Pre-heater	0088-01-C						
	K-6701 – Cogen & HSRG	0088-01-C	32,632	32,632	-	48,125	Par	Operating
	K-6702 – Cogen & HSRG	0088-01-C						
	K-6703 – Cogen & HSRG	0088-01-C						
	K-6704 – Cogen & HSRG	0088-02-C	-	-	-	9,605	Par	Operating

[5] Boilers operating during the 2009 baseline were shutdown June 1, 2016 and replaced with new boilers (under the same project/permit modification). The new boilers were acquired by Par and 2009 baseline boiler emissions are shown under the Par column, “Split-Par-2009”.

		SubTotal	**103,990**	**100,767**	**3,223**	**120,256**		
	WSR Combustion							
	K-6701 - Cogen	0088-01-C	44,986	44,986	-	33,063	Par	Operating
	K-6702 - Cogen	0088-01-C						
	K-6703 - Cogen	0088-01-C						
	K-6704 - Cogen	0088-02-C	-	-	-	21,162	Par	Operating
		SubTotal	**44,986**	**44,986**	**-**	**54,225**		
	Diesel Combustion							
	F-5205 - Boiler	0088-02-C	-	-	-	37,203	Par	Operating
	F-5206 - Boiler	0088-02-C						
	Black Start Generator	0088-03-C	-	-	-	424	Par	Operating
	RICE-110	0088-03-C						
	RICE-1233	0088-03-C						
	RICE-1522	0088-03-C						
		SubTotal	**-**	**-**	**-**	**37,627**		
	Fuel Oil Combustion							
	F-5103 - Crude Atm Furnace	0088-01-C	103,699	103,699	-	96,052	Par	Operating
	F-5153 - Crude Vac Furnace	0088-01-C						
	F-5201 - Boiler[5]	0088-01-C	89,647	89,647	-	-	Chevron/IES	Permanently Shutdown
	F-5202 - Boiler[5]	0088-01-C						
	F-5203 - Boiler[5]	0088-01-C						
	F-5205 - Boiler	0088-02-C	-	-	-	-	Par	Operating
	F-5206 - Boiler	0088-02-C						
		SubTotal	**193,346**	**193,346**	**-**	**96,052**		
	Total Subpart C		**342,322**	**339,099**	**3,223**	**308,266**		
Subpart P	**Hydrogen Mfg**	0088-01-C	7,247	7,247	-	4,881	Par	Idle
		SubTotal	**7,247**	**7,247**	**-**	**4,881**		
	Total Subpart P		**7,247**	**7,247**	**-**	**4,881**		
Subpart Y	**FCC Coke Combustion**	0088-01-C	226,349	-	226,349	162,253	IES	Idle
	Flare P1 (FCC/Sour)	0088-01-C	1,017	1,017	-	140	Par	Operating
	Flare P2 (Crude/Sweet)	0088-01-C	117	117	-	-	Par	Operating
	Acid Plant	0088-01-C	485	485	-	581	Par	Idle
	Fugitive Venting (Columns)		363	308	55			

	C-5100 - Crude Unit	0088-01-C				308	Par	Operating
	C-5150 - Crude Unit	0088-01-C					Par	Operating
	C-5170 - Crude Unit	0088-01-C					Par	Operating
	C-5830 - Alkylation Unit	0088-01-C					Par	Idle
	C-5840 - Alkylation Unit	0088-01-C					Par	Idle
	C-5940 - Isomerization Unit	0088-01-C					Par	Idle
	C-6101 - Amine/Acid Unit	0088-01-C					Par	Idle
	C-6660 - Dimersol Unit	TBD				55	IES	Idle
	C-5850 - Alkylation Unit	TBD					IES	Idle
	C-5860 - Alkylation Unit	TBD					IES	Idle
	C-5330 - FCC Unit	TBD					IES	Idle
	C-5340 - FCC Unit	TBD					IES	Idle
	C-5350 - FCC Unit	TBD					IES	Idle
	C-5405 - FCC Unit	TBD					IES	Idle
	C-5400 - FCC Unit	TBD					IES	Idle
	C-5410 - FCC Unit	TBD					IES	Idle
	C-5420 - FCC Unit	TBD					IES	Idle
	C-5450 - FCC Unit	TBD					IES	Idle
	Loading Vent (Crude Receipts)	0863-01-C	45	-	45	39	IES	Operating
		SubTotal	**228,376**	**1,927**	**226,449**	**163,376**		
	Total Subpart Y		**228,376**	**1,927**	**226,449**	**163,376**		

Total Direct metric tons CO2e	**577,945**	**348,273**	**229,672**	476,523	**Total 2017 Emissions**
				307,344	**2017 Par Equipment**
				169,179	**2017 IES Equipment**

Rationale for assigning the Retired Boiler GHG baseline allocation to Par

The 2009 GHG baseline allocation associated with boilers F-5201, F-5202 and F-5203 (Boilers 1/2/3 or older boilers) are allocated to Par as shown in Table 4., consistent with the permitting and operational history of the refinery and Par's rights under the topping plant purchase agreement that was used to purchase the boiler plant from IES.

Par purchased all of the fuel-fired steam generating units with valid air permits issued by the DOH and they should have come with a GHG baseline allocation to allow them to operate. The 3 older boilers no longer have a valid air permit. Cogen 4 (K-6704) and the 2 new boilers (F-5205 and F-5206) were permitted in 2007 as part of the Hybrid Energy Plant Permit (CSP 0088-02-C), they were not fully commissioned until much later. Cogen 4 was started on May 25, 2011 and the 2 boilers were truly started in May of 2016. The Hybrid Energy Plant permit (CSP 0088-02-C), included a condition (Attachment II-B, Section C.1) that required Boilers 1/2/3 that were listed in CSP 0088-01-C be shut down within one year after the startup of the new boilers. The shutdown of the older boilers was required by the DOH to provide emission offsets for the new boilers that were to be operated under the Hybrid Energy Plant CSP. The authority to operate Boilers 1/2/3 became conditional when the Hybrid Energy Permit was issued on May 23, 2007. Chevron submitted a letter to the DOH that the last of the three boilers had been shut down on June 1, 2016. A copy of the letter is included in Appendix B. Although a description of Boilers 1/2/3 remained on the main refinery permit (CSP 0088-01-C) as Attachment II(H), after being shut down in June of 2016, the 3 retired boilers were no longer permitted to be operated under any CSP.

IES acquired the refinery (and associated permits) from Chevron on November 1, 2016, approximately 5 months after the last of the 3 older boilers had been shut down. Because the new boilers were already listed on the Hybrid Energy Permit (CSP 0088-02-C) and the last of the 3 older boilers had been shut down in June of 2016, IES submitted an application to remove Boilers 1/2/3 from CSP 0088-01-C. The main refinery permit was reissued on November 16, 2018 in preparation for sale of the topping plant sale to Par, without any reference to the Boiler Plant. Permits CSP 0088-01-C, 0088-02-C and 0088-03-C (and operational license of the new boilers and Cogen 4) were then transferred to Par upon purchase from IES on December 19, 2018. Just as the as permits for the boilers effectively shifted the refinery permit (CSP 0088-01-C) to the Hybrid Energy Permit (0088-02-C), the GHG baseline allocation was expected to shift, as well.

The shift in steam generation and GHG emissions from the 3 older boilers to the Hybrid Energy Plant was deliberate and touted as a key element of Chevron's plan for reducing GHG emissions. Based on the baseline GHG calculations which Chevron submitted on October 28, 2016, Boilers 1/2/3 accounted for approximately 113,815 tonnes or roughly 20% of the 577,945 tonnes of GHG's emitted by the refinery in the baseline year (2009). In 2017, there were three large contributors to GHG emissions: 2 new boilers (F-5205 and F-5206) and Cogen 4, none of which were operating in 2009 or 2010. They accounted for approximately 91,290 tonnes or roughly 19% of the 476,523 tonnes of GHG's emitted by the refinery in 2017. Thus, the reduction in GHG emissions from the shutdown of Boiler 1/2/3 was and still is needed to offset the GHG emissions (and other criteria pollutants) from the new Hybrid Energy Plant. Chevron, like Par planned to apply the GHG baseline allocation that was created by the 3 older boilers, on the Hybrid Plant.

3.0 2020 Direct GHG Emissions Cap – Par West Refinery

Per §11-60.1-204(d)(2), the regulation requires a 16% reduction from the proposed 2009 baseline year emission split of 348,273 tonnes per year CO2e for Par West. This equates to a reduction of 55,724 tonnes per year of CO2e and an emissions cap of 292,549 tonnes per year CO2e.

Par proposes a cap of **292,549** tonnes per year CO2e for its Par West Refinery operations which meets the State's 16% emission reduction requirement.

4.0 GHG Control Assessment

Per §11-60.1-204(d)(2), the GHG rule requires each affected source to conduct a GHG control assessment. The initial GHG plan submitted by Chevron includes an assessment of the control measures identified in §11-60.1-204(d)(3) as well as an evaluation of the technical feasibility, control effectiveness, and cost evaluation of each measure as required by §11-60.1-204(d)(4-5).

Par West has not included a revised control assessment in this updated GHG plan because it does not seek an alternate cap. Building upon energy conservation projects implemented by Chevron previously, Par Hawaii Refinery projects that it will be able to meet the 16% cap by not operating some of the GHG emitting equipment that it recently acquired from IES. Based on current projections, Par is able to accept emission caps being placed on its CSP as required by the regulation. However, even though the operation of some equipment maybe suspended indefinitely, Par is not committing nor contemplating the permanent shutdown of any permitted equipment, as a consequence of the submitting this GHGERP.

5.0 Proposed Control Strategy

Per §11-60.1-204(d)(6), the regulation requires each affected source to propose a control strategy to include a listing of identified control measures that can be implemented in order to meet the required or proposed alternate 2020 facility-wide GHG emissions cap.

Par West proposes to attain a 16% reduction in GHG emissions by relying upon the energy efficient measures and projects that Chevron has implemented since 2009 and by operating the portion of the refinery that it acquired from IES as a topping plant. Many of the GHG producing units that Par purchased from IES will be idled and suspending their operation will account for the

bulk of the reduction. While the operations of many of the process heaters will be suspended, projects will continue to be evaluated to optimize business needs or opportunities that may cause some of these units to be restarted in the future.

The Proposed Control Strategy presented in Chevron's 2015 GHGERP, identified several control measures that had been or were in the process of being implemented at the refinery to affect the reduction of direct GHG emissions. While Chevron's plan described measures from 1990's, the most relevant, for the purpose of strict conformance with the GHG rule requirements are those that occurred after the baseline year (2010 for most facilities). One control measure in particular that relates to the Par topping plant includes the new equipment in the Hybrid Energy Plant permit (CSP 0088-02-C). Chevron's initial GHGERP, submitted on June 30, 2015, stated:

> "As part of the Energy Project which began in the early 2000's, Chevron built a new cogeneration unit (Cogen #4) which allows the refinery to optimize its energy use and steam generation. This project included motorization of the Alky plant compressor in April 2013 which enabled full utilization of 4 cogen units. The project also included replacement of three existing boilers with two more energy efficient boilers. A revision of the permit limits for the boilers is pending and the ultimate shutdown of the original three boilers will achieve further reductions in direct GHG emissions."

While plans to reduce energy use had been developed far in advance of the rule requirements, the Hybrid Energy Project was completed well after 2010. As mentioned in Section 2.3, Cogen 4 and the new boilers were fully commissioned in 2011 and 2016, respectively, so these GHG emission reductions are now currently being realized.

In addition to these control measures, Par has also elected and will reduce GHG emissions by suspending the operation of the following combustion devices and GHG generators:

40 CFR 98 Subpart C Equipment

1. F-5700 - Hydrogen Furnace
2. F-5930 - Isomerization Furnace
3. F-5950 - Isomerization Furnace
4. F-5600 - Hydrogenation Furnace
5. F-6200 - Acid Plant Combustion Chamber
6. F-6260 - Acid Plant Pre-heater

40 CFR 98 Subpart P Equipment

1. Hydrogen Plant (with CO_2 vent)

40 CFR 98 Subpart Y Equipment

1. Acid Plant
2. Fugitive Venting from Columns

Table 5. summarizes the Par West Control Strategy to achieve a 16% reduction in GHG emissions. The operation of the Hybrid Energy Plant (under the proposed GHG cap) is dependent upon the 2009 baseline that was established by Boilers 1/2/3 that were shut down in 2016 as required by permit condition of the CSP for the Hybrid plant. As shown in Table 5. below, the allocation from the old boilers' baseline provides an allocation benefit of just 22,101 tonnes, because most of the baseline is needed or consumed by the firing of the Hybrid Energy Plant and BSG/RICE Diesel engines. Increased efficiency leads to a reduction in greenhouse gases.

Table 5. Par West Control Strategy and Projected GHG Emissions

2009 Baseline Emissions			
A	**Proposed 2009 Baseline GHG Emissions**	**348,273**	**Tonnes**
	Hybrid Energy Permit (CSP 0088-02-C)		
	- Retired Boilers 1/2/3 Fuel Gas Emissions	(24,168)	Tonnes
	- Retired Boilers 1/2/3 Fuel Oil Emissions	(89,647)	Tonnes
	+ New Boilers F-5205 & F-5206 Fuel Gas Emissions	23,320	Tonnes
	+ New Boilers F-5205 & F-5206 Diesel Emissions	37,203	Tonnes
	+ New Cogen 4 (K-6704) Fuel Gas Emissions	9,605	Tonnes
	+ New Cogen 4 (K-6704) WSR Emissions	21,162	Tonnes
a	Δ Retired Boilers - (New Boilers & Cogen 4)	(22,525)	Tonnne
	BSG/RICE Engine Permit (CSP 0088-03-C)		
	+ New BSG/RICE Diesel Emissions	424	Tonnes
B	Δ Old and New Equipment GHG Emissions	(22,101)	Tonnes
	(Implemented by Chevron)		
2018 Par West Control Measures			
	- Idled Equipment Subpart C by Par	(41,979)	Tonnes
	- Idled Equipment Subpart P by Par	(4,881)	Tonnes
	- Idled Equipment Subpart Y by Par	(735)	Tonnes
C	Total Par West Control Strategy Reductions	(47,595)	Tonnes
D	Net Reductions (B + C)	(69,696)	Tonnes
E	Estimated Potential 2020 GHG Emissions (A - D)	278,577	Tonnes

As a consequence of replacing the 3 older boilers with the Hybrid Energy Plant, the amount of GHG emitted by steam generators has been reduced by approximately 22,525 tonnes or roughly 20%. By idling operations in the Hydrogen Manufacturing, Isomerization, Hydrogenation and Acid Plants, Par West expects to reduce GHG by an additional 47,595 tonnes. Taken collectively these measures (along with others) are projected to achieve more than a 16% reduction in GHGs. As indicated in Table 6. below, surplus GHG reductions will be used to partner with Par West.

Table 6. Baseline, GHG Emissions Cap and Partner Surplus

2020 Par West Control Strategy			
A	2009 Baseline - Par Hawaii Refining*	348,273	tonnes
B	Less: 16% GHG Reduction of Baseline	(55,724)	tonnes
C	Proposed 2020 GHG Emissions Cap (A - B)	292,549	tonnes
D	Less: Estimated 2020 GHG's After Controls (and shutdowns of older boilers)	278,577	tonnes
	GHG Reduction Surplus (available for Par East) (C – D)	**13,972**	**tonnes**

* 2009 baseline includes GHG from Boilers F-5201, F-5202 and F-5203 in 2009, which were shut down and replaced by the Hybrid Energy Plant in 2016

Even though the surplus GHG reductions generated mostly by not-operating some of the combustion equipment at the Par West refinery is relatively small (13,972), Par plans to partner the Par West and Par East facilities to achieve the State's GHG emission reduction target.

In addition to the sharing the baseline allocation between the two facilities, operational changes at both refineries are a key element of the control strategy. Many of the units will no longer be operated at Par West and because some of the crude oil that Par Hawaii had previously planned to process at Par East will now be processed at Par West, the two Par refineries will be able to meet the 16 percent reduction on a combined basis.

Table 7. Reflects the individual facility and combined partnering baseline and annual GHG emissions limits.

Table 7. Combined Baseline CO_2e and Proposed GHG Emissions Caps

Facility	Permit No.	Emissions (tonnes)	
		Baseline CO_2e	CO_2e Cap (16% reduction to Baseline)
Par East	0212-01-C	733,676*	616,288
Par West	0088-01-C 0088-02-C 0088-03-C	348,273**	292,549
Combined		1,081,949	908,837

* Based on 2007
** Based on 2009, including baseline created by operation of retired Boilers F-5201, F-5202 and F-5203

The Par East facility will be the main permit for the partnered facilities and CSP 0212-01-C will list the Total Partnering GHG emissions limit and the facility specific emission limits. The Par West CSPs will reference the Par East CSP for its GHG emission limits.

6.0 Alternative/ Hybrid Baseline and GHG Emission Cap

Pursuant to the provisions of the GHG Rule §11-60.1-204(d)(1), the regulation allows for the development of an alternative baseline for newly permitted covered sources which did not operate in 2010. While largely anticipated (and insulated by the baseline established by operation of the 3 older boilers), the 2009 baseline does not include emissions directly from the Hybrid Energy Plant. Although the permit for the Hybrid Energy Plant (CSP 0088-02-C) was issued on May 23, 2007, neither Cogen 4 (K-6704) nor either of the two new 99 MMBTU/Hr boilers (F-5205 and F-5206) were operated prior to 2011. To account for the GHG emissions from the Hybrid Energy Plant as a new source, the 2009 baseline (which has already been reviewed by DOH) can be adjusted by deleting the GHG's from the old boilers (to reflect their shutdown) and including actual emissions from the Hybrid Energy Plant. The rule specifically precludes the use of potential-to-emits as means of establishing a GHG baseline however, actual data is available for retroactively establishing a baseline. Cogen 4 commenced operation on May 25, 2011 and the new boilers commenced operation much later, on May 22, 2016 and May 9, 2016. Consequently, 2017 is the first representative year during which the old boilers were shut down and the Hybrid Energy Plant was in full operation.

As discussed above and based on direct fuel measurement, actual GHG emissions from the Hybrid Energy Plant in 2017 were 22,525 tonnes (about 20%) lower than the GHG emissions from the 3 older boilers in 2009. If the baseline from the older boilers is not transferred (much like emission offsets) to the new Hybrid Energy Plant as presented in Section 2.3, then Par proposes and requests the Director's approval for an alternative/hybrid baseline for the Par West Refinery as calculated in Table 8 below.

The alternative/hybrid baseline also includes the Black Start Generator (CSP 0088-03-C). While emissions from the Black Start Generator are not significant, it was not in service in or prior to 2010 and, like the Hybrid Energy Plant, its construction commenced prior to the rule effective date (June 30, 2014) as specified for Permitted Covered Sources that are subject to the rule.

Table 8. Alternative/ Hybrid GHG Baseline

Alternative Hybrid Baseline GHG Emissions			
A	**2009 Baseline GHG Emissions ***	**348,273**	**tonnes**
	- Retired Boiler 1/2/3 Fuel Gas Emissions (2009)	(24,168)	tonnes
	- Retired Boiler 1/2/3 Fuel Oil Emissions (2009)	(89,647)	tonnes
	Hybrid Energy Permit (CSP 0088-02-C)		
	+ New Boilers F5205 & F5206 Fuel Gas Emissions**	23,320	tonnes
	+ New Boilers F5205 & F5206 Diesel Emissions**	37,203	tonnes
	+ New Cogen 4 (K-6704) Fuel Gas Emissions**	9,605	tonnes
	+ New Cogen 4 (K-6704) WSR Emissions**	21,162	tonnes
B	**Net 3 Boilers Shutdown and Hybrid Start**	**(22,525)**	**tonnes**
	BSG/RICE Engine Permit (CSP 0088-03-C)		
	+ New Black Start Gen /RICE Diesel Emissions	424	tonnes
C	Δ Old and New Equipment GHG Emissions	(22,101)	tonnes
D	**Alternative/Hybrid GHG Baseline (A + C)**	**326,172**	**tonnes**

* 2009 baseline includes GHG from 3 older boilers in 2009, which were shut down and replaced by the Hybrid Energy Plant in 2016
* * Based on fuel use in 2017 and GHG reported in accordance with Part 98

Aside from dropping the GHG from 3 older boilers and adding the Hybrid Energy Plant, the rest of the baseline for other sources is based on 2009. From this lower alternative starting point (or baseline), Par would intend to further reduce GHG emissions by not operating select combustion sources and other GHG-generating equipment as described in Section 5 above.

Table 9. Alternative/Hybrid Baseline and GHG Emissions Cap

2020 Par West Control Strategy			
A	Alternative/Hybrid Baseline - Par Hawaii Refining*	326,172	tonnes
B	Less: 16% GHG Reduction of Baseline	(52,187)	tonnes
C	Proposed 2020 GHG Emissions Cap (A - B)	273,984	tonnes
D	Less: Estimated 2020 GHG's After Controls (and shut downs of idled equipment) From Table 5.	278,577	tonnes
	GHG Reduction Shortfall (covered by Par East) (C – D)	**(4,593)**	**tonnes**

* 2009 baseline adjusted to exclude historic operation of 3 older boilers, and include the operation of the Hybrid Energy Plant in 2017

As indicated the Table 9 above, when the 16% cap is applied to the alternative/hybrid baseline, the projected GHG emission will be within 2% of the cap, or very nearly balanced. While there may be addition control measures that can be taken to make up for such a small gap, Par Hawaii Refining intends and is able to project that the 16% emission cap will be met on a combined basis, by partnering both facilities, as shown in Table 10 below.

Table 10. Combined Alternative/Hybrid Baseline CO_2e & GHG Emissions Caps

Facility	Permit No.	Emissions (tonnes)	
		Baseline CO_2e	CO_2e Cap (16% reduction to Baseline)
Par East	0212-01-C	733,676 *	616,288
Par West	0088-01-C 0088-02-C 0088-03-C	326,172**	273,984
Combined		1,059,848	890,272

* Based on 2007 Baseline
** Based on 2009 adjusted to exclude historic operation of 3 older boilers, and include the operation of the Hybrid Energy Plant in 2017

For the alternative/hybrid baseline, the Par East facility will be the main permit for the partnered facilities and CSP 0212-01-C will list the Total Partnering GHG emissions limit and the facility specific emission limits. The Par West CSPs will reference the Par East CSP for its GHG emission limits.

Par Hawaii Refining

Appendix A

2009 Baseline Emission Calculations

Appendix A
GHG Estimated Emissions 2006-2010
Summary data

Year	Crude	FCC	FO Comb	FG Comb	Fugitives	Flare P1	Flare P2	H2	AP	WSR Comb	TOTAL (tonnes CO2e)
2006	46	162,976	186,569	82,136	363	1,044	118	8,993	584	39,700	482,530
2007	46	184,301	193,906	102,017	363	1,053	93	9,354	577	35,745	527,454
2008	42	203,649	175,891	91,098	363	424	99	6,908	486	38,457	517,418
2009	45	226,349	193,346	103,990	363	1,017	117	7,247	485	44,986	577,945
2010	37	177,838	186,197	108,645	363	-	8	7,025	475	42,529	523,117

	Chevron Demonstration Workbook Calculated Emissions Metric Tons CO2e/year			
Year	Fuel Combustion	FCC	Remaining Sources	Demonstration Total
	308,406	162,976	11,148	482,530
2007	331,667	184,301	11,486	527,454
2008	305,447	203,649	8,321	517,418
2009	342,322	226,349	9,274	577,945
2010	337,371	177,838	7,907	523,117

Actual Emissions	% Diff	
536,124	10%	
569,048	7%	
522,593	1%	Difference in Averaging Periods, GWP and EF Changes
581,734	1%	Difference in Averaging Periods, GWP and EF Changes
529,651	1%	Difference in Averaging Periods, GWP and EF Changes

Notes on GHG emission calculations for historical years:

- GWP potentials in Default Const tab are the current factors, effective 2014, for consistency with the MRR reporting.
- Input data averaging periods are different from EPA's IVT methodology . Different averaging periods of data such as heating value can cause differences in calculation results.
- Some emission factors have changed from the earlier years in this historical data set (e.g. FO combustion). This spreadsheet uses the current Efs for consistency with MRR reporting.
- Some sources have been added to the historical years for consistency with the current MRR inventory (AP and Crude).
- GHG emissions for internal combustion engines (ICE) have been added to the 2015 and later years inventory to account for newly permitted sources.

Appendix A
GHG Calculations 2009
Default Constants

Type of Value	Parameter Name	Variable Name	Unit	Variable Value	
Global Constant	F to R	STPConv	dimensionless	459.671	
Global Constant	MolVolConvEPA, StdCond	StdMolVolEPA	scf/mol	0.8495	
Global Constant	Operating Hours in a Month	OperatingHoursMonth	hr	732	
Global Constant	kg to tonne	ConvTonneKg	dimensionless	0.001	
Global Constant	mmbbl to bbl	ConvBblMmbbl	dimensionless	1000000	
Global Constant	tonne to lb	ConvLbTonne	dimensionless	2204.62	
Global Constant	kg to lb	ConvLbKg	dimensionless	2.20462	
Global Constant	bbl to gal	ConvGalBbl	dimensionless	42	
Global Constant	mbtu to mmbtu	ConvMmbtuMbtu	dimensionless	0.001	
Global Constant	mscf to scf	ConvScfMscf	dimensionless	1000	
Global Constant	g to lb	ConvLbG	dimensionless	0.00220462	
Global Constant	btu to mmbtu	ConvMmbtuBtu	dimensionless	0.000001	
Global Constant	Minute to Hour	ConvHrMin	dimensionless	0.016666667	
Global Constant	Operating Hours in a 30d Month	OperatingHoursMonth	hr	720	
Global Constant	Operating Hours in a 31d Month	OperatingHoursMonth	hr	744	
Global Constant	Operating Hours in a 28d Month	OperatingHoursMonth	hr	672	
Global Constant	Operating Hours in a 29d Month	OperatingHoursMonth	hr	696	leap years: 2016: 2012; 2008; 2004; 2000
Global Constant	Methane GWP 2014 updated value	MGWP	dimensionless	25	
Global Constant	Nitrous Oxide GWP 2014 updated value	NGWP	dimensionless	298	
Global Constant	Methane GWP old value	oMGWP	dimensionless	21	
Global Constant	Nitrous Oxide GWP old value	oNGWP	dimensionless	301	

Appendix A
GHG Calculations 2009
Default Emission Factors

Entity - Proc Unit ID	Material Name	Type of Value	Parameter Name	Variable Name	Unit	Variable Value
Crude Tank	Methane	Global Emission Factor	Dflt Emiss Factor, Storage Tanks, EPA Y	EF	tonne/1000000 bbl	0.1
Diesel Engine	Carbon Dioxide	Global Emission Factor	Comb, Distillate Fuel Oil No. 2, EPA	EF	kg/mmbtu	73.96
	Carbon Dioxide	Global Emission Factor	Default HHV, Distillate Fuel Oil No 2, EPA	HHV	mmbtu/gal	0.138
	Methane	Global Emission Factor	Comb, Distillate Fuel Oil No. 2, EPA	EF	kg/mmbtu	0.003
	Methane	Global Emission Factor	Default HHV, Distillate Fuel Oil No 2, EPA	HHV	mmbtu/gal	0.138
	Nitrogen Oxide (N2O)	Global Emission Factor	Comb, Distillate Fuel Oil No. 2, EPA	EF	kg/mmbtu	0.0006
	Nitrogen Oxide (N2O)	Global Emission Factor	Default HHV, Distillate Fuel Oil No 2, EPA	HHV	mmbtu/gal	0.138
FCC Unit (Regenerator) (Plant 53)	Methane	Global Emission Factor	Comb, Petroleum Coke, EPA	EF_CO2	kg/mmbtu	102.41
	Methane	Global Emission Factor	Comb, Petroleum Products, EPA	EF_CH4	kg/mmbtu	0.003
	Nitrogen Oxide (N2O)	Global Emission Factor	Comb, Petroleum Coke, EPA	EF_CO2	kg/mmbtu	102.41
	Nitrogen Oxide (N2O)	Global Emission Factor	Comb, Petroleum Products, EPA	EF_N2O	kg/mmbtu	0.0006
Fuel Oil Combustion	Carbon Dioxide	Global Emission Factor	Comb, Distillate Fuel Oil No. 6, EPA	EF	kg/mmbtu	75.1
	Methane	Global Emission Factor	Comb, Distillate Fuel Oil No. 6, EPA	EF	kg/mmbtu	0.003
	Nitrogen Oxide (N2O)	Global Emission Factor	Comb, Distillate Fuel Oil No. 6, EPA	EF	kg/mmbtu	0.0006
Fugitives						
Fuel Gas Combustion	Methane	Global Emission Factor, 2014, 2015	Comb, Natural Gas, Pipeline, EPA	EF	kg/mmbtu	0.001
	Nitrogen Oxide (N2O)	Global Emission Factor, 2014, 2015	Comb, Natural Gas, Pipeline, EPA	EF	kg/mmbtu	0.0001
	Methane	Global Emission Factor, 2013 and earlier	Comb, Fuel Gas, EPA	EF	kg/mmbtu	0.003
	Nitrogen Oxide (N2O)	Global Emission Factor, 2013 and earlier	Comb, Fuel Gas, EPA	EF	kg/mmbtu	0.0006
Flare P1 Sweet	Carbon Dioxide	Global Emission Factor	Flr, Refinery Default, EPA	EF_CO2	kg/mmbtu	60
	Methane	Global Emission Factor	Comb, Petroleum Products, EPA	EF_CH4	kg/mmbtu	0.003
	Methane	Global Emission Factor	Flr, Refinery Default, EPA	EF_CO2	kg/mmbtu	60
	Nitrogen Oxide (N2O)	Global Emission Factor	Comb, Petroleum Products, EPA	EF_N2O	kg/mmbtu	0.0006
	Nitrogen Oxide (N2O)	Global Emission Factor	Flr, Refinery Default, EPA	EF_CO2	kg/mmbtu	60
	Methane	Global Emission Factor	Default weight fraction of carbon in methane ir	f_CH4	dimensionless	0.4
Flare P2 Sour	Carbon Dioxide	Global Emission Factor	Flr, Refinery Default, EPA	EF_CO2	kg/mmbtu	60
	Methane	Global Emission Factor	Comb, Petroleum Products, EPA	EF_CH4	kg/mmbtu	0.003
	Methane	Global Emission Factor	Flr, Refinery Default, EPA	EF_CO2	kg/mmbtu	60
	Nitrogen Oxide (N2O)	Global Emission Factor	Comb, Petroleum Products, EPA	EF_N2O	kg/mmbtu	0.0006
	Nitrogen Oxide (N2O)	Global Emission Factor	Flr, Refinery Default, EPA	EF_CO2	kg/mmbtu	60
	Methane	Global Emission Factor	Default weight fraction of carbon in methane ir	f_CH4	dimensionless	0.4
Hydrogen Manufacturing (Unit 57)						
Acid Plant (Unit 62)						
WSR Combustion (Cogens)	Carbon Dioxide	Global Emission Factor	Comb, Naptha (<401 deg F), EPA	EF	kg/mmbtu	68.02
	Methane	Global Emission Factor	Comb, Naptha (<401 deg F), EPA	EF	kg/mmbtu	0.003
	Nitrogen Oxide (N2O)	Global Emission Factor	Comb, Naptha (<401 deg F), EPA	EF	kg/mmbtu	0.0006

Month	Year	Process Unit	Emission Scenario	GHG Species	Fuel Use (Gas Volume) [FuelCalculated]	Units	Carbon Content [CC]	Units	Molecular Weight [MW]	Units	Higher Heating Value	Units	Convert Fuel Volume to STP	Fuel Use (Gas Volume) At STP [FuelConverted]	Units	Convert CC to Annual Weighted Average	Annual Weighted Average CC	Units	Convert MW to Annual Weighted Average	Annual Weighted Average MW	Units	Species Emission Rate Expression	Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	141295.1409	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	143470.2885	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	17466918.32	lb/month	7922.870299	MT/month	7922.870299	
Jan	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	141295.1409	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	143470.2885	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	975.4613894	lb/month	0.44246237	MT/month	11.06155924	
Jan	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	141295.1409	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	143470.2885	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	195.0922779	lb/month	0.088492474	MT/month	26.37075723	
Feb	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	133358.9603	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	135411.9355	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	16485846.95	lb/month	7477.863282	MT/month	7477.863282	
Feb	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	133358.9603	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	135411.9355	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	920.6722603	lb/month	0.417610409	MT/month	10.44026023	
Feb	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	133358.9603	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	135411.9355	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	184.1344521	lb/month	0.083522082	MT/month	24.88958039	
Mar	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	136662.0965	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	138765.9214	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	16894180.95	lb/month	7663.080691	MT/month	7663.080691	
Mar	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	136662.0965	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	138765.9214	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	943.4761715	lb/month	0.427954102	MT/month	10.69885254	
Mar	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	136662.0965	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	138765.9214	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	188.6952343	lb/month	0.08559082	MT/month	25.50606446	
Apr	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	137719.2741	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	139839.3735	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	17024869.34	lb/month	7722.360016	MT/month	7722.360016	
Apr	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	137719.2741	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	139839.3735	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	950.7746241	lb/month	0.431264628	MT/month	10.7816157	
Apr	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	137719.2741	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	139839.3735	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	190.1549248	lb/month	0.086252926	MT/month	25.70337183	
May	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	153196.9327	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	155555.3007	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	18938218.92	lb/month	8590.241821	MT/month	8590.241821	
May	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	153196.9327	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	155555.3007	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	1057.627969	lb/month	0.479732548	MT/month	11.99331369	
May	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	153196.9327	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	155555.3007	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	211.5255938	lb/month	0.09594651	MT/month	28.59205983	
Jun	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	126838.4462	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	128791.0423	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	15679780.4	lb/month	7112.237209	MT/month	7112.237209	
Jun	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	126838.4462	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	128791.0423	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	875.656489	lb/month	0.397191575	MT/month	9.929789363	
Jun	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	126838.4462	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	128791.0423	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	175.1312978	lb/month	0.079438315	MT/month	23.67261784	
Jul	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	144104.6647	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	146323.0631	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	17814231.91	lb/month	8080.409281	MT/month	8080.409281	
Jul	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	144104.6647	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	146323.0631	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	994.8575411	lb/month	0.451260327	MT/month	11.28150816	

Month	Year	Process Unit	Emission Scenario	GHG Species	Fuel Use (Gas Volume) [FuelCalculated]	Units	Carbon Content [CC]	Units	Molecular Weight [MW]	Units	Higher Heating Value	Units	Convert Fuel Volume to STP	Fuel Use (Gas Volume) At STP [FuelConverted]	Units	Convert CC to Annual Weighted Average	Annual Weighted Average CC	Units	Convert MW to Annual Weighted Average	Annual Weighted Average MW	Units	Species Emission Rate Expression	Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jul	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	144104.6647	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	146323.0631	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	198.9715082	lb/month	0.090252065	MT/month	26.89511546	
Aug	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	155720.3423	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	158117.5566	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	19250163.05	lb/month	8731.737464	MT/month	8731.737464	
Aug	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	155720.3423	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	158117.5566	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	1075.04887	lb/month	0.487634545	MT/month	12.19086361	
Aug	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	155720.3423	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	158117.5566	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	215.0097739	lb/month	0.097526909	MT/month	29.06301885	
Sep	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	152070.6513	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	154411.6809	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	18798987.91	lb/month	8527.08762	MT/month	8527.08762	
Sep	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	152070.6513	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	154411.6809	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	1049.852443	lb/month	0.476205624	MT/month	11.9051406	
Sep	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	152070.6513	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	154411.6809	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	209.9704886	lb/month	0.095241125	MT/month	28.38185519	
Oct	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	164171.6392	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	166698.9557	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	20294913.14	lb/month	9205.628699	MT/month	9205.628699	
Oct	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	164171.6392	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	166698.9557	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	1133.394215	lb/month	0.514099579	MT/month	12.85248948	
Oct	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	164171.6392	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	166698.9557	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	226.6788429	lb/month	0.102819916	MT/month	30.64033493	
Nov	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	220390.0985	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	223782.862	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	27244644.26	lb/month	12357.97746	MT/month	12357.97746	
Nov	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	220390.0985	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	223782.862	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	1521.510438	lb/month	0.690146346	MT/month	17.25365866	
Nov	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	220390.0985	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	223782.862	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	304.3020876	lb/month	0.138029269	MT/month	41.13272224	
Dec	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Carbon Dioxide	180296.6365	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	183072.187	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	(44/12) * FuelCalculated * CarbonContent * MW / StdMolVolEPA * ConvScfMscf * ConvLbG	22288286.8	lb/month	10109.80886	MT/month	10109.80886	
Dec	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Methane	180296.6365	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	183072.187	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	1244.716601	lb/month	0.564594625	MT/month	14.11486562	
Dec	2009	Mix Drum Fuel Gas To Refinery	Stationary Comb	Nitrogen Oxide	180296.6365	mscf	0.706671	kg C/kg gas	18.10487	kg/kmol	0.00103	mmbtu/scf	FuelUsage * (68 + STPConv) / (60 + STPConv)	183072.187	mscf	∑ (FuelCalculated(i) * CC(i)) / ∑ (FuelCalculated(i))	0.7066707	kg C/kg gas	∑ (FuelCalculated(i) * MW(i)) / ∑ (FuelCalculated(i))	18.104871	kg/kmol	FuelConverted*HHV*EF * ConvScfMscf * ConvLbKg	248.9433203	lb/month	0.112918925	MT/month	33.64983963	

Appendix A
GHG Calculations 2009
WSR Combustion

Month	Year	Process Unit	Emission Scenario	GHG Species	Fuel Use (Liquid Volume) [FuelUsage]	Units	Heat Content (Liquid) - HHV [HHV]	Units	Species Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	16661	bbl	4974	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	12427312.4	lb/month	5636.940788	MT/month	5636.940788	
Jan	2009	WSR Combustion Sources	Stationary Comb	Methane	16661	bbl	4974	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	548.1025757	lb/month	0.248615442	MT/month	6.21538605	
Jan	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	16661	bbl	4974	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	109.6205151	lb/month	0.049723088	MT/month	14.81748034	
Feb	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	12224	bbl	4912	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	9004136.495	lb/month	4084.21247	MT/month	4084.21247	
Feb	2009	WSR Combustion Sources	Stationary Comb	Methane	12224	bbl	4912	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	397.1245146	lb/month	0.180132864	MT/month	4.5033216	
Feb	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	12224	bbl	4912	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	79.42490293	lb/month	0.036026573	MT/month	10.73591869	
Mar	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	11897	bbl	5008	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	8934539.071	lb/month	4052.643572	MT/month	4052.643572	
Mar	2009	WSR Combustion Sources	Stationary Comb	Methane	11897	bbl	5008	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	394.0549428	lb/month	0.178740528	MT/month	4.4685132	
Mar	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	11897	bbl	5008	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	78.81098857	lb/month	0.035748106	MT/month	10.65293547	
Apr	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	11312	bbl	5006	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	8491816.722	lb/month	3851.827853	MT/month	3851.827853	
Apr	2009	WSR Combustion Sources	Stationary Comb	Methane	11312	bbl	5006	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	374.5288175	lb/month	0.169883616	MT/month	4.2470904	
Apr	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	11312	bbl	5006	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	74.9057635	lb/month	0.033976723	MT/month	10.12506351	
May	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	8712	bbl	5045	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	6590971.108	lb/month	2989.617761	MT/month	2989.617761	
May	2009	WSR Combustion Sources	Stationary Comb	Methane	8712	bbl	5045	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	290.6926393	lb/month	0.13185612	MT/month	3.296403	
May	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	8712	bbl	5045	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	58.13852785	lb/month	0.026371224	MT/month	7.858624752	

Month	Year	Process Unit	Emission Scenario	GHG Species	Fuel Use (Liquid Volume) [FuelUsage]	Units	Heat Content (Liquid) - HHV [HHV]	Units	Species Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jun	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	9204	bbl	5046	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	6964568.7	lb/month	3159.07898	MT/month	3159.07898	
Jun	2009	WSR Combustion Sources	Stationary Comb	Methane	9204	bbl	5046	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	307.1700397	lb/month	0.139330152	MT/month	3.4832538	
Jun	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	9204	bbl	5046	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	61.43400794	lb/month	0.02786603	MT/month	8.304077059	
Jul	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	6502	bbl	5018	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	4892693.3	lb/month	2219.290989	MT/month	2219.290989	
Jul	2009	WSR Combustion Sources	Stationary Comb	Methane	6502	bbl	5018	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	215.7906483	lb/month	0.097881108	MT/month	2.4470277	
Jul	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	6502	bbl	5018	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	43.15812966	lb/month	0.019576222	MT/month	5.833714037	
Aug	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	6333	bbl	5063	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	4808258.256	lb/month	2180.991852	MT/month	2180.991852	
Aug	2009	WSR Combustion Sources	Stationary Comb	Methane	6333	bbl	5063	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	212.0666681	lb/month	0.096191937	MT/month	2.404798425	
Aug	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	6333	bbl	5063	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	42.41333363	lb/month	0.019238387	MT/month	5.733039445	
Sep	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	10866	bbl	5009	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	8161896.87	lb/month	3702.178548	MT/month	3702.178548	
Sep	2009	WSR Combustion Sources	Stationary Comb	Methane	10866	bbl	5009	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	359.9778096	lb/month	0.163283382	MT/month	4.08208455	
Sep	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	10866	bbl	5009	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	71.99556192	lb/month	0.032656676	MT/month	9.731689567	
Oct	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	10849	bbl	4992	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	8121470.225	lb/month	3683.841308	MT/month	3683.841308	
Oct	2009	WSR Combustion Sources	Stationary Comb	Methane	10849	bbl	4992	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	358.1948056	lb/month	0.162474624	MT/month	4.0618656	
Oct	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	10849	bbl	4992	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	71.63896111	lb/month	0.032494925	MT/month	9.68348759	

Month	Year	Process Unit	Emission Scenario	GHG Species	Fuel Use (Liquid Volume) [FuelUsage]	Units	Heat Content (Liquid) - HHV [HHV]	Units	Species Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Nov	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	11055	bbl	5034	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	8345307.21	lb/month	3785.372177	MT/month	3785.372177	
Nov	2009	WSR Combustion Sources	Stationary Comb	Methane	11055	bbl	5034	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	368.0670631	lb/month	0.16695261	MT/month	4.17381525	
Nov	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	11055	bbl	5034	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	73.61341261	lb/month	0.033390522	MT/month	9.950375556	
Dec	2009	WSR Combustion Sources	Stationary Comb	Carbon Dioxide	16053	bbl	5012	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	12065286.49	lb/month	5472.728401	MT/month	5472.728401	
Dec	2009	WSR Combustion Sources	Stationary Comb	Methane	16053	bbl	5012	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	532.1355404	lb/month	0.241372908	MT/month	6.0343227	
Dec	2009	WSR Combustion Sources	Stationary Comb	Nitrogen Oxide	16053	bbl	5012	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	106.4271081	lb/month	0.048274582	MT/month	14.38582532	

Appendix A
GHG Calculations 2009
Fuel Oil Combustion

Month	Year	Process Unit	Emission Scenario	GHG Species	Fuel Use (Liquid	Units	Heat Content	Units	Species Emission Rate Calculation	Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	36719	bbl	6314	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	38385668	lb/month	17411.47	MT/month	17411.47	
Jan	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	36719	bbl	6314	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1533.3822	lb/month	0.695531	MT/month	17.38828	
Jan	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	36719	bbl	6314	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	306.67644	lb/month	0.139106	MT/month	41.45367	
Feb	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	33395	bbl	6287	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	34761506	lb/month	15767.57	MT/month	15767.57	
Feb	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	33395	bbl	6287	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1388.6088	lb/month	0.629863	MT/month	15.74658	
Feb	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	33395	bbl	6287	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	277.72176	lb/month	0.125973	MT/month	37.53984	
Mar	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	37900	bbl	6328	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	39708123	lb/month	18011.32	MT/month	18011.32	
Mar	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	37900	bbl	6328	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1586.21	lb/month	0.719494	MT/month	17.98734	
Mar	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	37900	bbl	6328	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	317.242	lb/month	0.143899	MT/month	42.88182	
Apr	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	33723	bbl	6292	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	35130845	lb/month	15935.1	MT/month	15935.1	
Apr	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	33723	bbl	6292	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1403.3627	lb/month	0.636555	MT/month	15.91388	
Apr	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	33723	bbl	6292	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	280.67253	lb/month	0.127311	MT/month	37.9387	
May	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	35290	bbl	6324	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	36950235	lb/month	16760.36	MT/month	16760.36	
May	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	35290	bbl	6324	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1476.0413	lb/month	0.669522	MT/month	16.73805	
May	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	35290	bbl	6324	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	295.20827	lb/month	0.133904	MT/month	39.9035	
Jun	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	31427	bbl	6303	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	32796229	lb/month	14876.14	MT/month	14876.14	
Jun	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	31427	bbl	6303	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1310.1024	lb/month	0.594253	MT/month	14.85633	
Jun	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	31427	bbl	6303	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	262.02047	lb/month	0.118851	MT/month	35.41749	
Jul	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	35350	bbl	6308	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	36919413	lb/month	16746.38	MT/month	16746.38	
Jul	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	35350	bbl	6308	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1474.8101	lb/month	0.668963	MT/month	16.72409	
Jul	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	35350	bbl	6308	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	294.96202	lb/month	0.133793	MT/month	39.87022	
Aug	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	33960	bbl	6345	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	35675740	lb/month	16182.26	MT/month	16182.26	
Aug	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	33960	bbl	6345	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1425.1294	lb/month	0.646429	MT/month	16.16072	

Appendix A
GHG Calculations 2009
Fuel Oil Combustion

Month	Year	Process Unit	Emission Scenario	GHG Species	Fuel Use (Liquid	Units	Heat Content	Units	Species Emission Rate Calculation	Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Aug	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	33960	bbl	6345	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	285.02588	lb/month	0.129286	MT/month	38.52714	
Sep	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	34521	bbl	6313	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	36082186	lb/month	16366.62	MT/month	16366.62	
Sep	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	34521	bbl	6313	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1441.3656	lb/month	0.653793	MT/month	16.34483	
Sep	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	34521	bbl	6313	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	288.27312	lb/month	0.130759	MT/month	38.96608	
Oct	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	38044	bbl	6299	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	39676327	lb/month	17996.9	MT/month	17996.9	
Oct	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	38044	bbl	6299	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1584.9398	lb/month	0.718917	MT/month	17.97294	
Oct	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	38044	bbl	6299	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	316.98797	lb/month	0.143783	MT/month	42.84748	
Nov	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	27119	bbl	6342	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	28475646	lb/month	12916.35	MT/month	12916.35	
Nov	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	27119	bbl	6342	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1137.5092	lb/month	0.515966	MT/month	12.89915	
Nov	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	27119	bbl	6342	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	227.50183	lb/month	0.103193	MT/month	30.75158	
Dec	2009	Fuel Oil Combustion Sources	Stationary Comb	Carbon Dioxide	28856	bbl	6333	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	30256542	lb/month	13724.15	MT/month	13724.15	
Dec	2009	Fuel Oil Combustion Sources	Stationary Comb	Methane	28856	bbl	6333	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	1208.6502	lb/month	0.548235	MT/month	13.70588	
Dec	2009	Fuel Oil Combustion Sources	Stationary Comb	Nitrogen Oxide	28856	bbl	6333	mbtu/bbl	FuelUsage*HHV*EF * ConvLbKg * ConvMmbtuMbtu	241.73003	lb/month	0.109647	MT/month	32.67481	

Month	Year	Process Unit	Emission Scenario	GHG Species	Feedstock Volume [Feedstock]	Units	Carbon Content [CarbonContent]	Units	Molecular Weight [MW_Fuel]	Units	Feedstock Volume at Standard Conditions (STP) Expression	Feedstock Volume at STP [FeedstockCalc]	Units	Emission Rate Expression	EmissionRate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	5958.694211	mscf	0.80186822	lb/lb	32.72872373	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	6050.424466	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1510983.443	lb/month	685.371376	MT/month	685.3713761	
Feb	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	6563.694567	mscf	0.793936583	lb/lb	27.98133516	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	6664.738413	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1408896.68	lb/month	639.065544	MT/month	639.065544	
Mar	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	4679.473646	mscf	0.802065	lb/lb	33.14838185	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	4751.511126	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1202113.402	lb/month	545.270115	MT/month	545.2701153	
Apr	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	7503.379572	mscf	0.793204849	lb/lb	27.69753453	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	7618.889263	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1592795.148	lb/month	722.480586	MT/month	722.4805855	
May	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	4888.019012	mscf	0.796654277	lb/lb	28.88938995	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	4963.266913	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1086970.318	lb/month	493.042029	MT/month	493.0420288	
Jun	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	4996.716173	mscf	0.796189667	lb/lb	28.75547443	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	5073.637397	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1105346.117	lb/month	501.377161	MT/month	501.3771613	
Jul	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	4263.185184	mscf	0.79718298	lb/lb	29.16538709	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	4328.814171	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	957715.4544	lb/month	434.412939	MT/month	434.4129394	
Aug	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	3600.251792	mscf	0.799475067	lb/lb	30.42184951	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	3655.675347	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	846057.6325	lb/month	383.765743	MT/month	383.7657431	
Sep	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	6851.956891	mscf	0.798691977	lb/lb	30.03796296	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	6957.43835	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1588330.796	lb/month	720.455587	MT/month	720.4555868	
Oct	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	7975.415561	mscf	0.796787294	lb/lb	28.97770236	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	8098.191941	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1779246.842	lb/month	807.053752	MT/month	807.0537518	
Nov	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	6007.980916	mscf	0.796520097	lb/lb	28.73186991	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	6100.469909	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1328512.694	lb/month	602.603938	MT/month	602.6039382	
Dec	2009	Unit 57 - Hydrogen Manufacturing	Hydrogen Plant	Carbon Dioxide	6680.580599	mscf	0.798963373	lb/lb	30.44804614	lb/lb-mol	Feedstock * ((68 + STPConv) / (60 + STPConv))	6783.423831	mscf	44 / 12 * FeedstockCalc * CarbonContent * (MW_Fuel / StdMolVolEPA) * ConvLbG * ConvScfMscf	1570279.794	lb/month	712.26778	MT/month	712.2677803	

Month	Year	Process Unit	Emission Scenario	GHG Species	Heat Content (Gas) - HHV [HHV]	Units	Flare Volume (Gas) [FlareGasVolNorm]	Units	SSM Flare Volume (Gas) [FlareGasVolSSM]	Units	SSM Molecular Weight [MW_SSM]	Units	SSM Carbon Content [CarbContentSSM]	Units	Heat Content at Standard Conditions (STP) Expression	Heat Content (Gas) - HHV [HHVStd]	Units	Flare Gas Volume at STP Expression	Flare Volume (Gas) [FlrGsVolNormStd]	Units	SSM Flare Volume at STP Expression	SSM Flare Volume [FlrGsVolSSMStd]	Units	CO2 Emission Rate Factor Expression For Calculating CH4 and N2O	CO2 Emission Rate Factor [EmissionsCO2]	Units	Speices Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1098.020658	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1114.923979	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	181338.913	lb/month	82.25404515	Mt/month	82.25404515	
Jan	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1098.020658	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1114.923979	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	181338.913	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + ((EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	547.3642756	lb/month	0.248280554	Mt/month	6.207013857	
Jan	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1098.020658	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1114.923979	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	181338.913	lb/month	EmissionsCO2 * EF_N2O / EF_CO2	1.81338913	lb/month	0.00082254	Mt/month	0.245117055	
Feb	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1005.425763	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1020.903644	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	166046.7984	lb/month	75.31765039	Mt/month	75.31765039	
Feb	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1005.425763	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1020.903644	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	166046.7984	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + ((EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	501.2056376	lb/month	0.227343323	Mt/month	5.683583085	
Feb	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1005.425763	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1020.903644	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	166046.7984	lb/month	EmissionsCO2 * EF_N2O / EF_CO3	1.660467984	lb/month	0.000753177	Mt/month	0.224446598	
Mar	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1122.830885	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1140.116143	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	185436.3401	lb/month	84.11260901	Mt/month	84.11260901	
Mar	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1122.830885	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1140.116143	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	185436.3401	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + ((EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	559.7321957	lb/month	0.253890555	Mt/month	6.347263879	
Mar	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1122.830885	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1140.116143	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	185436.3401	lb/month	EmissionsCO2 * EF_N2O / EF_CO4	1.854363401	lb/month	0.000841126	Mt/month	0.250655575	
Apr	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1060.783841	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1077.113924	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	175189.2254	lb/month	79.46459046	Mt/month	79.46459046	
Apr	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1060.783841	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1077.113924	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	175189.2254	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + ((EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	528.8016889	lb/month	0.239860697	Mt/month	5.996517414	
Apr	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1060.783841	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1077.113924	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	175189.2254	lb/month	EmissionsCO2 * EF_N2O / EF_CO5	1.751892254	lb/month	0.000794646	Mt/month	0.23680448	
May	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1143.210079	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1160.809061	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	188801.9787	lb/month	85.63923885	Mt/month	85.63923885	
May	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1143.210079	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1160.809061	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	188801.9787	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + ((EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	569.8912418	lb/month	0.258498626	Mt/month	6.46246566	
May	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1143.210079	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1160.809061	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	188801.9787	lb/month	EmissionsCO2 * EF_N2O / EF_CO6	1.888019787	lb/month	0.000856392	Mt/month	0.255204932	
Jun	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	937.4495578	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	951.8809893	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	154820.4786	lb/month	70.22547131	Mt/month	70.22547131	
Jun	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	937.4495578	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	951.8809893	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	154820.4786	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + ((EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	467.319439	lb/month	0.211972784	Mt/month	5.299319599	

Month	Year	Process Unit	Emission Scenario	GHG Species	Heat Content (Gas) - HHV [HHV]	Units	Flare Volume (Gas) [FlareGasVolNorm]	Units	SSM Flare Volume (Gas) [FlareGasVolSSM]	Units	SSM Molecular Weight [MW_SSM]	Units	SSM Carbon Content [CarbContentSSM]	Units	Heat Content at Standard Conditions (STP) Expression	Heat Content (Gas) - HHV [HHVStd]	Units	Flare Gas Volume at STP Expression	Flare Volume (Gas) [FlrGsVolNormStd]	Units	SSM Flare Volume at STP Expression	SSM Flare Volume [FlrGsVolSSMStd]	Units	CO2 Emission Rate Factor Expression For Calculating CH4 and N2O	CO2 Emission Rate Factor [EmissionsCO2]	Units	Speices Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jun	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	937.4495578	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	951.8809893	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	154820.4786	lb/month	EmissionsCO2 * EF_N2O / EF_CO7	1.548204786	lb/month	0.000702255	Mt/month	0.209271905	
Jul	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1077.060865	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1093.641523	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	177877.3878	lb/month	80.68392187	Mt/month	80.68392187	
Jul	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1077.060865	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1093.641523	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	177877.3878	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	536.9157999	lb/month	0.2435412	Mt/month	6.088529995	
Jul	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1077.060865	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1093.641523	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	177877.3878	lb/month	EmissionsCO2 * EF_N2O / EF_CO8	1.778773878	lb/month	0.000806839	Mt/month	0.240438087	
Aug	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1060.966927	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1077.299828	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	175219.4622	lb/month	79.47830563	Mt/month	79.47830563	
Aug	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1060.966927	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1077.299828	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	175219.4622	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	528.8929573	lb/month	0.239902095	Mt/month	5.997552382	
Aug	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1060.966927	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1077.299828	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	175219.4622	lb/month	EmissionsCO2 * EF_N2O / EF_CO9	1.752194622	lb/month	0.000794783	Mt/month	0.236845351	
Sep	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1011.803483	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1027.379545	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	167100.0836	lb/month	75.79541308	Mt/month	75.79541308	
Sep	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1011.803483	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1027.379545	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	167100.0836	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	504.3849369	lb/month	0.228785431	Mt/month	5.719635775	
Sep	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1011.803483	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1027.379545	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	167100.0836	lb/month	EmissionsCO2 * EF_N2O / EF_CO10	1.671000836	lb/month	0.000757954	Mt/month	0.225870331	
Oct	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1049.425485	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1065.580714	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	173313.3846	lb/month	78.61372238	Mt/month	78.61372238	
Oct	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1049.425485	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1065.580714	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	173313.3846	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	523.1395383	lb/month	0.237292385	Mt/month	5.93230963	
Oct	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1049.425485	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1065.580714	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	173313.3846	lb/month	EmissionsCO2 * EF_N2O / EF_CO11	1.733133846	lb/month	0.000786137	Mt/month	0.234268893	
Nov	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	990.4951226	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1005.743156	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	163580.9923	lb/month	74.19917823	Mt/month	74.19917823	
Nov	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	990.4951226	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1005.743156	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	163580.9923	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	493.7627003	lb/month	0.22396726	Mt/month	5.599181495	
Nov	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	990.4951226	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1005.743156	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	163580.9923	lb/month	EmissionsCO2 * EF_N2O / EF_CO12	1.635809923	lb/month	0.000741992	Mt/month	0.221113551	
Dec	2009	P1 Sweet Flare	Flaring	Carbon Dioxide	1274	btu/scf	1037.034476	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1052.998953	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	171267.0005	lb/month	77.68549704	Mt/month	77.68549704	

Month	Year	Process Unit	Emission Scenario	GHG Species	Heat Content (Gas) - HHV [HHV]	Units	Flare Volume (Gas) [FlareGasVolNorm]	Units	SSM Flare Volume (Gas) [FlareGasVolSSM]	Units	SSM Molecular Weight [MW_SSM]	Units	SSM Carbon Content [CarbContentSSM]	Units	Heat Content at Standard Conditions (STP) Expression	Heat Content (Gas) - HHV [HHVStd]	Units	Flare Gas Volume at STP Expression	Flare Volume (Gas) [FlrGsVolNormStd]	Units	SSM Flare Volume at STP Expression	SSM Flare Volume [FlrGsVolSSMStd]	Units	CO2 Emission Rate Factor Expression For Calculating CH4 and N2O	CO2 Emission Rate Factor [EmissionsCO2]	Units	Speices Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Dec	2009	P1 Sweet Flare	Flaring	Methane	1274	btu/scf	1037.034476	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1052.998953	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	171267.0005	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	516.9626094	lb/month	0.234490574	Mt/month	5.862264351	
Dec	2009	P1 Sweet Flare	Flaring	Nitrogen Oxide	1274	btu/scf	1037.034476	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	1052.998953	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	171267.0005	lb/month	EmissionsCO2 * EF_N2O / EF_CO13	1.712670005	lb/month	0.000776855	Mt/month	0.231502781	

Month	Year	Process Unit	Emission Scenario	GHG Species	Heat Content (Gas) - HHV [HHV]	Units	Flare Volume (Gas) [FlareGasVolNorm]	Units	SSM Flare Volume (Gas) [FlareGasVolSSM]	Units	SSM Molecular Weight [MW_SSM]	Units	SSM Carbon Content [CarbContentSSM]	Units	Heat Content at Standard Conditions (STP) Expression	Heat Content (Gas) - HHV [HHVStd]	Units	Flare Gas Volume at STP Expression	Flare Volume (Gas) [FlrGsVolNormStd]	Units	SSM Flare Volume at STP Expression	Flare Volume SSM [FlrGsVolSSMStd]	Units	CO2 Emission Rate Factor Expression For Calculating CH4 and N2O	CO2 Emission Rate Factor [EmissionsCO2]	Units	Speices Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	55.44	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	56.29346306	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	9155.95646	lb/month	4.1530769	MT/month	4.15307693	
Jan	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	55.44	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	56.29346306	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	9155.956457	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	27.6368893	lb/month	0.0125359	MT/month	0.31339743	
Jan	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	55.44	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	56.29346306	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	9155.956457	lb/month	EmissionsCO2 * EF_N2O / EF_CO2	0.09155956	lb/month	4.153E-05	MT/month	0.01237617	
Feb	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	42.24	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	42.89025757	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	6975.96682	lb/month	3.1642491	MT/month	3.16424909	
Feb	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	42.24	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	42.89025757	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	6975.966824	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	21.0566776	lb/month	0.0095512	MT/month	0.23877899	
Feb	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	42.24	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	42.89025757	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	6975.966824	lb/month	EmissionsCO2 * EF_N2O / EF_CO3	0.06975967	lb/month	3.164E-05	MT/month	0.00942946	
Mar	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	46.32	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	47.03306654	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	7649.7818	lb/month	3.4698868	MT/month	3.46988678	
Mar	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	46.32	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	47.03306654	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	7649.781802	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	23.0905612	lb/month	0.0104737	MT/month	0.26184287	
Mar	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	46.32	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	47.03306654	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	7649.781802	lb/month	EmissionsCO2 * EF_N2O / EF_CO4	0.07649782	lb/month	3.47E-05	MT/month	0.01034026	
Apr	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	362.88	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	368.4663036	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	59929.8968	lb/month	27.183776	MT/month	27.1837763	
Apr	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	362.88	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	368.4663036	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	59929.89681	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	180.896003	lb/month	0.0820531	MT/month	2.05132861	
Apr	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	362.88	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	368.4663036	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	59929.89681	lb/month	EmissionsCO2 * EF_N2O / EF_CO5	0.59929897	lb/month	0.0002718	MT/month	0.08100765	
May	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	106.56	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	108.2004225	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	17598.4618	lb/month	7.9825375	MT/month	7.98253747	
May	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	106.56	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	108.2004225	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	17598.46176	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	53.1202548	lb/month	0.024095	MT/month	0.60237427	
May	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	106.56	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	108.2004225	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	17598.46176	lb/month	EmissionsCO2 * EF_N2O / EF_CO6	0.17598462	lb/month	7.983E-05	MT/month	0.02378796	
Jun	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	318.72	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	323.6264889	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	52636.8406	lb/month	23.875698	MT/month	23.8756977	
Jun	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	318.72	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	323.6264889	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	52636.84058	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	158.882204	lb/month	0.0720678	MT/month	1.80169603	
Jun	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	318.72	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	323.6264889	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	52636.84058	lb/month	EmissionsCO2 * EF_N2O / EF_CO7	0.52636841	lb/month	0.0002388	MT/month	0.07114958	

Month	Year	Process Unit	Emission Scenario	GHG Species	Heat Content (Gas) - HHV [HHV]	Units	Flare Volume (Gas) [FlareGasVolNorm]	Units	SSM Flare Volume (Gas) [FlareGasVolSSM]	Units	SSM Molecular Weight [MW_SSM]	Units	SSM Carbon Content [CarbContentSSM]	Units	Heat Content at Standard Conditions (STP) Expression	Heat Content (Gas) - HHV [HHVStd]	Units	Flare Gas Volume at STP Expression	Flare Volume (Gas) [FlrGsVolNormStd]	Units	SSM Flare Volume at STP Expression	Flare Volume SSM [FlrGsVolSSMStd]	Units	CO2 Emission Rate Factor Expression For Calculating CH4 and N2O	CO2 Emission Rate Factor [EmissionsCO2]	Units	Speices Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jul	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	181.44	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	184.2331518	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	29964.9484	lb/month	13.591888	MT/month	13.5918881	
Jul	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	181.44	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	184.2331518	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	29964.9484	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	90.4480015	lb/month	0.0410266	MT/month	1.0256643	
Jul	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	181.44	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	184.2331518	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	29964.9484	lb/month	EmissionsCO2 * EF_N2O / EF_CO8	0.29964948	lb/month	0.0001359	MT/month	0.04050383	
Aug	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	50.4	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	51.17587551	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	8323.59678	lb/month	3.7755245	MT/month	3.77552448	
Aug	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	50.4	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	51.17587551	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	8323.596779	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	25.1244449	lb/month	0.0113963	MT/month	0.28490675	
Aug	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	50.4	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	51.17587551	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	8323.596779	lb/month	EmissionsCO2 * EF_N2O / EF_CO9	0.08323597	lb/month	3.776E-05	MT/month	0.01125106	
Sep	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	43.2	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	43.86503615	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	7134.51152	lb/month	3.2361638	MT/month	3.23616384	
Sep	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	43.2	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	43.86503615	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	7134.511525	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	21.5352385	lb/month	0.0097682	MT/month	0.24420579	
Sep	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	43.2	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	43.86503615	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	7134.511525	lb/month	EmissionsCO2 * EF_N2O / EF_CO10	0.07134512	lb/month	3.236E-05	MT/month	0.00964377	
Oct	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	51.36	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	52.15065409	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	8482.14148	lb/month	3.8474392	MT/month	3.84743923	
Oct	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	51.36	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	52.15065409	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	8482.14148	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	25.6030057	lb/month	0.0116133	MT/month	0.29033355	
Oct	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	51.36	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	52.15065409	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	8482.14148	lb/month	EmissionsCO2 * EF_N2O / EF_CO11	0.08482141	lb/month	3.847E-05	MT/month	0.01146537	
Nov	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	76.8	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	77.98228649	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	12683.576	lb/month	5.7531802	MT/month	5.75318016	
Nov	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	76.8	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	77.98228649	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	12683.57604	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	38.2848684	lb/month	0.0173657	MT/month	0.43414362	
Nov	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	76.8	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	77.98228649	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	12683.57604	lb/month	EmissionsCO2 * EF_N2O / EF_CO12	0.12683576	lb/month	5.753E-05	MT/month	0.01714448	
Dec	2009	P2 Sour Flare	Flaring	Carbon Dioxide	1274	btu/scf	112.8	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	114.5364833	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf				0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	18629.0023	lb/month	8.4499834	MT/month	8.44998336	
Dec	2009	P2 Sour Flare	Flaring	Methane	1274	btu/scf	112.8	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	114.5364833	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	18629.00232	lb/month	((EmissionsCO2 * EF_CH4 / EF_CO2) + (EmissionsCO2 * 0.02 / 0.98 * (16 / 44) * f_CH4))	56.2309004	lb/month	0.0255059	MT/month	0.63764844	
Dec	2009	P2 Sour Flare	Flaring	Nitrogen Oxide	1274	btu/scf	112.8	mscf	0	mscf	0	kg/kmol	0	kg/kg	HHV / ((68 + STPConv) / (60 + STPConv))	1254.684934	btu/scf	FlareGasVolNorm * (68 + STPConv) / (60 + STPConv)	114.5364833	mscf	FlareGasVolSSM * (68 + STPConv) / (60 + STPConv)	0	mscf	0.98 * [[FlrGsVolNormStd * HHVStd * EF_CO2 * ConvLbKg * ConvScfMscf * ConvMmbtuBtu] + [(44 / 12) * FlrGsVolSSMStd * MW_SSM / StdMolVolEPA * CarbContentSSM * ConvLbG * ConvScfMscf]]	18629.00232	lb/month	EmissionsCO2 * EF_N2O / EF_CO13	0.18629002	lb/month	8.45E-05	MT/month	0.02518095	

Month	Year	Process Unit	Emission Scenario	GHG Species	AGR Flow Inlet [FlowInlet]	Units	AGR Mole Pct Sour Gas - Carbon [MolPctCSour]	Units	Correction Factor: Tail Gas Recycle [CorrectionFactr]	Units	AGR Flow Inlet Feed rate to Standard Contiditions (STP) Expression	AGR Flow Inlet [FlowInletConv]	Units	Emission Rate Expression	Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	4506.513377	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	4575.888245	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	104502.924	lb/month	47.40179	MT/month	47.40178523	
Feb	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	3877.768821	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	3937.464572	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	89922.773	lb/month	40.78833	MT/month	40.78833223	
Mar	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	4141.117532	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	4204.867366	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	96029.6472	lb/month	43.55837	MT/month	43.55836707	
Apr	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	2846.238613	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	2890.054622	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	66002.302	lb/month	29.93818	MT/month	29.93817619	
May	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	3857.294541	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	3916.675104	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	89447.9886	lb/month	40.57297	MT/month	40.57297341	
Jun	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	3276.227062	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	3326.662465	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	75973.4363	lb/month	34.46101	MT/month	34.461012	
Jul	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	3784.005839	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	3842.258169	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	87748.4744	lb/month	39.80209	MT/month	39.8020858	
Aug	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	3995.726853	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	4057.238492	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	92658.1381	lb/month	42.02907	MT/month	42.02907443	
Sep	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	4338.024752	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	4404.805846	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	100595.789	lb/month	45.62954	MT/month	45.62953673	
Oct	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	4358.444723	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	4425.54017	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	101069.314	lb/month	45.84432	MT/month	45.8443243	
Nov	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	2929.351355	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	2974.44683	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	67929.6289	lb/month	30.8124	MT/month	30.81239801	
Dec	2009	Unit 62 - Acid Plant	Sulfur Recovery	Carbon Dioxide	4185.40386	mscf	20	%	100	%	FlowInlet * (68 + STPConv) / (60 + STPConv)	4249.835454	mscf	FlowInletConv * (44 / StdMolVolEPA) * (MolPctCSour / 100) * (CorrectionFactr / 100) * ConvLbG * ConvScfMscf	97056.6165	lb/month	44.02419	MT/month	44.02419305	

Month	Year	Process Unit	Emission Scenario	GHG Species	# Crude Oil Distillation Columns [CrudeDistill]	Units	# Cat Cracking / Coking Units [CatAndCoke]	Units	# Hydrotreaters [HydroTreater]	Units	# Hydrogen Plants [H2Plants]	Units	# Fuel Gas Systems [FuelGasSystems]	Units	Fugitive Emissions Estimation Expression	Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Feb	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Mar	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Apr	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
May	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Jun	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Jul	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Aug	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Sep	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Oct	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Nov	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	
Dec	2009	Fugitive - Refining Equipment - EPA	Fugitive	Methane	1	dimensionless	18	dimensionless	2	dimensionless	1	dimensionless	1	dimensionless	(0.4 * CrudeDistill + 0.2 * CatAndCoke + 0.1 * HydroTreater + 4.3 * H2Plants + 6 * FuelGasSystems) * ConvLbTonne / 12	2663.915833	lb/month	1.20833333	MT/month	30.20833333	

Appendix A
GHG Calculations 2009
Crude

Month	Year	Process Unit	Emission Scenario	GHG Species	Crude Received	Units	Species Emission Rate Expression	Species Emission Rate	Units	Converted Rate	Units	MT/Month CO2e	Comments
Jan	2009	Crude Receiving Tanks	Venting	Methane	1559299	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	343.7661761	lb/month	0.1559299	MT/month	3.8982475	
Feb	2009	Crude Receiving Tanks	Venting	Methane	1427805	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	314.7767459	lb/month	0.1427805	MT/month	3.5695125	
Mar	2009	Crude Receiving Tanks	Venting	Methane	1594532	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	351.5337138	lb/month	0.1594532	MT/month	3.98633	
Apr	2009	Crude Receiving Tanks	Venting	Methane	1506419	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	332.1081456	lb/month	0.1506419	MT/month	3.7660475	
May	2009	Crude Receiving Tanks	Venting	Methane	1623472.49	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	357.9139921	lb/month	0.162347249	MT/month	4.058681225	
Jun	2009	Crude Receiving Tanks	Venting	Methane	1331272	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	293.4948877	lb/month	0.1331272	MT/month	3.32818	
Jul	2009	Crude Receiving Tanks	Venting	Methane	1529534	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	337.2041247	lb/month	0.1529534	MT/month	3.823835	
Aug	2009	Crude Receiving Tanks	Venting	Methane	1506679	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	332.1654657	lb/month	0.1506679	MT/month	3.7666975	
Sep	2009	Crude Receiving Tanks	Venting	Methane	1436862	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	316.7734702	lb/month	0.1436862	MT/month	3.592155	
Oct	2009	Crude Receiving Tanks	Venting	Methane	1490289	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	328.5520935	lb/month	0.1490289	MT/month	3.7257225	
Nov	2009	Crude Receiving Tanks	Venting	Methane	1406602	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	310.1022901	lb/month	0.1406602	MT/month	3.516505	
Dec	2009	Crude Receiving Tanks	Venting	Methane	1472692.53	bbl	CrudeReceived * EF / ConvBblMmbbl * ConvLbTonne	324.6727405	lb/month	0.147269253	MT/month	3.681731325	

Par Hawaii Refining

Appendix B

Chevron Notification of Permanent Shutdown of Existing Boilers Letter Dated June 24, 2016

Jon Mauer
Refinery Manager

Hawaii Refinery
Chevron Products Company
91-480 Malakole St
Kapolei HI 96707
Tel 808 682 5711
Fax 808 682 2324
JonMauer@chevron.com

June 24, 2016

CERTIFIED MAIL RECEIPT NO. 7015 0640 0003 9266 1424
RETURN RECEIPT REQUESTED

Mr. Nolan Hirai
Manager, Clean Air Branch
Hawaii Department of Health
919 Ala Moana Boulevard, Room 203
Honolulu, Hawaii 96814

Refinery Covered Source Permit (CSP) Nos. 0088-01-C and 0088-02-C
Notification of Permanent Shutdown of Existing Boilers

Dear Mr. Hirai:

As required by CSP No. 0088-01-C, Attachment II(H), Special Condition E.2.c and CSP No. 0088-02-C, Attachment IIB, Special Condition E.7, this letter provides the required notification of permanent shutdown of three existing boilers, identified as Unit Nos F-5201, F-5202 and F-5203. Permanent shutdown of these units occurred June 1, 2016.

If you should have questions or require further information, please contact Alice Armstrong of our Environmental Staff at (808) 682-2205.

I certify, as the company official having supervisory responsibility for the persons who, acting under my direct instructions made the verification, that this knowledge is true, accurate, and complete to the best of their knowledge, information, and belief.

Sincerely,

aea

bcc: Kristi Mitchum

File: A-3-0-0-16

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SCB 6/23/16
MLP 6/23/16
AA 6/23/16
KAM 6/24/16

GHGERP Change Log

Date	Description of Review/ Amendment
04/2019	Start of Change Log.
09/2019	Added Boilers 1/2/3 permitting background, updated Section 5. Proposed Control Strategy, added partnering GHG Emission limits, and added Section 6. Alternative/Hybrid Baseline and GHG Emission Cap.

Par Hawaii Refining
91-325 Komohana Street
Kapolei, HI 96707

Certified Mail: 91 7199 9991 7037 9123 6480

November 19, 2020

Ms. Marianne Rossio, P.E.
Manager, Clean Air Branch
Hawaii Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawaii 96782

Subject: **CSP: 0088-01-C**
Par West Refinery
Significant Permit Modification
Establish Annual Greenhouse Gas (GHG) Emissions Cap

Dear Ms. Rossio:

Pursuant to the October 26, 2020 request from the Department of Health, Clean Air Branch (CAB) Par Hawaii Refining, LLC is hereby submitting a significant permit modification application to establish an annual facility-wide GHG emission cap for the Par West Refinery (Covered Source Permit No. 0088-01-C), as described in previously submitted GHG Emission Reduction Plan (ERP). A separate application will be submitted for the Par East Refinery (Covered Source Permit No. 0212-01-C).

This modification is to adopt into each permit an emissions reduction of 16% from our baseline GHG emissions established pursuant to HAR §11-60.1-204(d), and related conditions, as described below. There are no emissions increases associated with this permit modification.

This modification is to include the following permit revisions, as it applies to each source:

1. A total combined limit on carbon dioxide equivalent (CO_2e) emissions from the two (2) partnering facilities of 908,837 metric tons (1,001,821 short tons) per calendar year;
2. An individual facility-wide limit on CO_2e emissions from the Par East Refinery of 616,288 metric tons (679,341 short tons) per calendar year that will not apply as long as the total combined cap among the partnering facilities is met;
3. An individual facility-wide limit on CO_2e emissions from the Par West Refinery of 292,549 metric tons (322,480 short tons) per calendar year that will not apply as long as the total combined cap among the partnering facilities is met;
4. A January 1, 2020 compliance date for the CO_2e emission caps pursuant to HAR §11-60.1-204(c) that is retroactive;
5. GHG emissions monitoring, recordkeeping, and reporting measures from the applicable sections of Title 40, Code of Federal Regulations, Part 98, Mandatory GHG Reporting, and HAR Title 11, Chapter 60.1, Air Pollution Control; and
6. The following requirements from HAR §11-60.1-204(g):
    a. The GHG emission reduction plan shall become a part of the CSP application process for renewals and any required modifications pursuant to Subchapter 5 of HAR, Title 11, Chapter 60.1;

b. With each subsequent GHG emission reduction plan submittal, the owner or operator of the affected source shall report:
    i. The GHG emission reduction status;
    ii. Factors contributing to the emission changes;
    iii. Any control measure updated; and
    iv. Any new developments or changes that would affect the basis of the facility-wide CO2e emissions cap.

The enclosed permit application includes:

- Permit Application Form S-1
- Emissions Table S-1
- Form S-6
- Compliance Plan C-1
- Compliance Certification C-2
- Application Fee
- GHG Emission Reduction Plan (submitted September 24, 2019)
    - Please note that labeling of metric tons have (tonnes) been clarified on Figure 1, and table in Appendix A (highlighted in yellow), for consistency with the rest of the document.

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief. Should you have any questions please call Benton Widlansky at (808) 547-3993.

Sincerely,

Richard Creamer
Vice President & General Manager

Attachments

cc: Darin Lum Darin.Lum@doh.hawaii.gov

Chief
Permits Office, (Attention: Air-3)
Air Division, USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

File/Application No.: 0088-01-C

S-1: Standard Air Pollution Control Permit Application Form

(Covered Source Permit and Noncovered Source Permit)

State of Hawaii
Department of Health
Environmental Management Division
Clean Air Branch
P.O. Box 3378 • Honolulu, HI 96801-3378 • Phone: (808) 586-4200

1. Company Name: Par Hawaii Refining, LLC

2. Facility Name (if different from the Company): Par West Refinery

3. Mailing Address: 91-325 Komohana St.

   City: Kapolei State: HI Zip Code: 96707-1713

   Phone Number: (808)

4. Name of Owner/Owner's Agent: Richard L. Creamer

   Title: Vice President Phone: (808) 547-3841

   Mailing Address: 91-325 Komohana St.

   City: Kapolei State: HI Zip Code: 96707-1713

5. Plant Site Manager/Other Contact: Benton Widlansky

   Title: Environmental Manager Phone: (808) 547-3993

   Mailing Address: 91-325 Komohana St.

   City: Kapolei State: HI Zip Code: 96707-1713

6. Permit Application Basis: (Check all applicable categories.)

   ☐ Initial Permit for a New Source ☐ Initial Permit for an Existing Source

   ☐ Renewal of Existing Permit ☐ General Permit

   ☐ Temporary Source ☐ Transfer of Permit

   ☒ Modification to a Covered Source: → Is Modification? ☒ Significant ☐ Minor ☐ Uncertain

   ☐ Modification to a Noncovered Source

7. If renewal or modification, include existing permit number: **(CSP) No. 0088-01-C**

8. Does the Proposed Source require a County Special Management Area Permit? ☐ Yes ☑ No

9. Type of Source (Check One): ☐ Covered Source ☒ Covered and PSD Source

   ☐ Noncovered Source ☐ Uncertain

10. Standard Industrial Classification Code (SICC), if known: 2911

11. Proposed Equipment/Plant Location (e.g. street address): Par West Refinery 91-480 Malakole Street CCB

City: Kapolei State: HI Zip Code: 96707

UTM Coordinates (meters): East: 591894 North: 2356970

UTM Zone: 4 UTM Horizontal Datum: ☐ Old Hawaiian ☐ NAD-27 ☑ NAD-83

12. General Nature of Business: Petroleum Refining

13. Date of Planned Commencement of Construction or Modification: January 2020 (retroactive)

14. Is ***any*** of the equipment to be leased to another individual or entity? ☐ Yes ☑ No

15. Type of Organization: ☑ Corporation ☐ Individual Owner ☐ Partnership

☐ Government Agency (Government Facility Code: _____)

☐ Significant Other: _____

Any applicant for a permit who fails to submit any relevant facts or who has submitted incorrect information in any permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information. In addition, an applicant shall provide additional information as necessary to address any requirements that become applicable to the source after the date it filed a complete application, but prior to the issuance of the noncovered source permit or release of a draft covered source permit. (HAR §11-60.1-64 & 11-60.1-84)

RESPONSIBLE OFFICIAL (as defined in HAR §11-60.1-1)

Name (Last): Creamer (First): Richard (MI): L

Title: Vice President/General Manager Phone: (808) 547-3841

Mailing Address: 91-325 Komohana St.

City: Kapolei State: HI Zip Code: 96707

Certification by Responsible Official (pursuant to HAR §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules (HAR), Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

NAME (Print/Type): Richard L. Creamer

(Signature): Richard L. Creamer Date: 11/23/20

FOR AGENCY USE ONLY:

File/Application No.: _____

Island: _____

Date Received: _____

Submit the following documents as part of your application:

A. The ***Emissions Units Table***, filled in as completely as possible. Use separate sheets of paper as needed. General instructions include the following:

1. Identify each **emission point** with a unique number for this plant site, consistent with emission point identification used on the location drawing and previous permits; if known, provide the SICC number. Emission points shall be identified and described in sufficient detail to establish the basis for **fees** and applicability of requirement of HAR, Chapter 11-60.1. Examples of emission point names are: heater, vent, boiler, tank, baghouse, fugitive, etc. Abbreviations may be used.
   a. For each emission point use as many lines as necessary to list regulated and hazardous air pollutant data. For hazardous air pollutants, also list the Chemical Abstracts Service number (CAS#).
   b. Indicate the emission points that discharge together for any length of time.
   c. The **Equipment Date** is the date of equipment construction, reconstruction, or modification. Provide supporting documentation.

See Form S1

2. State the **maximum emission rates** in terms sufficient to establish compliance with the applicable requirements and standard reference test methods. Provide all supporting emission calculations and assumptions:
   a. Include all regulated and hazardous air pollutants and air pollutants for which the source is major, as defined in HAR §11-60.1-1. Examples of regulated pollutant names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_X), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), and particulate less than 10 microns (PM_{10}). Abbreviations may be used.
   b. Include fugitive emissions.
   c. **Pounds per hour (#/HR)** is the maximum potential emission rate expected by applicant.
   d. **Tons per year** is the annual maximum potential emissions expected by the applicant, taking into account the typical operating schedule.

See Form S1

3. Describe ***Stack Source Parameters***:
   a. **Stack Height** is the height above the ground.
   b. **Direction** refers to the exit direction of stack emissions: up, down or horizontal.
   c. **Flow Rate** is the actual, not the calculated, flow rate.

See Form S1

4. Provide any additional information, if applicable, as follows:
   a. If combinations of different fuels are used that cause any of the stack source parameters to differ, complete one row for each possible set of stack parameters and identify each fuel in the **Equipment Description**.
   b. For a rectangular stack, indicate the length and width.
   c. Provide any information on stack parameters or any stack height limitations developed pursuant to Section 123 of the Clean Air Act.

See Form S1

B. A **process flow diagram** identifying all equipment used in the process, including the following:
1. Identify and describe each emission point.
2. Identify the locations of safety valves, bypasses, and other such devices which when activated may release air pollutants to the atmosphere.

See Form S1. No physical change.

C. A **facility location map**, drawn to a reasonable scale and showing the following:

1. The property involved and all structures on it. Identify property/fence lines plainly.
2. Layout of the facility.
3. Location and identification of the proposed emissions unit on the property.
4. Location of the property and equipment with respect to streets and all adjacent property. Show the location of all structures within 100 meters of the applicant's emissions unit. Provide the building dimensions (height, length, and width) of all structures that have heights greater than 40% of the stack height of the emissions unit.

No new proposed emissions units.

D. Provide a description of any proposed modifications or permit revisions. Include any justification or supporting information for the proposed modifications or permit revisions.

Application is to establish GHG emissions cap.

Company Name: Par Hawaii Refinery
Location: 91-325 Komohana St., Kapolei, HI 96707
(Make as many copies of this page as necessary)

File No _____
Page ___ of _____

EMISSIONS UNITS TABLE

Review of applications and issuance of permits will be expedited by supplying all necessary information on this table.

AIR POLLUTANT DATA: EMISSION POINTS				AIR POLLUTANT		AIR POLLUTANT EMISSION RATE		UTM Zone: 4 Horizontal Datum [a]: NAD-83		STACK SOURCE PARAMETERS						
Stack No.	Unit No.	Equipment Name/Description & SCC number	Equipment Date	Regulated/Hazardous Air Pollutant Name	CAS #	#/HR	Tons/YR	East	North	Stack Height (mtrs)	Direction (u/d/h)[b]	Inside Diameter (mtrs)	Velocity (m/s)	Flow Rate (m3/s)	Temp. (K)	Capped (Y/N)
Par West Refinery Facility-Wide Cap (Sources listed below)				**Carbon Dioxide Equivalent**	**CO2e**	**7,349**	**322,480**									
	Furnaces (Except Hydrogen Manufacturing):															
	F-5103	Atmospheric Furnace														
	F-5153	Vacuum Furnace														
	F-5930	Isomerization Furnace														
	F-5059	Isomerization Furnace														
	Hydrogen Manufacturing:															
	HMU	Hydrogen Generation Unit (Feedstock Processing)														
	F-5600	Hydrogenation Unit Furnace														
	F-5700	Hydrogen Manufacturing furnace														
	Cogeneration Units:															
	K-6701	Cogeneration Unit No. 1														
	K-6702	Cogeneration Unit No. 2														
	K-6703	Cogeneration Unit No. 3														
	K-6704	Cogeneration Unit No. 4 with HRSG														
	Boilers:															
	F-5205	Boiler No. 5														
	F-5206	Boiler No. 6														
	Refinery Flares/Oxidation:															
	F-2301	Crude Flare														
	F-2302	FCC Flare														
	CatOx	Catalytic Oxidation Unit														
	Acid Pant															
	Acid Plant	Sour Gas Feedstock Processed														
	F-6200	Acid Plant combustion chamber														
	F-6262	Acid Plant preheater														
	Permitted Diesel Generator & Pumps															
		Cogen Black Start Generator														
		Sand Filter Pump Diesel Engine #1														
		Sand Filter Pump Diesel Engine #2														
		Transfer Pump														
	Miscellaneous Emissions Sources (Leaks and Insignificant Sources)															
Total Combined for Partner Facilities (Par East and Par West)				**Carbon Dioxide Equivalent**	**CO2e**	**22,831**	**1,001,821**									

a Specify UTM Horizontal Datum as Old Hawaiian, NAD-83, or NAD-27
b Specify the direction of the stack exhaust as u = upward, d = downward, or h = horizontal

File No.: _____

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. *Equipment Specifications:*

1.	*Maximum design capacity.*	No new equipment
2.	*Fuel type.*	No new equipment
3.	*Fuel use.*	No new equipment
4.	*Production capacity.*	No new equipment
5.	*Production rates.*	No new equipment
6.	*Raw materials.*	No new equipment
7.	*Provide any manufacturer's literature.*	No new equipment

B. *Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.*

This permit modification is to adopt into each permit an emissions reduction of 16% from our baseline GHG emissions established pursuant to HAR §11-60.1-204(d), and related conditions. There are no emissions increases associated with this permit modification.

1. *Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.*

There is no proposed physical change to equipment. Emissions will have a facility-wide cap applied, as specified in Table S1. Emissions will be monitored and calculated in accordance with 40 CFR 98.

2. *List all **new insignificant** activities in accordance with HAR §11-60.1-82.*

None

C. *Maximum Operating Schedule (to the extent needed to determine or regulate emissions):*

No change

D. *Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:*

1. *Description of or reference to any applicable test methods for determining compliance with each applicable requirement.*

- HAR Title 11, Chapter 60.1 Subchapter 11 Greenhouse Gas Emissions
- 40 CFR 98 Subpart A General Provision
- 40 CFR 98 Subpart C General Stationary Fuel Combustion Sources
- 40 CFR 98 Subpart P Hydrogen Production
- 40 CFR 98 Subpart Y Petroleum Refineries
- 40 CFR 98 Subpart MM Suppliers of Petroleum Products

2. *Explanation of all proposed exemptions from any applicable requirements.*

No exemptions are proposed.

E. *Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.*

See GHG Emission Reduction Plan

F. *Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable.*

No construction or modification is proposed.

G. *Provide detailed information to define permit terms and conditions for any proposed* ***emissions trading*** *within the facility in accordance with HAR §11-60.1-96.*

✓No emissions trading is proposed *HAR §11-60.1-96.* However, Par East and Par West Refineries will partner for compliance with a combined GHG emission cap pursuant to HAR §11-60.1-204(d)(6)(A).

H. *For* ***significant*** *modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards.*

There are no emissions increases associated with this permit modification. This permit modification intended to incorporate new emission limits into the permit.

I. *For* ***new*** *covered sources or* ***significant*** *modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7.*

Not applicable.

J. *Provide the following for compliance purposes:*
   1. *A Compliance Plan, Form C-1.*

      See Attached Form C-1.

   1. *A Compliance Certification, Form C-2.*

      See Attached Form C-2.

II. Submit an application fee according to the Application Fee Schedule in the Instructions for Applying for an Air Pollution Control Permit.

See attached fee.

III. Provide other information as follows:

A. *As required by any applicable requirement or as requested and deemed necessary by the Director of Health (hereafter, Director) to make a decision on the application.*

B. *As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.*

IV. The Director reserves the right to request the following information:

A. *A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.*

B. *Results of source emissions testing, ambient air quality monitoring, or both.*

C. *Information on other available control technologies.*

V. An application shall be determined to be complete only when all of the following have been complied with:

A. *All information required or requested in numbers* ***I, III, and IV*** *has been submitted.*

B. *All documents requiring certification have been certified pursuant to HAR §11-60.1-4.*

C. *All applicable fees have been submitted.*

D. *The Director has certified that the application is complete.*

   Information, certified documents, and fees required or requested in numbers I, III, and IV have been submitted with this application.

VI. The Director shall not continue to act upon or consider an incomplete application.

A. The applicant shall be notified in writing whether the application is complete:
   1. For the requirements of subchapter 7, thirty days after receipt of the application.
   2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
   3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to **VI.A.2** above, the application shall be deemed complete for the requirements of subchapter 5.

B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.

VII. After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.

A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.

B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.

VIII. The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.

IX. The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.

X. The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.

XI. Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.

File No.: 0088-01-C

C-1: Compliance Plan

The Responsible Official shall submit a Compliance Plan as indicated in the Instructions for Applying for an Air Pollution Control Permit and at such other times as requested by the Director of Health (hereafter, Director).

Use separate sheets of paper if necessary.

---

1. Compliance status with respect to all Applicable Requirements:

   Will your facility be in compliance, or is your facility in compliance, with all applicable requirements in effect at the time of your permit application submittal?

   [x] YES {If YES, complete items a and c below}

   [ ] NO {If NO, complete items a, b, and c below}

   a. Identify all applicable requirement(s) for which compliance is achieved.

      For Greenhouse gases:
      - HAR Title 11, Chapter 60.1 Subchapter 11 Greenhouse Gas Emissions
      - 40 CFR 98 Subpart A General Provision
      - 40 CFR 98 Subpart C General Stationary Fuel Combustion Sources
      - 40 CFR 98 Subpart P Hydrogen Production
      - 40 CFR 98 Subpart Y Petroleum Refineries
      - 40 CFR 98 Subpart MM Suppliers of Petroleum Products

      Provide a statement that the source is in compliance and will continue to comply with all such requirements.

      The Par West Refinery is in compliance and will continue to comply with all applicable state and federal Greenhouse Gas Regulations

   b. Identify all applicable requirement(s) for which compliance is NOT achieved.
      N/A

      Provide a detailed Schedule of Compliance Schedule and a description of how the source will achieve compliance with all such applicable requirements.

Description of Remedial Action	Expected Date of Completion
N/A	

c. Identify any other applicable requirement(s) with a future compliance date that your source is subject to. These applicable requirements may take effect AFTER permit issuance:

Applicable Requirement	Effective Date	Currently in Compliance?
N/A		

If the source is not currently in compliance, provide a Schedule of Compliance and a description of how the source will achieve compliance with all such applicable requirements:

Description of Proposed Action/Steps to Achieve Compliance	Expected Date of Achieving Compliance
N/A	

Provide a statement that the source on a timely basis will meet all these applicable requirements:

N/A

If the expected date of achieving compliance will NOT meet the applicable requirement's effective date, provide a more detailed description of each remedial action and the expected date of completion:

Description of Remedial Action and Explanation	Expected Date of Completion
N/A	

2. Compliance Progress Reports:

   a. If a compliance plan is being submitted to remedy a violation, complete the following information:

      Frequency of Submittal: N/A (less than or equal to 6 months) Beginning Date: _____

   b. Date(s) that the Action described in (1)(b) was achieved:

Remedial Action	Date Achieved
N/A	

   c. Narrative description of why any date(s) in (1)(b) was not met, and any preventive or corrective measures taken in the interim:

      N/A

RESPONSIBLE OFFICIAL (as defined in HAR §11-60.1-1)

Name (Last): Creamer (First): Richard (MI): L

Title: Vice President/General Manager Phone: (808) 547-3841

Mailing Address: 91-325 Komohana St.

City: Kapolei State: HI Zip Code: 96707

Certification by Responsible Official (pursuant to HAR §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

Name (Print/Type): Richard L. Creamer

(Signature): Richard L. Creamer Date: 11/23/20

Facility Name: Par Hawaii Refining, LLC Par West Refinery

Location: 91-480 Malakole Street CCB, Kapolei, HI 96707

Permit Number: CSP No. 0088-01-C

FOR AGENCY USE ONLY

File/Application No.:

Island:

File No.: _____

C-2: Compliance Certification

The Responsible Official shall submit a Compliance Certification as indicated in the Instructions for Applying for an Air Pollution Control Permit and at such other times as requested by the Director of Health (hereafter, Director).

Complete as many copies of this form as needed. Use separate sheets of paper if necessary.

RESPONSIBLE OFFICIAL (as defined in HAR §11-60.1-1)

Name (Last): Creamer (First): Richard (MI): L

Title: Vice President/General Manager Phone: (808) 547-3841

Mailing Address: 91-325 Komohana St.

City: Kapolei State: HI Zip Code: 96707

Certification by Responsible Official (pursuant to HAR §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

Name (Print/Type): Richard L. Creamer

(Signature): Richard L. Creamer Date: 11/25/20

Facility Name: Par Hawaii Refining, LLC Par West Refinery

Location: 91-480 Malakole Street CCB, Kapolei, HI 96707

Permit Number: CSP No. 0088-01-C

FOR AGENCY USE ONLY
File/Application No.: _____
Island: _____

Complete the following information for ***each*** applicable requirement that applies to ***each*** emissions unit at the source. Also include any additional information as required by the Director. The compliance certification may reference information contained in a previous compliance certification submittal to the Director, provided such referenced information is certified as being current and still applicable.

1. Schedule for submission of Compliance Certifications during the term of the permit:

   Frequency of Submittal: Annual Beginning Date: One year from permit issuance

2. Emissions Unit No./Description: Par West Refinery GHG Emissions

3. Identify the applicable requirement(s) that is/are the basis of this certification:

   For Greenhouse gases:

- HAR Title 11, Chapter 60.1 Subchapter 11 Greenhouse Gas Emissions
- 40 CFR 98 Subpart A General Provision
- 40 CFR 98 Subpart C General Stationary Fuel Combustion Sources
- 40 CFR 98 Subpart P Hydrogen Production
- 40 CFR 98 Subpart Y Petroleum Refineries
- 40 CFR 98 Subpart MM Suppliers of Petroleum Products

4. Compliance status:

   a. Will the emissions unit be in compliance with the identified applicable requirement(s)?

   ■ YES ☐ NO

   b. If YES, will compliance be continuous or intermittent?

   ■ Continuous ☐ Intermittent

   c. If NO, explain:

_____

_____

_____

_____

_____

5. Describe the methods to be used in determining compliance of the emissions unit with the applicable requirement(s), including any monitoring, recordkeeping, reporting requirements, and/or test methods:

Detailed in the GHG Emission Reduction Plan

Provide a detailed description of the methods used to determine compliance (e.g. monitoring device type and location, test method description, or parameter being recorded, frequency of recordkeeping, etc.):

Detailed in the GHG Monitoring Plan

6. Statement of Compliance with Enhanced Monitoring and Compliance Certification Requirements.

a. Will the emissions unit identified in this application be in compliance with applicable enhanced monitoring and compliance certification requirements?

☐ YES ☐ NO Not Applicable

b. If YES, identify the requirements and the provisions being taken to achieve compliance:

c. If NO, describe below which requirements will not be met: