Received
October 22, 2020
WV DEP/Div of Air Quality

Email Cover Letter

Division of Air Quality Permit Application Submittal

(Email to: **DEPAirQualityPermitting@wv.gov**)

Please find attached a permit application for: **Williams Ohio Valley Midstream, LLC – Oak Grove Gas Plant**

Subject: [Company Name; Facility Location]

- DAQ Facility ID (for existing facilities only): **051-00157**
- Current 45CSR13 and 45CSR30 (Title V) permits associated with this process (for existing facilities only): **R13-3070C-2019 (Oak Grove Gas Plant)**
  R13-3289B-2017 (Francis Compressor Station)
  R30-051-00157-2016
  (MM-03 and MM-04-2018) and
  (MM-05-2020)

- Type of NSR Application (check all that apply):
  - ☐ Construction
  - ☐ Modification
  - ☐ Class I Administrative Update
  - ☐ Class II Administrative Update
  - ☐ Relocation
  - ☐ Temporary
  - ☐ Permit Determination

- Type of 45CSR30 (TITLE V) Application:
  - ☐ Title V Initial
  - ☒ **Title V Renewal**
  - ☐ Administrative Amendment**
  - ☐ Minor Modification**
  - ☐ Significant Modification**
  - ☐ Off Permit Change

  **If the box above is checked, include the Title V revision information as ATTACHMENT S to the combined NSR/Title V application.

- Payment Type: **na**
  - ☐ Credit Card (Instructions to pay by credit card will be sent in the Application Status email.)
  - ☐ Check (Make checks payable to: WVDEP – Division of Air Quality)
    Mail checks to:
    WVDEP – DAQ – Permitting
    Attn: NSR Permitting Secretary
    601 57th Street, SE Charleston, WV 25304

Please wait until DAQ emails you the Facility ID Number and Permit Application Number. Please add these identifiers to your check or cover letter with your check.

- If the permit writer has any questions, please contact (all that apply):
  - ☐ Responsible Official/Authorized Representative
    - Name:
    - Email:
    - Phone Number:
  - ☒ **Company Contact**
    - Name: **Steven Sobutka, Environmental Specialist**
    - Email: **Steven.Sobutka@Williams.Com**
    - Phone Number: **(304) 843-3191**
  - ☐ Consultant
    - Name:
    - Email:
    - Phone Number:

Williams Ohio Valley Midstream LLC
100 Teletech Drive, Suite 2
Moundsville, WV 26041
(304) 843-3100

October 16, 2020
(Submitted via Email to: DEPAirQualityPermitting@WV.gov)

Carrie McCumbers
Title V Operating Permit Program Manager
Division of Air Quality
West Virginia Department of Environmental Protection
601 57th Street SE
Charleston, WV 25304-2345

Subject: Williams Ohio Valley Midstream LLC - Oak Grove Gas Plant
Application for Title V Permit Renewal
Permit No. R30-051-00157-2016 (MM03 thru MM05)
Marshall County, West Virginia

Dear Ms. McCumbers:

Williams Ohio Valley Midstream LLC (OVM) is submitting this Application for Title V Permit Renewal in accordance with the West Virginia Air Control Act and Title 45 Series 30 (45CSR30) for the existing Oak Grove Gas Plant (OGGP) located in Marshall County, West Virginia.

The OVM-OGGP is currently operating under West Virginia Department of Environmental Protection Title V Permit No. R30-051-00157-2016, issued 04/26/16, with expiration date of 04/26/21. A renewal application is due six-months prior to expiration or no later than 10/26/20.

There are no requested modifications to the current Title V Operating Permit R30-051-00157-2016 (MM03 thru MM05), nor to the underlying New Source Review Construction Permits R13-3070C-10/17/19 (OGGP) and R13-3289B-10/12/17 (Francis Compressor Station, FCS).

If you have any questions concerning this submittal or need additional information, please contact me at (304) 843-3191 or at Steven.Sobutka@Williams.com.

Sincerely,

Steven Sobutka
Environmental Specialist

Enclosures:
Title V Permit Application – Checklist
Title V Permit Application – Forms
Attachment A thru H
Supplement 01 thru 06

TITLE V PERMIT APPLICATION CHECKLIST FOR ADMINISTRATIVE COMPLETENESS

A complete application is demonstrated when all of the information required below is properly prepared, completed and attached. The items listed below are required information which must be submitted with a Title V permit application. Any submittal will be considered incomplete if the required information is not included.*

☒	A signed copy of the application ("Certification" page must be signed and dated by a Responsible Official as defined in 45CSR30) **(General Forms Section 6)**
☒	*Table of Contents (needs to be included but not for administrative completeness)
☒	Facility information **(General Forms Section 1)**
☒	Description of process and products, including NAICS and SIC codes, and including alternative operating scenarios **(General Forms Section 1 and Supplement 01)**
☒	ATTACHMENT A - Area map showing plant location **(Attachment A)**
☒	ATTACHMENT B - Plot plan showing buildings and process areas **(Attachment B)**
☒	ATTACHMENT C - Process flow diagram(s), showing all emission units, control equipment, emission points, and their relationships **(Attachment C)**
☒	Identification of all applicable requirements with a description of the compliance status, the methods used for demonstrating compliance **(General Forms Section 2 and Supplement 02)**, and a Schedule of Compliance Form **(Attachment F)** for all requirements for which the source is not in compliance
☒	Listing of all active permits and consent orders (if applicable) **(General Forms Section 2)**
☒	Facility-wide emissions summary **(General Forms Section 3 and Supplement 03)**
☒	Identification of Insignificant Activities **(General Forms Section and Supplement 04)**
☒	ATTACHMENT D - Title V Equipment Table **(Attachment D)** completed for all emission units at the facility except those designated as insignificant activities **(General Forms Section 4 and Supplement 04)**
☒	ATTACHMENT E - Emission Unit Form **(Attachment E)** completed for each emission unit listed in the Title V Equipment Table **(Attachment D)**
☐ na	ATTACHMENT F - Schedule of Compliance Form **(Attachment F - Not Applicable)** for all requirements for which each emission unit is not in compliance
☒	ATTACHMENT G - Air Pollution Control Device Form **(Attachment G)** completed for each control device listed in the Title V Equipment Table **(Attachment D)**
☐ na	ATTACHMENT H - Compliance Assurance Monitoring (CAM) Form **(Attachment H - Not Applicable)** completed for each control device for which the "Is the device subject to CAM?" question is answered "Yes" on the Air Pollution Control Device Form **(Attachment G)**
☒	General Application Forms signed by a Responsible Official **(General Forms Section 6)**
☐ na	Confidential Information submitted in accordance with 45CSR31 **(General Forms Section 1 - Not Applicable)**

Application for
45CSR30 Title V Permit Renewal
(R30-051-00157-2016 / MM03, MM04, MM05)
(w/o Modification)

For the:

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Marshall County, West Virginia

Submitted to:

West Virginia
Division of Air Quality
Department of Environmental Protection
(Via email to DEPAirQualityPermitting@WV.gov)

Submitted by:

Williams Ohio Valley Midstream LLC
100 Teletech Drive, Suite 2
Moundsville, WV 26041

Prepared by:

EcoLogic Environmental Consultants, LLC
864 Windsor Court
Santa Barbara, CA 93111

October 2020

Application for
45CSR30 Title V Permit Renewal
(R30-051-00157-2016 / MM03, MM04, MM05)
(w/o Modification)

Williams Ohio Valley Midstream LLC
Oak Grove Gas Plant
Marshall County, West Virginia

Table of Contents

Title V Permit Application

General Forms

- **Section 1: General Information**
- **Section 2: Applicable Requirements**
- **Section 3: Facility-Wide Emissions**
- **Section 4: Insignificant Activities**
- **Section 5: Emission Units, Control Devices, and Emission Points**
- **Section 6: Certification of Information**

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street SE
Charleston, WV 25304
Phone: (304) 926-0475
www.dep.wv.gov/daq

INITIAL/RENEWAL TITLE V PERMIT APPLICATION - GENERAL FORMS

Section 1: General Information

1. Name of Applicant (As registered with the WV Secretary of State's Office):

Williams Ohio Valley Midstream LLC

2. Facility Name or Location:

Oak Grove Gas Plant (OGGP)
(and Co-Located Francis Compressor Station (FCS))

3. DAQ Plant ID No.:

0 5 1 - 0 0 1 5 7

4. Federal Employer ID No. (FEIN):

2 7 - 0 8 5 6 7 0 7

5. Permit Application Type:

☐ Initial Permit — When did operations commence? May 29, 2014
☑ Permit Renewal — What is the expiration date of the existing permit? April 26, 2021
☐ Update to Initial/Renewal Permit Application

6. Type of Business Entity:

☐ Corporation ☐ Government Agency ☑ LLC
☐ Partnership ☐ Limited Partnership

7. Is the Applicant the:

☐ Owner ☐ Operator ☑ Both

If the Applicant is not both the owner and operator, please provide the name and address of the other party.

na

8. Number of On-site Employees:

~36

9. Governmental Code:

☑ Privately owned and operated; 0
☐ Federally owned and operated; 1
☐ State government owned and operated; 2
☐ County government owned and operated; 3
☐ Municipality government owned and operated; 4
☐ District government owned and operated; 5

10. Business Confidentiality Claims

Does this application include confidential information (per 45CSR31)? ☐ Yes ☑ No

If yes, identify each segment of information on each page that is submitted as confidential, and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's "*PRECAUTIONARY NOTICE-CLAIMS OF CONFIDENTIALITY*" guidance.

11. Mailing Address

Street or P.O. Box:
Williams Ohio Valley Midstream LLC
100 Teletech Drive, Suite 2

City:	State:	Zip:
Moundsville	WV	26041
Telephone Number: (304) 843-3100	**Fax Number:** (304) 843-3131	

12. Facility Location

Street:	City:	County:
5258 Fork Ridge Rd ~3.7 Miles SE of Moundsville	Moundsville	Marshall
UTM Easting: 526.01 km	**UTM Northing:** 4,414.01 km	**Zone:** ☑ 17 ☐ 18

Directions:
From Lafayette Ave in Moundsville:
a. Head East onto 12th St ~1.1 Miles;
b. Turn Left onto Fork Ridge Rd ~5.4 Miles;
c. Entrance to the Site is on the Left.

Portable Source?	☐ Yes	☑ No	
Is facility located w/in a nonattainment area? (https://www.epa.gov/green-book: Marshall Co - Clay District)	☑ Yes	☐ No	**If yes, for what air pollutants?** Sulfur Dioxide (SO2)
Is facility located w/in 50 miles of another state?	☑ Yes	☐ No	**If yes, name the affected state(s).** Ohio and Pennsylvania
Is facility located w/in 100 km of a Class I Area[1]?	☐ Yes	☑ No	**If yes, name the area(s).**
If no, do emissions impact a Class I Area[1]?	☐ Yes	☑ No	na

[1] *Class I areas include Dolly Sods and Otter Creek Wilderness Areas in West Virginia, and Shenandoah National Park James River Face Wilderness Area in Virginia.*

15. Contact Information

Responsible Official: Paul V. Hunter		**Title:** Vice President
Street or P.O. Box: Williams Ohio Valley Midstream LLC Park Place Corporate Center 2 2000 Commerce Dr, Ste 100		
City: Pittsburgh	**State:** PA	**Zip:** 15275-1025
Telephone Number: (412) 787-4197	**Fax Number:** (412) 787-5158	
E-mail address: PaulV.Hunter@Williams.com		
Environmental Contact: Steven Sobutka		**Title:** Environmental Specialist
Street or P.O. Box: Williams Ohio Valley Midstream LLC 100 Teletech Drive, Suite 2		
City: Moundsville	**State:** WV	**Zip:** 26041
Telephone Number: (304) 843-3191	**Fax Number:** (412) 787-5158	
E-mail address: Steven.Sobutka@Williams.Com		
Application Preparer: Walter Konkel, III		**Title:** Principal Scientist
Company: EcoLogic Environmental Consultants, LLC		
Street or P.O. Box: 864 Windsor Court		
City: Santa Barbara	**State:** CA	**Zip:** 93111
Telephone Number: (805) 964-7597	**Fax Number:** na	
E-mail address: wkonkel@elogicllc.com		

14. Facility Description

List all processes, products, NAICS and SIC codes for normal operation, in order of priority. Also list any process, products, NAICS and SIC codes associated with any alternative operating scenarios if different from those listed for normal operation.

Process	Products	NAICS	SIC
Natural Gas Processing	Natural Gas, Ethane, Natural Gas Liquids (NGL)	211112	1311

Provide a general description of operations.

Please reference **SUPPLEMENT 01** – Process Description

The Ohio Valley Midstream LLC Oak Grove Gas Plant (OGGP) has the capacity to process 600 MMscfd of raw natural gas through three (3) cryogenic turboexpander plants (TXP), and other equipment, to produce three (3) product streams:

1) Dry, "clean", methane gas (CH4) (aka, residue gas),
2) Dry, "clean", ethane liquid (C2H6); and
3) Dry natural gas liquids (NGL (C3+)).

Natural gas from the surrounding area wells enters the OGGP via pipeline through an inlet separator which removes any free liquids entrained in the gas. The gas is then compressed (electric driven compressors) and routed through a mole sielve to remove any remaining free liquids from the gas stream.

The gas is then cooled in a cryogeneic process to separate ethane and natural gas liquids (NGL-propane, butane, and heavier hydrocarbons) from the methane (aka, residue gas). The residue gas is compressed (electric driven compressors) and shipped off-site via pipeline.

The ethane is then separated from the NGL in a de-ethanizer and the NGL is shipped off-site (electric driven pumps) via pipeline. The ethane is further processed in an amine unit to remove carbon dioxide (CO2) and then shipped off-site (electric driven pumps) via pipeline.

15. Provide an **Area Map** showing plant location as **ATTACHMENT A**.

16. Provide a **Plot Plan(s)**, e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is located as **ATTACHMENT B**.
For instructions, refer to "Plot Plan - Guidelines."

17. Provide a detailed **Process Flow Diagram(s)** showing each process or emissions unit as **ATTACHMENT C**.
Process Flow Diagrams should show all emission units, control equipment, emission points, and their relationships.

Section 2: Applicable Requirements

18. Applicable Requirements Summary			
Instructions: Mark all applicable requirements.			
☐	SIP	☐	FIP
☑	**Minor Source NSR (45CSR13)**	☐	PSD (45CSR14)
☐	NESHAP (45CSR34)	☐	Nonattainment NSR (45CSR19)
☑	**Section 111 NSPS (Dc, KKK, JJJJ, and OOOO)**	☐	Section 112(d) MACT Standards
☐	Section 112(g) Case-by-case MACT	☑	**112(r) RMP**
☐	Section 112(i) Early Reduction of HAP	☐	Consumer/Commercial Prod. Reqts., Sect 183(e)
☐	Section 129 Standards/Reqts.	☐	Stratospheric Ozone (Title VI)
☐	Tank vessel Reqt., Section 183(f)	☐	Emissions Cap 45CSR§30-2.6.2
☐	NAAQS, Increments or Visibility (temp. sources)	☐	45CSR27 State Enforceable Only Rule (CPU)
☑	**45CSR4 State Enforceable Only Rule (Odors)**	☐	Acid Rain (Title IV, 45CSR33)
☐	Emissions Trading and Banking (45CSR28)	☐	Compliance Assurance Monitoring (40CFR64)
☐	CAIR NOx Annual Trading Program (45CSR39)	☐	CAIR NOx Ozone Trading Program (45CSR40)
☐	CAIR SO2 Trading Program (45CSR41)		

19. Non Applicability Determinations

List all requirements which the source has determined not applicable and for which a permit shield is requested. The listing shall also include the rule citation and the reason why the shield applies.

Please reference **SUPPLEMENT 02** – Regulatory Discussion

NEW SOURCE PERFORMANCE STANDARDS (NSPS)

NSPS D - No boiler greater than 250 MMBtu/hr (40CFR60.40(a)(1))
NSPS Da - No boiler greater than 250 MMBtu/hr (40CFR60.40a(a)(1))
NSPS Db - No boiler greater than 100 MMBtu/hr (40CFR60.40b(a))
NSPS K - No tank greater than 40,000 gallons (40CFR 60.110(a))
NSPS Ka - No tank greater than 151.416 m3 (40,000 gal) (40CFR60.110a(a))
NSPS Kb - No tank greater than 75 m3 (19,815 gal) (40CFR60.110b(a))
NSPS GG - No stationary gas turbine (40CFR60.330(a))
NSPS KKK - Plant construction commenced after 08/23/11 (40CFR60.630(a))
NSPS LLL - No sweetening units on site (40CFR60.640(a))
NSPS IIII - No stationary compression ignition engine (§60.4200(a))
NSPS KKKK - No stationary combustion turbine (§60.4300(a))

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

NESHAP HH - Not a major source of HAP and no TEG dehydration unit (§63.760(b)(2)
NESHAP HHH - No natural gas transmission or storage prior to local distribution (§63.1270(a))
NESHAP YYYY - No stationary gas turbine (§63.6080(a))
NESHAP DDDDD - Not a major source of HAP (§63.7485(a))
NESHAP JJJJJJ - No boiler as defined (§63.11195(e))

COMPLIANCE ASSURANCE MONITORING (CAM)

CAM - This rule does not apply because there no pollutant specific emission units subject to an emissions limitation or standard that require a control device be used to achieve compliance (§64.2a))

WEST VIRGINIA AIR QUALITY REGULATIONS

45CSR14 - Not a PSD major sources or PSD major modification
45CSR19 - Not located in a non-attainment area for NOx, CO, or VOC
45CSR21 - Control of VOCs - Not located in Putnam, Kanawha, Cabell, Wayne, or Wood County
45CSR27 - Exempt because equipment is used in the production and distribution of petroleum products
45CSR28 - Voluntary Emission Trading Program - Applicant chooses not to participate
45CSR29 - Not in Putnam, Kanawha, Cabell, Wayne, or Wood County
45CSR34 - Not a major source of HAP or otherwise subject to NESHAP requirements

☑ **Permit Shield**

20. Facility-Wide Applicable Requirements

List all facility-wide applicable requirements. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements) .

The Oak Grove Title V Permit R30-05100157 (MM03, MM04, MM05) requirements are based on the Oak Grove New Source Review Permit R13-3070C and the co-located Francis Compressor Station Permit R13-3289B.

No Changes are Proposed to the Current Oak Grove Title V Permit R30-05100157 (MM03, MM04, MM05).

☑ **Permit Shield**

For all facility-wide applicable requirements listed above, provide monitoring/testing/recordkeeping/ reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number and/or citation. (Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

The Oak Grove Title V Permit R30-05100157 (MM03, MM04, MM05) requirements are based on the Oak Grove New Source Review Permit R13-3070C and the co-located Francis Compressor Station Permit R13-3289B.

No Changes are Proposed to the Current Oak Grove Title V Permit R30-05100157 (MM03, MM04, MM05).

Are you in compliance with all facility-wide applicable requirements? ☑ Yes ☐ No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**. **(Not Applicable)**

20. Facility-Wide Applicable Requirements (*Continued*) - *Attach additional pages as necessary.*

List all facility-wide applicable requirements. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.

☑ **Permit Shield**

For all facility-wide applicable requirements listed above, provide monitoring/testing/recordkeeping/ reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number and/or citation. (Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

Are you in compliance with all facility-wide applicable requirements? ☑ Yes ☐ No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**. **(Not Applicable)**

21. Active Permits/Consent Orders

Permit or Consent Order Number	Date of Issuance MM/DD/YYYY	List any Permit Determinations that Affect the Permit (if any)
R13-3070C (OGGP)	10/17/2019	na
R13-3289B (FCS)	10/12/2017	na

22. Inactive Permits/Obsolete Permit Conditions

Permit Number	Date of Issuance	Permit Condition Number
na		

Section 3: Facility-Wide Emissions

23. Facility-Wide Emissions Summary [Tons per Year]			
Criteria Pollutants	**Potential Emissions (Including Fugitives)**		
	R13-3070C (OGGP)	**R13-3289B (FCS)**	**Total Plant**
Carbon Monoxide (CO)	192.66	3.89	196.55
Nitrogen Oxides (NOX)	121.26	6.66	127.93
Lead (Pb)	---	---	---
Particulate Matter (PM2.5)[1]	10.68	0.49	11.18
Particulate Matter (PM10)[1]	10.68	0.49	11.18
Total Particulate Matter (TSP)	10.68	0.49	11.18
Sulfur Dioxide (SO2)	0.76	0.03	0.79
Volatile Organic Compounds (VOC)	102.29	29.74	132.03
Hazardous Air Pollutants[2]	**Potential Emissions (Including Fugitives)**		
	R13-3070C (OGGP)	**R13-3289B (FCS)**	**Total Plant**
Benzene	1.78	0.05	1.82
Ethylbenzene	1.96	0.04	2.00
Formaldehyde (HCHO)	0.12	1.65	1.77
n-Hexane	3.98	0.33	4.31
Toluene	1.87	0.05	1.92
2,2,4-Trimethylpentane (TMP)	2.01	0.05	2.05
Xylenes	1.96	0.04	2.00
Other HAP (Acrolein, MeOH, etc.)	0.01	0.25	0.26
Total HAP	13.68	2.45	16.13
Regulated Pollutants other than Criteria and HAP	**Potential Emissions (Including Fugitives)**		
	R13-3070C (OGGP)	**R13-3289B (FCS)**	**Total Plant**
Carbon Dioxide (CO_2)	203,348	6,761	210,109
Nitrous Oxide (N_2O)	0.90	0.01	0.91
Methane (CH_4)	174.69	81.13	255.82
CO_2 equivalent (CO_2e)	207,984	8,792	216,776

[1] *PM2.5 and PM10 are components of TSP.*

[2] *For HAPs that are also considered PM or VOCs, emissions should be included in both the HAPs section and the Criteria Pollutants section.*

Please reference **SUPPLEMENT 03** – Emission Calculations

Section 4: Insignificant Activities

24. Insignificant Activities (Check all that apply)		
☑	1	Air compressors and pneumatically operated equipment, including hand tools.
☑	2	Air contaminant detectors or recorders, combustion controllers or shutoffs.
☑	3	Any consumer product used in the same manner as in normal consumer use, provided the use results in a duration and frequency of exposure which are not greater than those experienced by consumer, and which may include, but not be limited to, personal use items; janitorial cleaning supplies, office supplies and supplies to maintain copying equipment.
☑	4	Bathroom/toilet vent emissions.
☑	5	Batteries and battery charging stations, except at battery manufacturing plants.
☑	6	Bench-scale laboratory equipment used for physical or chemical analysis, but not lab fume hoods or vents. Many lab fume hoods or vents might qualify for treatment as insignificant (depending on the applicable SIP) or be grouped together for purposes of description.
☐	7	Blacksmith forges.
☐	8	Boiler water treatment operations, not including cooling towers.
☑	9	Brazing, soldering or welding equipment used as an auxiliary to the principal equipment at the source.
☐	10	CO2 lasers, used only on metals and other materials which do not emit HAP in the process.
☑	11	Combustion emissions from propulsion of mobile sources, except for vessel emissions from Outer Continental Shelf sources.
☑	12	Combustion units designed and used exclusively for comfort heating that use liquid petroleum gas or natural gas as fuel.
☑	13	Comfort air conditioning or ventilation systems not used to remove air contaminants generated by or released from specific units of equipment.
☐	14	Demineralized water tanks and demineralizer vents.
☐	15	Drop hammers or hydraulic presses for forging or metalworking.
☐	16	Electric or steam-heated drying ovens and autoclaves, but not the emissions from the articles or substances being processed in the ovens or autoclaves or the boilers delivering the steam.
☐	17	Emergency (backup) electrical generators at residential locations.
☐	18	Emergency road flares.
☑	19	Emission units which do not have any applicable requirements and which emit criteria pollutants (CO, NOx, SO2, VOC and PM) into the atmosphere at a rate of less than 1 pound per hour and less than 10,000 pounds per year aggregate total for each criteria pollutant from all emission units. Please specify all emission units for which this exemption applies along with the quantity of criteria pollutants emitted on an hourly and annual basis: Please reference **SUPPLEMENT 04** - Insignificant Emission Units - Misc Stoage Tanks

24. Insignificant Activities (Check all that apply) (Continued)

☑	20	Emission units which do not have any applicable requirements and which emit hazardous air pollutants into the atmosphere at a rate of less than 0.1 pounds per hour and less than 1,000 pounds per year aggregate total for all HAPs from all emission sources. This limitation cannot be used for any source which emits dioxin/furans nor for toxic air pollutants as per 45CSR27. Please specify all emission units for which this exemption applies along with the quantity of hazardous air pollutants emitted on an hourly and annual basis: Please reference **SUPPLEMENT 04** - Insignificant Emission Units - Misc Storage Tanks
☐	21	Environmental chambers not using hazardous air pollutant (HAP) gases.
☑	22	Equipment on the premises of industrial and manufacturing operations used solely for the purpose of preparing food for human consumption.
☐	23	Equipment used exclusively to slaughter animals, but not including other equipment at slaughterhouses, such as rendering cookers, boilers, heating plants, incinerators, and electrical power generating equipment.
☑	24	Equipment used for quality control/assurance or inspection purposes, including sampling equipment used to withdraw materials for analysis.
☑	25	Equipment used for surface coating, painting, dipping or spray operations, except those that will emit VOC or HAP.
☑	26	Fire suppression systems.
☑	27	Firefighting equipment and the equipment used to train firefighters.
☐	28	Flares used solely to indicate danger to the public.
☑	29	Fugitive emission related to movement of passenger vehicle provided the emissions are not counted for applicability purposes and any required fugitive dust control plan or its equivalent is submitted.
☐	30	Hand-held applicator equipment for hot melt adhesives with no VOC in the adhesive formulation.
☑	31	Hand-held equipment for buffing, polishing, cutting, drilling, sawing, grinding, turning or machining wood, metal or plastic.
☐	32	Humidity chambers.
☑	33	Hydraulic and hydrostatic testing equipment.
☑	34	Indoor or outdoor kerosene heaters.
☑	35	Internal combustion engines used for landscaping purposes.
☐	36	Laser trimmers using dust collection to prevent fugitive emissions.
☐	37	Laundry activities, except for dry-cleaning and steam boilers.
☑	38	Natural gas pressure regulator vents, excluding venting at oil and gas production facilities.
☐	39	Oxygen scavenging (de-aeration) of water.
☐	40	Ozone generators.

24. Insignificant Activities (Check all that apply) (Continued)

☑	41	Plant maintenance and upkeep activities (e.g., grounds-keeping, general repairs, cleaning, painting, welding, plumbing, re-tarring roofs, installing insulation, and paving parking lots) provided these activities are not conducted as part of a manufacturing process, are not related to the source's primary business activity, and not otherwise triggering a permit modification. (Cleaning and painting activities qualify if they are not subject to VOC or HAP control requirements. Asphalt batch plant owners/operators must still get a permit if otherwise requested.)
☑	42	Portable electrical generators that can be moved by hand from one location to another. "Moved by Hand" means that it can be moved without the assistance of any motorized or non-motorized vehicle, conveyance, or device.
☐	43	Process water filtration systems and demineralizers.
☑	44	Repair or maintenance shop activities not related to the source's primary business activity, not including emissions from surface coating or de-greasing (solvent metal cleaning) activities, and not otherwise triggering a permit modification.
☑	45	Repairs or maintenance where no structural repairs are made and where no new air pollutant emitting facilities are installed or modified.
☑	46	Routing calibration and maintenance of laboratory equipment or other analytical instruments.
☐	47	Salt baths using nonvolatile salts that do not result in emissions of any regulated air pollutants. Shock chambers.
☐	48	Shock chambers.
☐	49	Solar simulators.
☑	50	Space heaters operating by direct heat transfer.
☑	51	Steam cleaning operations.
☐	52	Steam leaks.
☐	53	Steam sterilizers.
☐	54	Steam vents and safety relief valves.
☐	55	Storage tanks, reservoirs, and pumping and handling equipment of any size containing soaps, vegetable oil, grease, animal fat, and nonvolatile aqueous salt solutions, provided appropriate lids and covers are utilized.
☑	56	Storage tanks, vessels, and containers holding or storing liquid substances that will not emit any VOC or HAP. Exemptions for storage tanks containing petroleum liquids or other volatile organic liquids should be based on size limits such as storage tank capacity and vapor pressure of liquids stored and are not appropriate for this list.
☐	57	Such other sources or activities as the Director may determine.
☑	58	Tobacco smoking rooms and areas.
☑	59	Vents from continuous emissions monitors and other analyzers.

25. Equipment Table

Fill out the **Title V Equipment Table** and provide it as **ATTACHMENT D**.

26. Emission Units

For each emission unit listed in the Title V Equipment Table, fill out and provide an Emission Unit Form as ATTACHMENT E.

For each emission unit not in compliance with an applicable requirement, fill out a **Schedule of Compliance Form** as **ATTACHMENT F**. **(Not Applicable)**

27. Control Devices

For each control device listed in the **Title V Equipment Table**, fill out and provide an **Air Pollution Control Device Form** as **ATTACHMENT G**.

For any control device that is required on an emission unit in order to meet a standard or limitation for which the potential pre-control device emissions of an applicable regulated air pollutant is greater than or equal to the Title V Major Source Threshold Level, refer to the **Compliance Assurance Monitoring (CAM) Form(s)** for CAM applicability. Fill out and provide these forms, if applicable, for each Pollutant Specific Emission Unit (PSEU) as **ATTACHMENT H**. **(Not Applicable)**

Section 6: Certification of Information

28. Certification of Truth, Accuracy and Completeness and Certification of Compliance

*Note: This Certification must be signed by a responsible official. The **original**, signed in **blue ink**, must be submitted with the application. Applications without an **original** signed certification will be considered as incomplete.*

a. Certification of Truth, Accuracy and Completeness

I certify that I am a responsible official (as defined at 45CSR§30-2.38) and am accordingly authorized to make this submission on behalf of the owners or operators of the source described in this document and its attachments. I certify under penalty of law that I have personally examined and am familiar with the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine and/or imprisonment.

b. Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

Responsible official (type or print)	
Paul V. Hunter	**Title:** Vice President

Responsible official's signature:

Signature: DocuSigned by: Paul Hunter 55BF66F59E67473... Signature Date: 10/22/2020 | 6:31 AM PDT

(Must be signed and dated in blue ink)

Note: Please check all applicable attachments included with this permit application:	
☑	ATTACHMENT A: Area Map
☑	ATTACHMENT B: Plot Plan(s)
☑	ATTACHMENT C: Process Flow Diagram(s)
☑	ATTACHMENT D: Equipment Table
☑	ATTACHMENT E: Emission Unit Form(s)
☐	ATTACHMENT F: Schedule of Compliance Form(s) **(Not Applicable)**
☑	ATTACHMENT G: Air Pollution Control Device Form(s)
☐	ATTACHMENT H: Compliance Assurance Monitoring (CAM) Form(s) **(Not Applicable)**

All of the required forms and additional information can be found and downloaded from, the DEP website at www.dep.wv.gov/daq, requested by phone (304) 926-0475, and/or obtained through the mail.

Attachment A

Area (Topographic) Map

Provide an Area Map showing plant location as Attachment A.

- **Address:**
  5258 Fork Ridge Rd
  ~3.7 Miles Southeast of Moundsville
  North side of Fork Ridge Rd
  Moundsville, Marshall County, WV 26041

- **Latitude and Longitude:**
  39°52'37.0" North x -80°41'56.5" West
  (39.8769° North x -80.6990° West)

- **UTM Coordinates:**
  525.74 km Easting x 4,414.314 km Northing x Zone: 17S

- **USGS:**
  7.5 Minute Topographic – Moundsville WV-OH – 2019
  7.5 Minute Topographic – Glen Easton WV – 2019

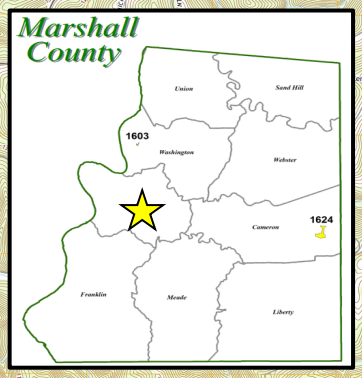
- **Elevation:**
  ~1,200’

- **Directions:**
  From Lafayette Ave/WV-2 in Moundsville:
  a. Head east onto 12th St ~1.1 Mile;
  b. Continue onto Fork Ridge Rd ~5.4 Mile;
  c. Entrance to site is on the left.

- A1 – USGS Topo – Moundsville, WV Quadrangle – 2019
- A2 – USGS Topo – Glen Easton, WV Quadrangle – 2019

---

science for a changing world
U.S. GEOLOGICAL SURVEY
The National Map US Topo
MOUNDSVILLE QUADRANGLE
WEST VIRGINIA - OHIO
7.5-MINUTE SERIES



Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

5258 Fork Ridge Rd
~3.7 Miles Southeast of Moundsville
~0.4 Miles North of Fork Ridge Rd
Moundsville, Marshall County, WV 26041
39°52'34.5" N x -80°41'49.0" W
39.8763° N x -80.6969° W
525.9 km E x 4,414.1 km N x 17S
Elevation ~1,200'
USGS Moundsville, WV,OH Quadrangle - 2019
USGS Glen Easton, WV Quadrangle - 2019

From Lafayette Ave in **Moundsville**:
a. Head East onto 12th St ~1.1 Mi;
b. Turn Left onto Fork Ridge Rd ~5.4 Mi;
c. Entrance to site is on the Left.

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17S
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.
Imagery.....NAIP, August 2015 - October 2015
Roads.....U.S. Census Bureau, 2016
Names.....GNIS, 1979 - 2019
Hydrography.....National Hydrography Dataset, 2002
Contours.....National Elevation Dataset, 2004 - 2010
Boundaries.....Multiple sources; see metadata file 2017 - 2018
Public Land Survey System.....BLM, 2017
Wetlands.....FWS National Wetlands Inventory 1982 - 2014

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000
CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

ADJOINING QUADRANGLES
1 Lansing
2 Wheeling
3 Valley Grove
4 Businessburg
5 Majorsville
6 Powhatan Point
7 Glen Easton
8 Cameron

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

MOUNDSVILLE, WV, OH
2019

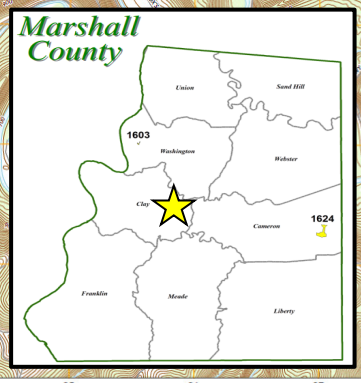
USGS science for a changing world
U.S. GEOLOGICAL SURVEY
The National Map US Topo
GLEN EASTON QUADRANGLE
WEST VIRGINIA - MARSHALL COUNTY
7.5-MINUTE SERIES

From Lafayette Ave in **Moundsville**:
a. Head East onto 12th St ~1.1 Mi;
b. Turn Left onto Fork Ridge Rd ~5.4 Mi;
c. Entrance to site is on the Left.

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

5258 Fork Ridge Rd
~3.7 Miles Southeast of Moundsville
~0.4 Miles North of Fork Ridge Rd
Moundsville, Marshall County, WV 26041
39°52'34.5" N x -80°41'49.0" W
39.8763° N x -80.6969° W
525.9 km E x 4,414.1 km N x 17S
Elevation ~1,200'
USGS Moundsville, WV, OH Quadrangle - 2019
USGS Glen Easton, WV Quadrangle - 2019



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83).
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 17S
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.
Imagery.....NAIP, Not Available
Roads.....U.S. Census Bureau, 2016
Names.....GNIS, 1980 - 2019
Hydrography.....National Hydrography Dataset, 2002 - 2019
Contours.....National Elevation Dataset, 2004 - 2006
Boundaries.....Multiple sources; see metadata file 2017 - 2018
Wetlands.....FWS National Wetlands Inventory 1982

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000
1 0 1 2 KILOMETERS
1000 500 0 METERS 1000 2000
0.5 0 0.5 1 MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION
ADJOINING QUADRANGLES
1 Businessburg
2 Moundsville
3 Majorsville
4 Powhatan Point
5 Cameron
6 New Martinsville
7 Wileyville
8 Littleton

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

GLEN EASTON, WV
2019

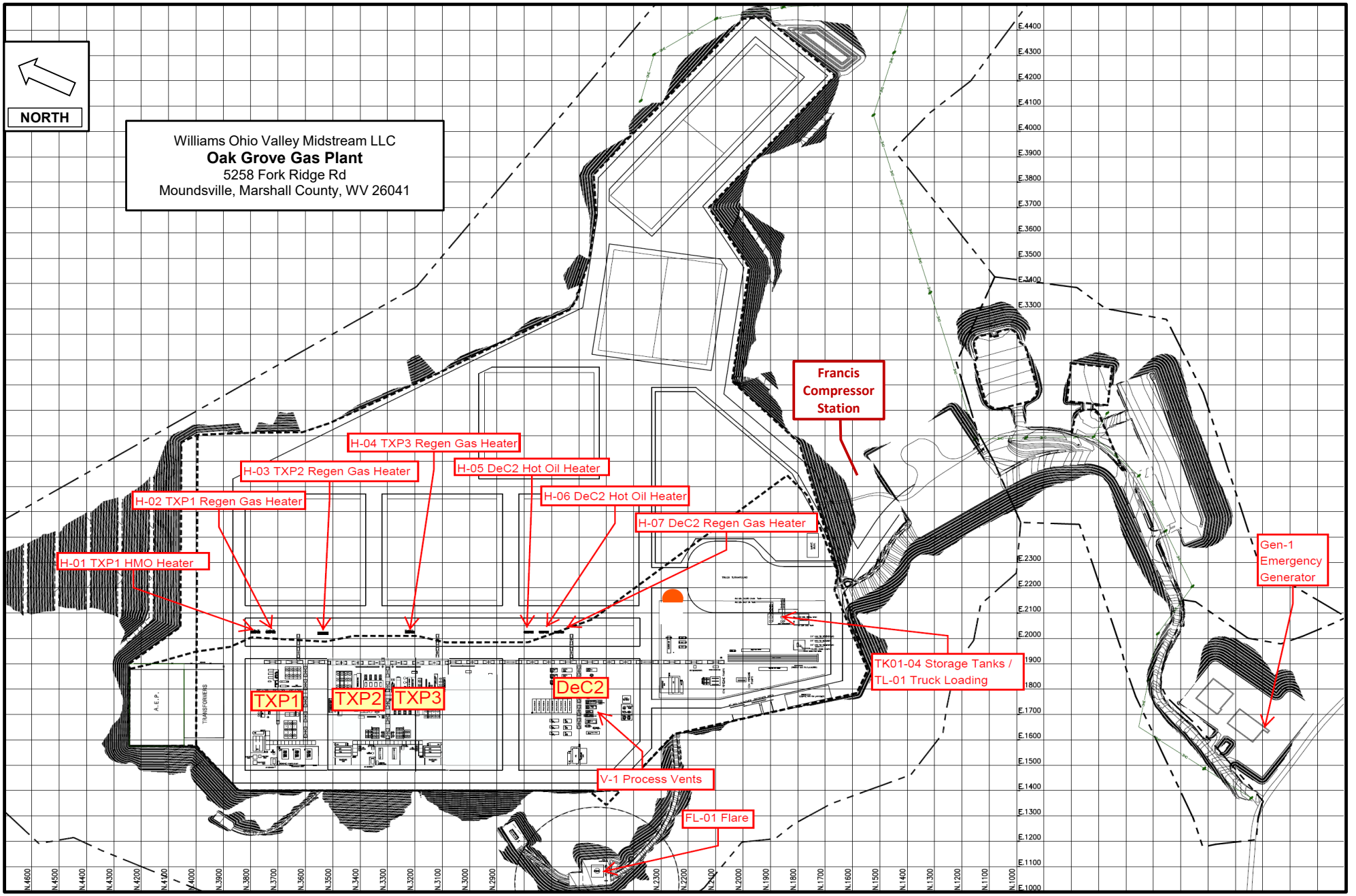
Attachment B
Plot Plan(s)

Provide a Plot Plan(s), e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is located as Attachment B.

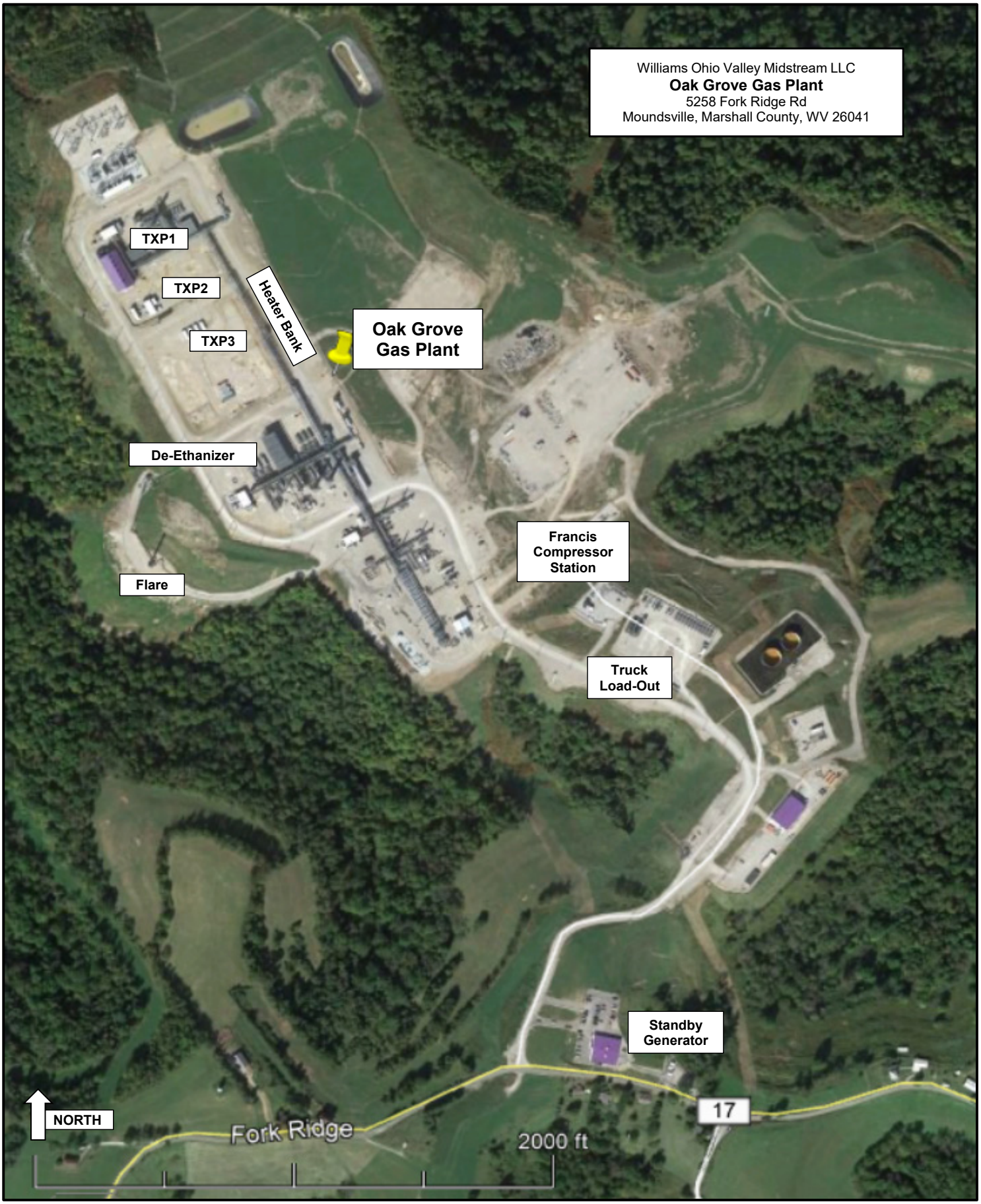
- B1 – Plot Plan – Oak Grove Gas Plant
- B2 – Aerial View – Oak Grove Gas Plant

Williams Ohio Valley Midstream LLC
Oak Grove Gas Plant
Application for Title V Permit Renewal
Attachment Ba

Plot Plan



Aerial View


Williams Ohio Valley Midstream LLC
Oak Grove Gas Plant
5258 Fork Ridge Rd
Moundsville, Marshall County, WV 26041
TXP1
TXP2
TXP3
Heater Bank
Oak Grove Gas Plant
De-Ethanizer
Flare
Francis Compressor Station
Truck Load-Out
Standby Generator
NORTH
Fork Ridge
2000 ft
17

Attachment C

Process Flow Diagram(s) (PFD)

Provide a detailed Process Flow Diagram(s) showing each process or emissions unit as Attachment C. Process Flow Diagrams should show all emission units, control equipment, emission points, and their relationships.

- C1 – Process Flow Diagram – Oak Grove Gas Plant
- C2 – Process Flow Diagram – Francis Compressor Station

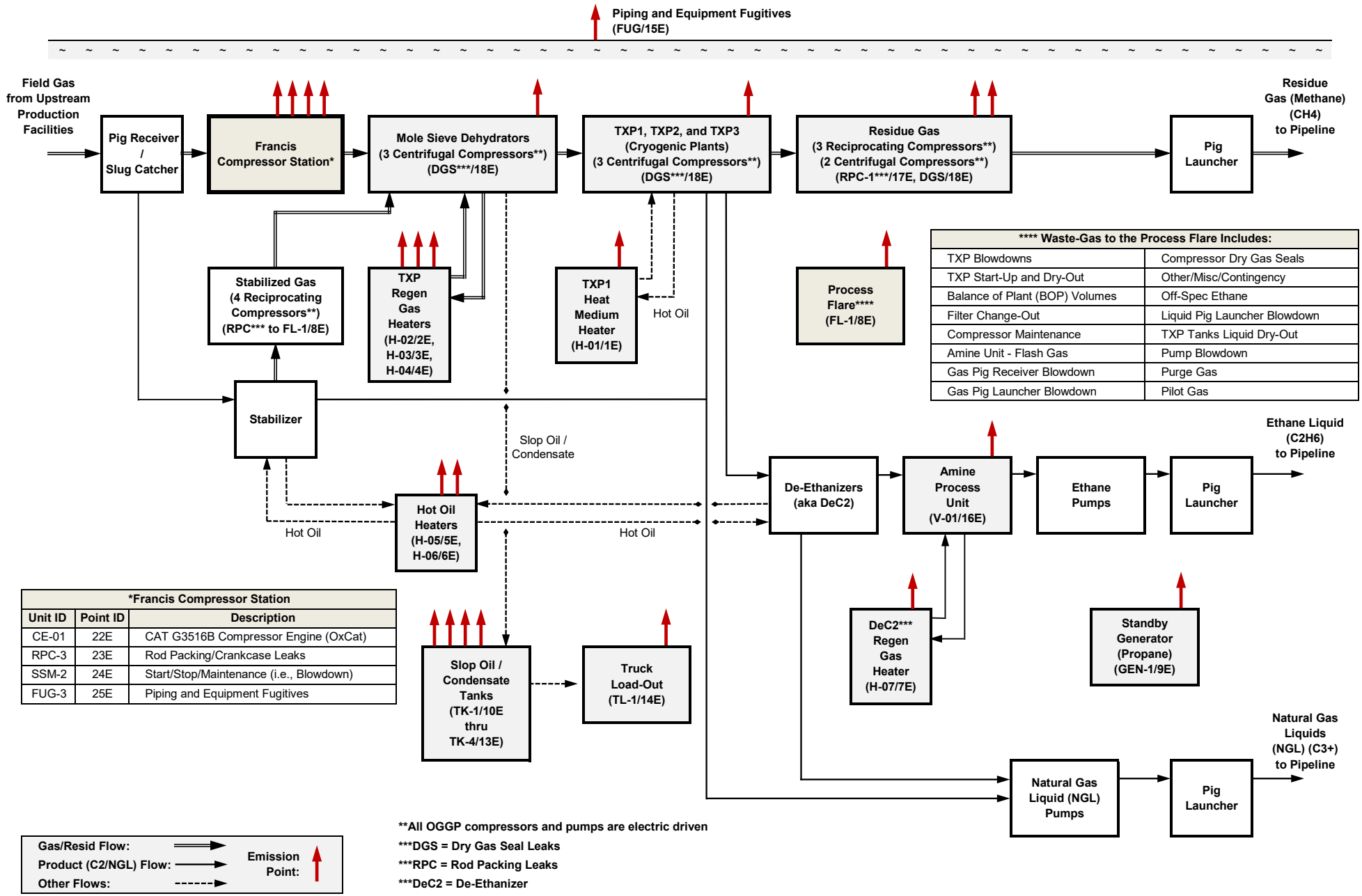
Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for Title V Permit Renewal

Attachment Ca

Process Flow Diagram (PFD)



**** Waste-Gas to the Process Flare Includes:	
TXP Blowdowns	Compressor Dry Gas Seals
TXP Start-Up and Dry-Out	Other/Misc/Contingency
Balance of Plant (BOP) Volumes	Off-Spec Ethane
Filter Change-Out	Liquid Pig Launcher Blowdown
Compressor Maintenance	TXP Tanks Liquid Dry-Out
Amine Unit - Flash Gas	Pump Blowdown
Gas Pig Receiver Blowdown	Purge Gas
Gas Pig Launcher Blowdown	Pilot Gas

*Francis Compressor Station		
Unit ID	**Point ID**	**Description**
CE-01	22E	CAT G3516B Compressor Engine (OxCat)
RPC-3	23E	Rod Packing/Crankcase Leaks
SSM-2	24E	Start/Stop/Maintenance (i.e., Blowdown)
FUG-3	25E	Piping and Equipment Fugitives

**All OGGP compressors and pumps are electric driven

***DGS = Dry Gas Seal Leaks

***RPC = Rod Packing Leaks

***DeC2 = De-Ethanizer

Oak Grove Gas Plant

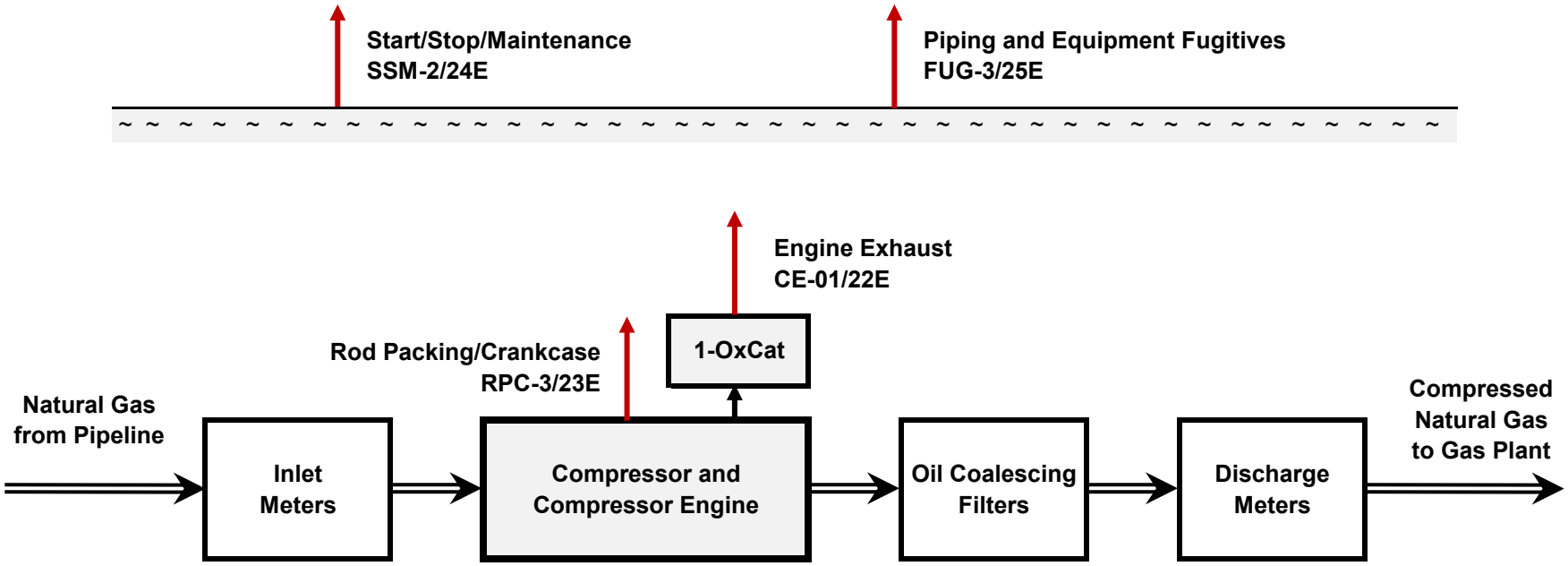
Francis Compressor Station

(Located at the Oak Grove Gas Plant)

Application for Title V Permit Renewal

Attachment Cb

Francis - Process Flow Diagram (PFD)



ID No.	Description
CE-01/22E	Compressor Engine Emissions
RPC-3/23E	Rod Packing/Crankcase Leaks
SSM-2/24E	Start/Stop/Maintenance (Blowdown)
FUG-3/25E	Piping and Equipment Fugitives

Attachment D
Title V Equipment Table

Fill out the Title V Equipment Table and provide it as Attachment D.

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Attachment D

Title V Equipment Table

(includes all emission units at the facility except those designated as insignificant activities in Section 4, Item 24 of the General Forms)

Emission Point ID[1]	Control Device[1]	Emission Unit ID[1]	Emission Unit Description	Design Capacity	Year Installed/ Modified
Oak Grove Gas Plant (OGGP)					
1E	na	H-01	TXP1 Heat Medium Heater	26.26 MMBtu/hr	2013/2016
2E	na	H-02	TXP1 Regeneration Gas Heater	9.40 MMBtu/hr	2013/2016
3E	na	H-03	TXP2 Regeneration Gas Heater	20.30 MMBtu/hr	2013/2016
4E	na	H-04	TXP3 Regeneration Gas Heater	20.30 MMBtu/hr	2013/2016
5E	na	H-05	DeC2 Hot Oil Heater	68.33 MMBtu/hr	2013/2016
6E	na	H-06	DeC2 Hot Oil Heater	68.33 MMBtu/hr	2013/2016
7E	na	H-07	DeC2 Regeneration Gas Heater	10.44 MMBtu/hr	2013/2016
8E	na	FL-1(1)	Process Flare	208,000 lb/hr	2013/2016
9E	na	GEN-1	Standby Generator	224 bhp	2016
10E	na	TK-1	Slop Oil/Condensate Tank	16,800 gal	2013/2016
11E	na	TK-2	Slop Oil/Condensate Tank	16,800 gal	2013/2016
12E	na	TK-3	Slop Oil/Condensate Tank	16,800 gal	2013/2016
13E	na	TK-4	Slop Oil/Condensate Tank	16,800 gal	2013/2016
14E	na	TL-1	Truck Load-Out - Slop Oil/Condensate	4,000,000 gal.yr	2013/2016
15E	LDAR	FUG-G	Piping and Equipment Fugitives - Gas	na	2013/2019
		FUG-L	Piping and Equipment Fugitives - Light Liquid	na	
		FUG-M	Piping and Equipment Fugitives - Mix Gas/Liq	na	
16E	FL-1	V-01	Amine Process Unit Vent	1,848,000 gal/day	2013/2019
17E	na	RPC-1	Rod Packing - Reciprocating Compressors	na	2013/2016
18E	na	DGS	Dry Gas Seals - Centrifugal Compressors	na	2013/2016
Francis Compressor Station (FCS)					
22E	OxCat(2)	CE-01	CAT G3516B Compressor Engine (OxCat)	1,380 bhp	2016/2017
23E	na	RPC-3	Rod Packing/Crankcase Leaks(3)	na	2016/2017
24E	na	SSM-2	Start/Stop/Maintenance (i.e., Blowdown)	na	2016/2017
25E	LDAR	FUG-3-G	Piping and Equipment Fugitives - Gas	na	2016/2017
		FUG-3-L	Piping and Equipment Fugitives - Light Liquid	na	
		FUG-3-M	Piping and Equipment Fugitives - Mix Gas/Liq	na	

Notes:
(1) The amine unit flash-tank off-gas is either burned in the flare or used as fuel. The amine unit regenerator overheads are emitted directly to the atmosphere.
(2) OxCat= Oxidation Catalyst
(3) Rod Packing Leaks are from two compressors, one driven by the CAT G3516B engine (CE-01) and the other driven by an electric motor.

[1]For 45CSR13 permitted sources, the numbering system used for the emission points, control devices, and emission units should be consistent with the numbering system used in the 45CSR13 permit. For grandfathered sources, the numbering system should be consistent with registrations or emissions inventory previously submitted to DAQ. For emission points, control devices, and emissions units which have not been previously labeled, use the following 45CSR13 numbering system: 1S, 2S, 3S,... or other appropriate description for emission units; 1C, 2C, 3C,... or other appropriate designation for control devices; 1E, 2E, 3E, ... or other appropriate designation for emission points.

Attachment E

Emission Unit Form(s)

For each emission unit listed in the Title V Equipment Table, fill out and provide an Emission Unit Form as Attachment E.

Oak Grove Gas Plant:

- 26.26 MMBtu/hr TXP1 Heat Medium Heater (H-01 (01E))
- 9.40 MMBtu/hr TXP1 Regeneration Gas Heater (H-02 (02E))
- 20.30 MMBtu/hr TXP2 & 3 Regeneration Gas Heater (H-03 (03E) & H-04 (04E)) (Each)
- 68.33 MMBtu/hr DeC2 Hot Oil Heaters (H-05 (05E) & H-06 (06E)) (Each)
- 10.44 MMBtu/hr DeC2 Regeneration Gas Heater (H-07 (07E))
- 4,624 MMBtu/hr Process Flare (FL-1 (08E))
- 224 bhp Standby Generator (w/ Propane-Fired Engine) (GEN-1 (09E))
- Piping and Equipment Fugitive Emissions (FUG-G, FUG-L, FUG-M (15E)) and
- Reciprocating Compressor Rod Packing Leaks (Electric Drive) (7x) (RPC (17E))
- Centrifugal Compressor Dry Gas Seal Leaks (Electric Drive) (9x) (DGS (18E))
- Amine Process Unit Vent – Acid Gas (V-01 (16E))
- 4,000,000 gal/yr Slop Oil/Condensate Truck Load-Out (TL-1 (14E))
- 400 bbl Slop Oil/Condensate Tanks (4x) (TK-1 (10E) thru TK-4 (13E))

Francis Compressor Station:

- 1,380 bhp Compressor Engine (CE-01 (22E)), Rod Packing/Crankcase (RPC-3 (23E)), Start-Stop/Compressor Blowdown (SSM-2 (24E)), and Fugitives (FUG-3 (25E))

Attachment E

Emission Unit Form

Emission Unit Description		**H-01 (1E)**
Emission unit ID number: H-01 (1E)	**Emission unit name:** TXP1 Heat Medium Heater	**List any control devices associated with this emission unit:** na

Provide a description of the emissions unit (type. Method of operation, design parameters, etc.):
Natural gas-fired heat medium heater

Manufacturer:	**Model number:**	**Serial number(s):**
Heatec	HCI-10010-40-D	HI11-342
Construction date:	**Installation date:**	**Modification date(s):**
2012	2013	na

Design Capacity (examples: furnaces - tons/hr, tanks - gallons):
26.26 MMBtu/hr

Maximum Hourly Throughput:	**Maximum Annual Throughput:**	**Maximum Operating Schedule:**
25,748 scf/hr	225.6 MMscf/yr	8,769 hr/yr

Fuel Usage Data (fill out all applicable fields)

Does this emission unit combust fuel? _X_ Yes ___No	**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 26.26 MMBtu/hr	**Type and Btu/hr rating of burners:** 26.26 MMBtu/hr

List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each.

Natural gas 25,748 scf/hr 225.6 MMscf/yr

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Natural gas	<0.01%	negligible	1,020 Btu/scf

Emission Unit Form (Continued)

Emission Data **H-01 (1E)**

Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	2.16	9.47
Nitrogen Oxides (NOX)	2.57	11.28
Lead (Pb)	---	---
Particulate Matter (PM2.5)	0.20	0.86
Particulate Matter (PM10)	0.20	0.86
Total Particulate Matter (TSP)	0.20	0.86
Sulfur Dioxide (SO2)	0.02	0.07
Volatile Organic Compounds (VOC)	0.15	0.64
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	5E-05	2E-04
Ethylbenzene	---	---
Formaldehyde (HCHO)	2E-03	0.01
n-Hexane	0.05	0.20
Toluene	9E-05	4E-04
2,2,4-Trimethylpentane (TMP)	---	---
Xylenes	---	---
Other HAP	5E-05	2E-04
Total HAP	0.05	0.21
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	3,072	13,456
Methane (CH4) (GWP=25)	0.06	0.25
Nitrous Oxide (N2O) (GWP=298)	0.01	0.03
CO2 Equivalent (CO2e)	3,075	13,470

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Criteria and HAP emission factors: AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2. and 1.4-3 (July 1998)

GHG emission factors: 40CFR98, Subpart C "General Stationary Fuel Combustion Sources", Tables C-1 and C-2 (12/11/14)

Applicable Requirements **H-01 (1E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

4.0 Heaters [emission point ID(s): 1E-7E]

4.1. Limitations and Standards

4.1.1. **Maximum Design Heat Input.** The maximum design heat input (MDHI) for Heaters (1E-7E) shall not exceed the values as given under Table 1.1: Emissions Units.
[45CSR13, R13-3070, 5.1.1.]

4.1.2. Maximum emissions from the 26.26 MMBTU/hr TXP1 Hot Oil Heater (1E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	2.57	11.28
Carbon Monoxide	2.16	9.47
Volatile Organic Compounds	0.15	0.64

[45CSR13, R13-3070, 5.1.2.]

4.1.3. The hourly quantity of natural gas that shall be consumed in the 26.26 MMBTU/hr Hot Oil Heater (1E) shall not exceed 25,748 scf/hr.
[45CSR13, R13-3070, 5.1.3.]

4.1.4. The annual quantity of natural gas that shall be consumed in the 26.26 MMBTU/hr Hot Oil Heater (1E) shall not exceed 226 MMscf/yr.
[45CSR13, R13-3070, 5.1.4.]

_X_ Permit Shield

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Attachment E

Emission Unit Form

Emission Unit Description		**H-02 (2E)**
Emission unit ID number: H-02 (2E)	**Emission unit name:** TXP1 Regen Gas Heater	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): Natural gas-fired regen gas heater		
Manufacturer: Heatec	**Model number:** HCI-5010-40-G	**Serial number(s):** HI11-278
Construction date: 2012	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): 9.40 MMBtu/hr		
Maximum Hourly Throughput: 9,216 scf/hr	**Maximum Annual Throughput:** 80.7 MMscf/yr	**Maximum Operating Schedule:** 8,760 hr/yr
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? _X_ Yes ___No		**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 9.40 MMBtu/hr		**Type and Btu/hr rating of burners:** 9.40 MMBtu/hr
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. Natural gas 9,216 scf/hr 80.7 MMscf/yr		

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Natural gas	<0.01%	negligible	1,020 Btu/scf

Emission Unit Form (Continued)

Emission Data **H-02 (2E)**

Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	0.77	3.39
Nitrogen Oxides (NOX)	0.92	4.04
Lead (Pb)	---	---
Particulate Matter (PM2.5)	0.07	0.31
Particulate Matter (PM10)	0.07	0.31
Total Particulate Matter (TSP)	0.07	0.31
Sulfur Dioxide (SO2)	0.01	0.02
Volatile Organic Compounds (VOC)	0.05	0.23
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	2E-05	8E-05
Ethylbenzene	---	---
Formaldehyde (HCHO)	7E-04	3E-03
n-Hexane	0.02	0.07
Toluene	3E-05	1E-04
2,2,4-Trimethylpentane (TMP)	---	---
Xylenes	---	---
Other HAP	2E-05	8E-05
Total HAP	0.02	0.08
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	1,100	4,816
Methane (CH4) (GWP=25)	0.02	0.09
Nitrous Oxide (N2O) (GWP=298)	2E-03	0.01
CO2 Equivalent (CO2e)	1,101	4,821

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Criteria and HAP emission factors: AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2. and 1.4-3 (July 1998)

GHG emission factors: 40CFR98, Subpart C "General Stationary Fuel Combustion Sources", Tables C-1 and C-2 (12/11/14)

Emission Unit Form (Continued)

Applicable Requirements **H-02 (2E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

4.1.5. Maximum emissions from the 9.40 MMBTU/hr TXP1 Regen Gas Heater (2E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	0.92	4.04
Carbon Monoxide	0.77	3.39
Volatile Organic Compounds	0.05	0.23

[45CSR13, R13-3070, 5.1.5.]

4.1.6. The hourly quantity of natural gas that shall be consumed in the 9.40 MMBTU/hr TXP1 Regen Gas Heater (2E) shall not exceed 9,216 scf/hr.
[45CSR13, R13-3070, 5.1.6.]

4.1.7. The annual quantity of natural gas that shall be consumed in the 9.40 MMBTU/hr TXP1 Regen Gas Heater (2E) shall not exceed 81 MMscf/yr.
[45CSR13, R13-3070, 5.1.7.]

_X_ Permit Shield

Attachment E

Emission Unit Form

Emission Unit Description		H-03 (3E) and H-04 (4E) (each)
Emission unit ID number: H-03 (3E) and H-04 (4E) (each)	**Emission unit name:** TXP2 & TXP3 Regen Gas Heaters (each)	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): Natural gas-fired regen gas heaters		
Manufacturer: Zeeco USA LLC	**Model number:** GLSF-14 Rond Flame Free-Jet Burner	**Serial number(s):** na
Construction date: 2012	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): 20.30 MMBtu/hr		
Maximum Hourly Throughput: 19,902 scf/hr (HHV)	**Maximum Annual Throughput:** 174.3 MMscf/yr	**Maximum Operating Schedule:** 8,760 hr/yr
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? _X_ Yes ___No		**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 20.30 MMBtu/hr		**Type and Btu/hr rating of burners:** 20.30 MMBtu/hr
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. Natural gas 19,902 scf/hr 174.3 MMscf/yr		

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Natural gas	<0.01%	negligible	1,020 Btu/scf

Emission Unit Form (Continued)

Emission Data	H-03 (3E) and H-04 (4E) (each)	
Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	0.81	3.56
Nitrogen Oxides (NOX)	0.73	3.20
Lead (Pb)	---	---
Particulate Matter (PM2.5)	0.26	1.16
Particulate Matter (PM10)	0.26	1.16
Total Particulate Matter (TSP)	0.26	1.16
Sulfur Dioxide (SO2)	0.01	0.05
Volatile Organic Compounds (VOC)	0.39	1.69
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	4E-05	2E-04
Ethylbenzene	---	---
Formaldehyde (HCHO)	1E-03	0.01
n-Hexane	0.04	0.16
Toluene	7E-05	3E-04
2,2,4-Trimethylpentane (TMP)	---	---
Xylenes	---	---
Other HAP	4E-05	2E-04
Total HAP	0.04	0.16
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	2,375	10,401
Methane (CH4) (GWP=25)	0.14	0.62
Nitrous Oxide (N2O) (GWP=298)	4E-03	0.02
CO2 Equivalent (CO2e)	2,380	10,422

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Vendor data: NOx, CO, VOC and CH4. See Supplement 06.

Other Criteria and HAP emission factors: AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2. and 1.4-3 (July 1998)

GHG emission factors: 40CFR98, Subpart C "General Stationary Fuel Combustion Sources", Tables C-1 and C-2 (12/11/14)

Applicable Requirements — H-03 (3E) and H-04 (4E) (each)

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

4.1.8. Maximum emissions from the 20.30 MMBTU/hr TXP2 Regen Gas Heater (3E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	0.73	3.20
Carbon Monoxide	0.81	3.56
Volatile Organic Compounds	0.39	1.69

[45CSR13, R13-3070, 5.1.9.]

4.1.9. The hourly quantity of natural gas that shall be consumed in the 20.30 MMBTU/hr TXP2 Regen Gas Heater (3E) shall not exceed 19,902 scf/hr.
[45CSR13, R13-3070, 5.1.10.]

4.1.10. The annual quantity of natural gas that shall be consumed in the 20.30 MMBTU/hr TXP2 Regen Gas Heater (3E) shall not exceed 175 MMscf/yr.
[45CSR13, R13-3070, 5.1.11.]

4.1.11. Maximum emissions from the 20.30 MMBTU/hr TXP3 Regen Gas Heater (4E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	0.73	3.20
Carbon Monoxide	0.81	3.56
Volatile Organic Compounds	0.39	1.69

[45CSR13, R13-3070, 5.1.13.]

4.1.12. The hourly quantity of natural gas that shall be consumed in the 20.30 MMBTU/hr TXP3 Regen Gas Heater (4E) shall not exceed 19,902 scf/hr.
[45CSR13, R13-3070, 5.1.14.]

4.1.13. The annual quantity of natural gas that shall be consumed in the 20.30 MMBTU/hr TXP3 Regen Gas Heater (4E) shall not exceed 175 MMscf/yr.
[45CSR13, R13-3070, 5.1.15.]

_X_ Permit Shield

Attachment E

Emission Unit Form

Emission Unit Description		**H-05 (5E) and H-06 (6E) (each)**
Emission unit ID number: H-05 (5E) and H-06 (6E) (each)	**Emission unit name:** De-Ethanizer Hot Oil Heaters (each)	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): Natural gas-fired hot oil heaters		
Manufacturer: Heatec	**Model number:** HCI-25010-50-Q	**Serial number(s):** HI13-010 / HI13-010
Construction date: 2013	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): 68.33 MMBtu/hr (HHV)		
Maximum Hourly Throughput: 66,987 scf/hr	**Maximum Annual Throughput:** 586.8 MMscf/yr	**Maximum Operating Schedule:** 8,760 hr/yr
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? _X_ Yes ___No		**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 68.33 MMBtu/hr		**Type and Btu/hr rating of burners:** 68.33 MMBtu/hr
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. Natural gas 66,987 scf/hr 586.8 MMscf/yr		

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Natural gas	<0.01%	negligible	1,020 Btu/scf

Emission Unit Form (Continued)

Emission Data		H-05 (5E) and H-06 (6E) (each)
Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	2.53	11.07
Nitrogen Oxides (NOX)	2.46	10.77
Lead (Pb)	---	---
Particulate Matter (PM2.5)	0.51	2.23
Particulate Matter (PM10)	0.51	2.23
Total Particulate Matter (TSP)	0.51	2.23
Sulfur Dioxide (SO2)	0.04	0.18
Volatile Organic Compounds (VOC)	0.38	1.67
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	1E-04	6E-04
Ethylbenzene	---	---
Formaldehyde (HCHO)	5E-03	0.02
n-Hexane	0.12	0.53
Toluene	2E-04	1E-03
2,2,4-Trimethylpentane (TMP)	---	---
Xylenes	---	---
Other HAP	1E-04	6E-04
Total HAP	0.13	0.55
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	7,993	35,008
Methane (CH4) (GWP=25)	0.15	0.66
Nitrous Oxide (N2O) (GWP=298)	0.02	0.07
CO2 Equivalent (CO2e)	8,001	35,044

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Vendor data: NOx, and CO. See Supplement 06.

Other Criteria and HAP emission factors: AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2. and 1.4-3 (July 1998)

GHG emission factors: 40CFR98, Subpart C "General Stationary Fuel Combustion Sources", Tables C-1 and C-2 (12/11/14)

Applicable Requirements **H-05 (5E) and H-06 (6E) (each)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

4.1.14. Maximum emissions from each of the 68.33 MMBTU/hr De-Ethanizer Hot Oil Heaters (5E, 6E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	2.46	10.77
Carbon Monoxide	2.53	11.07
Volatile Organic Compounds	0.38	1.67

[45CSR13, R13-3070, 5.1.17.]

4.1.15. The hourly quantity of natural gas that shall be consumed in each of the 68.33 MMBTU/hr De-Ethanizer Hot Oil Heaters (5E, 6E) shall not exceed 67,000 scf/hr.
[45CSR13, R13-3070, 5.1.18.]

4.1.16. The annual quantity of natural gas that shall be consumed in each of the 68.33 MMBTU/hr De-Ethanizer Hot Oil Heaters (5E, 6E) shall not exceed 587 MMscf/yr.
[45CSR13, R13-3070, 5.1.19.]

_X_ Permit Shield

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Attachment E

Emission Unit Form

Emission Unit Description		**H-07 (7E)**
Emission unit ID number: H-07 (7E)	**Emission unit name:** DeC2 Regen Gas Heater	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): Natural gas-fired regen gas heater		
Manufacturer: Heatec	**Model number:** HCI-6010-50	**Serial number(s):** HI13-009
Construction date: 2013	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): 10.44 MMBtu/hr		
Maximum Hourly Throughput: 10,237 scf/hr	**Maximum Annual Throughput:** 89.7 MMscf/yr	**Maximum Operating Schedule:** 8,760 hr/yr
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? _X_ Yes ___No		**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 10.44 MMBtu/hr		**Type and Btu/hr rating of burners:** 10.44 MMBtu/hr
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. Natural gas 10,237 scf/hr 89.7 MMscf/yr		

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Natural gas	<0.01%	negligible	1,020 Btu/scf

Emission Unit Form (Continued)

Emission Data **H-07 (7E)**

Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	0.86	3.77
Nitrogen Oxides (NOX)	1.02	4.48
Lead (Pb)	---	---
Particulate Matter (PM2.5)	0.08	0.34
Particulate Matter (PM10)	0.08	0.34
Total Particulate Matter (TSP)	0.08	0.34
Sulfur Dioxide (SO2)	0.01	0.03
Volatile Organic Compounds (VOC)	0.06	0.25
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	2E-05	9E-05
Ethylbenzene	---	---
Formaldehyde (HCHO)	8E-04	3E-03
n-Hexane	0.02	0.08
Toluene	3E-05	2E-04
2,2,4-Trimethylpentane (TMP)	---	---
Xylenes	---	---
Other HAP	2E-05	9E-05
Total HAP	0.02	0.08
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	1,221	5,350
Methane (CH4) (GWP=25)	0.02	0.10
Nitrous Oxide (N2O) (GWP=298)	2E-03	0.01
CO2 Equivalent (CO2e)	1,223	5,356

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Criteria and HAP emission factors: AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2. and 1.4-3 (July 1998)

GHG emission factors: 40CFR98, Subpart C "General Stationary Fuel Combustion Sources", Tables C-1 and C-2 (12/11/14)

Applicable Requirements **H-07 (7E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

4.1.17. Maximum emissions from the 10.44 MMBTU/hr De-Ethanizer Regen Gas Heater (7E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	1.02	4.48
Carbon Monoxide	0.86	3.77
Volatile Organic Compounds	0.06	0.25

[45CSR13, R13-3070, 5.1.20.]

4.1.18. The hourly quantity of natural gas that shall be consumed in the 10.44 MMBTU/hr De-Ethanizer Regen Gas Heater (7E) shall not exceed 10,237 standard cubic feet per hour.
[45CSR13, R13-3070, 5.1.21.]

4.1.19. The annual quantity of natural gas that shall be consumed in the 10.44 MMBTU/hr De-Ethanizer Regen Gas Heater (7E) shall not exceed 89.68 x 10^6 standard cubic feet per year.
[45CSR13, R13-3070, 5.1.22.]

4.1.20. No person shall cause, suffer, allow or permit emission of smoke and/or particulate matter into the open air from any fuel burning unit which is greater than ten (10) percent opacity based on a six minute block average.
[45CSR§2-3.1.; 45CSR13, R13-3070, 5.1.24.]

4.1.21. The permitted facility shall comply with all applicable provisions of 40CFR60 Subpart Dc, provided that compliance with any more stringent limitation set forth under this permit shall also be demonstrated. Recordkeeping and reporting requirements shall be conducted in accordance with §60.48c. These reports shall be submitted in accordance with the time lines and in the order set forth in §60.48c and submitted to the addresses listed in Section 3.5.3. **[45CSR13, R13-3070, 5.1.25.; 45CSR16]**

4.1.22. No person shall cause, suffer, allow or permit the discharge of particulate matter into the open air from all fuel burning units located at one plant, measured in terms of pounds per hour in excess of the amount determined as follows:

For Type 'b' fuel burning units, the product of 0.09 and the total design heat inputs for such units in million B.T.U.'s per hour, provided however that no more than six hundred (600) pounds per hour of particulate matter shall be discharged into the open air from all such units.

[45CSR§2-4.1.b]

4.1.23. No person shall cause, suffer, allow or permit the discharge of sulfur dioxide into the open air from all stacks located at one plant, measured in terms of pounds per hour, in excess of the amount determined as follows:

For Type 'b' and Type 'c' fuel burning units, the product of 3.1 and the total design heat inputs for such units discharging through those stacks in million BTU's per hour.

[45CSR§10-3.1.e]

_X_ Permit Shield

Applicable Requirements **H-01 (1E) through H-07 (7E)**

For all applicable requirements listed above, provide monitoring/testing/recordkeeping/reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number or citation.
(Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

4.2. Monitoring Requirements

4.2.1. At such reasonable times as the Secretary may designate, the permittee shall conduct Method 9 emission observations for the purpose of demonstrating compliance with Section 4.1.20. Method 9 shall be conducted in accordance with 40 CFR 60 Appendix A.
[45CSR13, R13-3070, 5.2.1.]

4.3. Testing Requirements

4.3.1. Compliance with the visible emission requirements of section 4.1.20 shall be determined in accordance with 40 CFR Part 60, Appendix A, Method 9 or by using measurements from continuous opacity monitoring systems approved by the Director. The Director may require the installation, calibration, maintenance and operation of continuous opacity monitoring systems and may establish policies for the evaluation of continuous opacity monitoring results and the determination of compliance with the visible emission requirements of section 4.1.20. Continuous opacity monitors shall not be required on fuel burning units which employ wet scrubbing systems for emission control.
[45CSR§2-3.2.; 45CSR13, R13-3070, 5.3.1.]

4.3.2. At such reasonable times as the Director may designate, the owner or operator of any fuel burning unit(s) may be required to conduct or have conducted tests to determine the compliance of such unit(s) with the emission limitations of section 4 (45CSR2 PM limit in condition 4.1.22.). Such tests shall be conducted in accordance with the appropriate method set forth in the Appendix to this rule or other equivalent EPA approved method approved by the Director. The Director, or his duly authorized representative, may at his option witness or conduct such tests. Should the Director exercise his option to conduct such tests, the operator will provide all necessary sampling connections and sampling ports located in such manner as the Director may require, power for test equipment, and the required safety equipment such as scaffolding, railings and ladders to comply with generally accepted good safety practices.

The Director, or his duly authorized representative, may conduct such other tests as he may deem necessary to evaluate air pollution emissions other than those noted in 45CSR§2-4.1. (45CSR2 PM limit in condition 4.1.22.).

[45CSR§§2-8.1.b. and 8.1.c.]

4.4. Recordkeeping Requirements

4.4.1. To demonstrate compliance with sections 4.1.1-4.1.19, the permittee shall maintain a monthly record of the amount of natural gas consumed and the hours of operation of each of the heaters (1E-7E). Compliance with the maximum throughput limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the monthly throughput at any given time during the previous twelve consecutive calendar months. Said records shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
[45CSR§2-8.3.c; 45CSR§2A-7.1.a.1; 45CSR13, R13-3070, 5.4.1.]

Continued ...

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

4.4.2. Except as provided under conditions 4.4.3 and 4.4.4, the owner or operator of each affected facility shall record and maintain records of the amount of each fuel combusted during each operating day.
[40CFR§60.48c(g)(1); 45CSR16; 45CSR13, R13-3070, 5.4.2.]

4.4.3. As an alternative to meeting the requirements of condition 4.4.2, the owner or operator of an affected facility that combusts only natural gas, wood, fuels using fuel certification in §60.48c(f) to demonstrate compliance with the SO_2 standard, fuels not subject to an emissions standard (excluding opacity), or a mixture of these fuels may elect to record and maintain records of the amount of each fuel combusted during each calendar month.
[40CFR§60.48c(g)(2); 45CSR16; 45CSR13, R13-3070, 5.4.3.]

4.4.4. As an alternative to meeting the requirements of condition 4.4.2, the owner or operator of an affected facility or multiple affected facilities located on a contiguous property unit where the only fuels combusted in any steam generating unit (including steam generating units not subject to 40 C.F.R. 60, Subpart Dc) at that property are natural gas, wood, distillate oil meeting the most current requirements in §60.42C to use fuel certification to demonstrate compliance with the SO_2 standard, and/or fuels, excluding coal and residual oil, not subject to an emissions standard (excluding opacity) may elect to record and maintain records of the total amount of each steam generating unit fuel delivered to that property during each calendar month.
[40CFR§60.48c(g)(3); 45CSR16; 45CSR13, R13-3070, 5.4.4.]

4.5. Reporting Requirements

4.5.1. The owner or operator of each affected facility shall submit notification of the date of construction or reconstruction and actual startup, as provided by §60.7 of this part. This notification shall include:

a. The design heat input capacity of the affected facility and identification of fuels to be combusted in the affected facility.

b. If applicable, a copy of any federally enforceable requirement that limits the annual capacity factor for any fuel or mixture of fuels under §60.42c, or §60.43c.

c. The annual capacity factor at which the owner or operator anticipates operating the affected facility based on all fuels fired and based on each individual fuel fired.

d. Notification if an emerging technology will be used for controlling SO_2 emissions. The Administrator will examine the description of the control device and will determine whether the technology qualifies as an emerging technology. In making this determination, the Administrator may require the owner or operator of the affected facility to submit additional information concerning the control device. The affected facility is subject to the provisions of §60.42c(a) or (b)(1), unless and until this determination is made by the Administrator.

[40CFR§60.48c(a); 45CSR16; 45CSR13, R13-3070, 5.5.1.]

4.5.2. The reporting period for the reports required under this subpart is each six-month period. All reports shall be submitted to the Administrator and shall be postmarked by the 30th day following the end of the reporting period.
[40CFR§60.48c(j); 45CSR16; 45CSR13, R13-3070, 5.5.2.]

4.6. Compliance Plan

4.6.1. N/A

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment E

Emission Unit Form

Emission Unit Description		**FL-1 (8E)**
Emission unit ID numbe FL-1 (8E)	**Emission unit name:** Process Flare	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): Process Flare		
Manufacturer: Zeeco USA LLC	**Model number:** Flare Tip: AFTA-24/80 - Air-Assist	**Serial number(s):** na
Construction date: na	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): 4,623.68 MMBtu/hr (HHV)		
Maximum Hourly Throughput: 2,566,068 scf/hr	**Maximum Annual Throughput:** 630.2 MMscf/yr	**Maximum Operating Schedule:** 8,760 hr/yr
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? _X_ Yes ___No		**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 4,624 MMBtu/hr (HHV)		**Type and Btu/hr rating of burners:** 4,624 MMBtu/hr (HHV)
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. Waste Gas		

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Waste Gas (average)	<0.01%	negligible	1,685 Btu/scf

Emission Unit Form (Continued)

Emission Data **FL-1 (8E)**

Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	1,273.93	146.28
Nitrogen Oxides (NOX)	638.12	73.27
Lead (Pb)	---	---
Particulate Matter (PM2.5)	19.50	2.39
Particulate Matter (PM10)	19.50	2.39
Total Particulate Matter (TSP)	19.50	2.39
Sulfur Dioxide (SO2)	1.54	0.19
Volatile Organic Compounds (VOC)	177.30	20.36
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	4.49	0.52
Ethylbenzene	6.09	0.70
Formaldehyde (HCHO)	0.34	0.04
n-Hexane	5.48	0.63
Toluene	5.30	0.61
2,2,4-Trimethylpentane (TMP)	6.55	0.75
Xylenes	6.11	0.70
Other HAP	0.01	1E-03
Total HAP	34.38	3.95
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	723,433	83,066
Methane (CH4) (GWP=25)	217.07	24.92
Nitrous Oxide (N2O) (GWP=298)	5.96	0.68
CO2 Equivalent (CO2e)	730,635	83,893

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Vendor data, AP-42, engineering judgment, and mass balance.

GHG emission factors: 40CFR98, Subpart C "General Stationary Fuel Combustion Sources", Tables C-1 and C-2 (12/11/14)

Applicable Requirements **FL-1 (8E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

5.0 Flare Control Device [emission point ID(s): 8E]

5.1. Limitations and Standards

5.1.1. In accordance with information in permit application R13-3070~~A~~B, the permittee shall install and operate a Process Flare (FL-1) designed to achieve, at a minimum, a 99.0% destruction and removal efficiency (DRE) of VOCs and organic HAPs from the sources identified under Control Devices Table 1.1. The maximum aggregate amount of waste gases sent to the Process Flare from these sources shall not exceed 630.19 MMscf/yr based on a rolling 12 month total.
[45CSR13, R13-3070, 6.1.1.]

5.1.2. Maximum emissions from the Zeeco flare (8E) shall not exceed the following limits:

a. The maximum aggregate emissions generated at the Process Flare (8E) from the combustion of waste gases and the pilot light shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	638.12	73.27
Carbon Monoxide	1,273.91	146.28

b. The maximum emissions of VOCs and HAPs at the Process Flare (representing un-combusted pass-through organic vapors that are generated at one of the sources identified under 5.1.1.) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
VOCs	177.30	20.36
Benzene	*4.49*	*0.52*
Ethylbenzene	*6.09*	*0.70*
n-Hexane	*5.48*	*0.63*
Toluene	*5.30*	*0.61*
2,2,4-TMP	*6.55*	*0.75*
Xylenes	*6.11*	*0.70*
Total HAPs	34.38	3.95

[45CSR13, R13-3070, 6.1.2.]

Continued ...

Applicable Requirements **FL-1 (8E)**

5.1.3. The installed Process Flare (FL-1) shall be a Zeeco Model Number AFTA-24/80, shall have a maximum waste-gas capacity of 208,000 lb/hr, shall have an MDHI of 4,624 mmBtu/hr, and shall be designed and operated in accordance with the following:

a. Flare shall be air-assisted.

b. Flare shall be designed for and operated with no visible emissions, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours.

Note: Compliance with the no visible emissions requirement in 5.1.3.b ensures compliance with the applicable opacity and visible emissions requirements in 45CSR§§6-4.3, 4.4, and 4.5.

c. Flare shall be operated, with a flame present at all times whenever emissions may be vented to it, except during SSM (Startup, Shutdown, Malfunctions) events.

d. A flare shall be used only where the net heating value of the gas being combusted is 11.2 MJ/scm (300 Btu/scf) or greater if the flare is steam-assisted or air-assisted; or where the net heating value of the gas being combusted is 7.45 MJ/scm (200 Btu/scf) or greater if the flare is non-assisted. The net heating value of the gas being combusted in a flare shall be calculated using the following equation:

$$H_T = K\sum_{i=1}^{n} C_i H_i$$

Where:

H_T=Net heating value of the sample, MJ/scm; where the net enthalpy per mole of off gas is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining the volume corresponding to one mole is 20 °C.

K=Constant=

$$1.740\times10^{-7}\left(\frac{1}{ppmv}\right)\left(\frac{\text{g-mole}}{\text{scm}}\right)\left(\frac{\text{MJ}}{\text{kcal}}\right)$$

where the standard temperature for (g-mole/scm) is 20 °C.

C_i=Concentration of sample component i in ppmv on a wet basis, which may be measured for organics by Test Method 18, but is not required to be measured using Method 18 (unless designated by the Director).

H_i=Net heat of combustion of sample component i, kcal/g-mole at 25 °C and 760 mm Hg. The heats of combustion may be determined using ASTM D2382–76 or 88 or D4809–95 if published values are not available or cannot be calculated.

n=Number of sample components.

e. Air-assisted flares shall be designed and operated with an exit velocity less than the velocity V_{max}. The maximum permitted velocity, V_{max}, for air-assisted flares shall be determined by the following equation:

$$V_{max}=8.71 + 0.708(H_T)$$

Where:

V_{max}=Maximum permitted velocity, m/sec.
8.71=Constant.
0.708=Constant.
H_T=The net heating value as determined in 5.1.3.d.

[45CSR§§6-4.3, 4.4, and 4.5; 45CSR13, R13-3070, 6.1.3.]

Continued ...

Applicable Requirements **FL-1 (8E)**

5.1.4. The permittee is not required to conduct a flare compliance assessment for concentration of sample (i.e. Method 18) and tip velocity (i.e. Method 2) until such time as the Director requests a flare compliance assessment to be conducted in accordance with section 5.3.2, but the permittee is required to conduct a flare design evaluation in accordance with section 5.4.2. Alternatively, the permittee may elect to demonstrate compliance with the flare design criteria requirements of section 5.1.3 by complying with the compliance assessment testing requirements of section 5.3.2.
[45CSR13, R13-3070, 6.1.4.]

5.1.5. No person shall cause or allow particulate matter to be discharged from any incinerator into the open air in excess of the quantity determined by use of the following formula:

Emissions (lb/hr) = F x Incinerator Capacity (tons/hr)

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions.

	Incinerator Capacity	Factor F
A.	Less than 15,000 lbs/hr	5.43
B.	15,000 lbs/hr or greater	2.72

[45CSR§6-4.1]

5.1.6. Incinerators, including all associated equipment and grounds, shall be designed, operated and maintained so as to prevent the emission of objectionable odors.
[45CSR§6-4.6]

_X_ Permit Shield

For all applicable requirements listed above, provide monitoring/testing/recordkeeping/reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number or citation.
(Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

5.2. Monitoring Requirements

5.2.1. In order to demonstrate compliance with the requirements of 5.1.3.c, the permittee shall monitor the presence or absence of a flare pilot flame using a thermocouple or any other equivalent device, except during SSM events.
[45CSR13, R13-3070, 6.2.1.]

5.2.2. In order to determine compliance with 5.1.1., the permittee shall monitor and record the monthly and rolling twelve (12) month total aggregate waste gases, pilot gas, and purge gas sent to the flare (in MMscf) from the sources identified under Control Devices Table 1.1.
[45CSR13, R13-3070, 6.2.2.]

Continued ...

Applicable Requirements **FL-1 (8E)**

5.3. Testing Requirements

5.3.1. In order to demonstrate compliance with the flare opacity requirements of 5.1.3.b the permittee shall conduct a Method 22 opacity test for at least two hours. This test shall demonstrate no visible emissions are observed for more than a total of 5 minutes during any 2 consecutive hour period using 40CFR60 Appendix A Method 22. The permittee shall conduct this test within one (1) year of R13-3070 permit issuance or initial startup whichever is later. The visible emission checks shall determine the presence or absence of visible emissions. At a minimum, the observer must be trained and knowledgeable regarding the effects of background contrast, ambient lighting, observer position relative to lighting, wind, and the presence of uncombined water (condensing water vapor) on the visibility of emissions. This training may be obtained from written materials found in the References 1 and 2 from 40 CFR part 60, appendix A, Method 22 or from the lecture portion of 40 CFR part 60, appendix A, Method 9 certification course.
[45CSR13, R13-3070, 6.3.1.]

5.3.2. The Director may require the permittee to conduct a flare compliance assessment to demonstrate compliance with section 5.1.4. This compliance assessment testing shall be conducted in accordance with appropriate test methods or other equivalent testing as approved in writing by the Director.
[45CSR13, R13-3070, 6.3.2.]

5.3.3. At such reasonable times as the Secretary may designate, the operator of any incinerator shall be required to conduct or have conducted stack tests to determine the particulate matter loading (condition 5.1.5.), by using 40 CFR Part 60, Appendix A, Method 5 or other equivalent U.S. EPA approved method approved by the Secretary, in exhaust gases. Such tests shall be conducted in such manner as the Secretary may specify and be filed on forms and in a manner acceptable to the Secretary. The Secretary may, at the Secretary's option, witness or conduct such stack tests. Should the Secretary exercise his or her option to conduct such tests, the operator will provide all the necessary sampling connections and sampling ports to be located in such manner as the Secretary may require, power for test equipment and the required safety equipment such as scaffolding, railings and ladders to comply with generally accepted good safety practices.

The Secretary may conduct such other tests as the Secretary may deem necessary to evaluate air pollution emissions other than those noted above.

[45CSR§§6-7.1. and 7.2.]

5.4. Recordkeeping Requirements

5.4.1. For the purpose of demonstrating compliance with section 5.1.3.c and 5.2.1, the permittee shall maintain records of the times and duration of all periods which the pilot flame was absent.
[45CSR13, R13-3070, 6.4.1.]

5.4.2. For the purpose of demonstrating compliance with section 5.1.3 and 5.3.2, the permittee shall maintain a record of the flare design evaluation. The flare design evaluation shall include, net heat value calculations, exit (tip) velocity calculations, and all supporting concentration calculations and other related information requested by the Director.
[45CSR13, R13-3070, 6.4.2.]

5.4.3. For the purpose of demonstrating compliance with the requirements set forth in sections 5.1.3, the permittee shall maintain records of testing conducted in accordance with 5.3.2.
[45CSR13, R13-3070, 6.4.3.]

5.4.4. The permittee shall document and maintain the corresponding records specified by the on-going monitoring requirements of 5.2 and testing requirements of 5.3.
[45CSR13, R13-3070, 6.4.4.]

5.4.5. For the purpose of demonstrating compliance with section 5.1.3.b, the permittee shall maintain records of the visible emission opacity tests conducted per Section 5.3.1.
[45CSR13, R13-3070, 6.4.5.]

Continued ...

Applicable Requirements **FL-1 (8E)**

5.4.6. All records required under Section 5.3 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
[45CSR13, R13-3070, 6.4.6.]

5.5. Reporting Requirements

5.5.1. If permittee is required by the Director to demonstrate compliance with section 5.3.2, then the permittee shall submit a testing protocol at least thirty (30) days prior to testing and shall submit a notification of the testing date at least fifteen (15) days prior to testing. The permittee shall submit the testing results within sixty (60) days of testing and provide all supporting calculations and testing data.
[45CSR13, R13-3070, 6.5.1.]

5.5.2. Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.
[45CSR13, R13-3070, 6.5.2.]

5.5.3. Any deviation(s) from the flare design and operation criteria in Section 5.1.3 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of discovery of such deviation.
[45CSR13, R13-3070, 6.5.3.]

5.6. Compliance Plan

5.6.1. N/A

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment E

Emission Unit Form

Emission Unit Description		**GEN-1 (9E)**
Emission unit ID number: GEN-1 (9E)	**Emission unit name:** Standby Generator Engine (Propane) - EPA Certs	**List any control devices associated with this emission unit:** na

Provide a description of the emissions unit (type. Method of operation, design parameters, etc.):
Propane-fired standby generator engine

Manufacturer:	**Model number:**	**Serial number(s):**
Olympian	G150LG2	GXC02911
Construction date:	**Installation date:**	**Modification date(s):**
2015	2016	na

Design Capacity (examples: furnaces - tons/hr, tanks - gallons):
224 bhp

Maximum Hourly Throughput:	**Maximum Annual Throughput:**	**Maximum Operating Schedule:**
na	na	500 hr/yr

Fuel Usage Data (fill out all applicable fields)

Does this emission unit combust fuel? _X_ Yes ___No	**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 224 bhp	**Type and Btu/hr rating of burners:** na

List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each.

Propane 878 scf/hr 0.44 MMscf/yr

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Natural gas	0.25 grains/100 scf	negligible	2,516 Btu/scf

Emission Unit Form (Continued)

Emission Data **GEN-1 (9E)**

Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	1.98	0.49
Nitrogen Oxides (NOX)	0.99	0.25
Lead (Pb)	---	---
Particulate Matter (PM2.5)	0.04	0.01
Particulate Matter (PM10)	0.04	0.01
Total Particulate Matter (TSP)	0.04	0.01
Sulfur Dioxide (SO2)	1.29E-03	3.23E-04
Volatile Organic Compounds (VOC)	0.54	0.13
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	3E-03	9E-04
Ethylbenzene	5E-05	1E-05
Formaldehyde (HCHO)	0.04	0.01
n-Hexane	---	---
Toluene	1E-03	3E-04
2,2,4-Trimethylpentane (TMP)	---	---
Xylenes	4E-04	1E-04
Other HAP	0.02	0.01
Total HAP	0.07	0.02
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	304.09	76.02
Methane (CH4) (GWP=25)	0.50	0.13
Nitrous Oxide (N2O) (GWP=298)	5E-04	1E-04
CO2 Equivalent (CO2e)	304.09	76.02

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Vendor Data and AP-42

Applicable Requirements **GEN-1 (9E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

6.0 Standby Generator [emission point ID(s): 9E]

6.1. Limitations and Standards

6.1.1. To demonstrate compliance with Section 6.1.2, the quantity of propane that shall be consumed in the 224 hp liquid propane gas (LPG)-fired reciprocating engine, an Olympian Model G150LG2 (9E), shall not exceed 878 cubic feet per hour and 440,000 cubic feet per year.
[45CSR13, R13-3070, 7.1.1.]

6.1.2. Maximum emissions from the 224 hp LPG-fired reciprocating engine, an Olympian Model G150LG2 (9E), shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxide	0.99	0.25
Carbon Monoxide	1.98	0.49
VOCs	0.54	0.13
Formaldehyde	0.04	0.01

[45CSR13, R13-3070, 7.1.2.]

6.1.3. **Maximum Yearly Operation Limitation.** The maximum non-emergency yearly hours of operation for the 224 hp LPG-fired reciprocating engine, an Olympian Model G150LG2 (9E), shall not exceed 500 hours per year (use of the engine during emergency situations as defined under 2.17 does not count toward this limit). Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.
[45CSR13, R13-3070, 7.1.3.]

6.1.4. Owners and operators of stationary SI ICE with a maximum engine power greater than 19 KW (25 HP) manufactured on or after the applicable date in §60.4230(a)(4) that are rich burn engines that use LPG must comply with the emission standards in §60.4231(c) for their stationary SI ICE.
[40CFR§60.4233(c); 45CSR16; 45CSR13, R13-3070, 8.1.1.]

6.1.5. Stationary SI internal combustion engine manufacturers must certify their stationary SI ICE with a maximum engine power greater than 19 KW (25 HP) (except emergency stationary ICE with a maximum engine power greater than 25 HP and less than 130 HP) that are rich burn engines that use LPG and that are manufactured on or after the applicable date in §60.4230(a)(2), or manufactured on or after the applicable date in §60.4230(a)(4) for emergency stationary ICE with a maximum engine power greater than or equal to 130 HP, to the certification emission standards and other requirements for new nonroad SI engines in 40 CFR part 1048. Stationary SI internal combustion engine manufacturers must certify their emergency stationary SI ICE greater than 25 HP and less than 130 HP that are rich burn engines that use LPG and that are manufactured on or after the applicable date in §60.4230(a)(4) to the Phase 1 emission standards in 40 CFR 90.103, applicable to class II engines, and other requirements for new nonroad SI engines in 40 CFR part 90.

Continued ...

Stationary SI internal combustion engine manufacturers may certify their stationary SI ICE with a maximum engine power less than or equal to 30 KW (40 HP) with a total displacement less than or equal to 1,000 cc that are rich burn engines that use LPG to the certification emission standards and other requirements for new nonroad SI engines in 40 CFR part 90 or 1054, as appropriate.
[40CFR§60.4231(c); 45CSR16; 45CSR13, R13-3070, 8.1.2.]

6.1.6. The permittee must operate and maintain stationary SI ICE that achieve the emission standards as required in §60.4233 over the entire life of the engine.
[45CSR16; 40CFR§60.4234]

6.1.7. If the permittee owns or operates a stationary SI internal combustion engine that is manufactured after July 1, 2008, and must comply with the emission standards specified in 40 C.F.R. §§60.4233(a) through (c), the permittee must comply by purchasing an engine certified to the emission standards in 40 C.F.R. §§60.4231(a) through (c), as applicable, for the same engine class and maximum engine power. In addition, the permittee must meet the following requirements:

If the permittee operates and maintains the certified stationary SI internal combustion engine and control device according to the manufacturer's emission-related written instructions, the permittee must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required if the permittee is an owner or operator. The permittee must also meet the requirements as specified in 40 CFR part 1068, subparts A through D, as they apply. If the permittee adjusts engine settings according to and consistent with the manufacturer's instructions, the permittee's stationary SI internal combustion engine will not be considered out of compliance.
[45CSR16; 40CFR§§60.4243(a) and (a)(1)]

6.1.8. If the permittee owns or operates an emergency stationary ICE, the permittee must operate the emergency stationary ICE according to the following requirements. In order for the engine to be considered an emergency stationary ICE, any operation other than emergency operation, maintenance and testing, emergency demand response, and operation in non-emergency situations for 50 hours per year, as described in the following paragraphs, is prohibited. If the permittee does not operate the engine according to the following requirements, the engine will not be considered an emergency engine under this subpart and must meet all requirements for non-emergency engines.

a. There is no time limit on the use of emergency stationary ICE in emergency situations.

b. The permittee may operate the emergency stationary ICE for any combination of the purposes specified in paragraphs (b)(1) through (3) for a maximum of 100 hours per calendar year. Any operation for non-emergency situations as allowed by paragraph (c) of this section counts as part of the 100 hours per calendar year allowed by this paragraph (b).

1. Emergency stationary ICE may be operated for maintenance checks and readiness testing, provided that the tests are recommended by federal, state or local government, the manufacturer, the vendor, the regional transmission organization or equivalent balancing authority and transmission operator, or the insurance company associated with the engine. The permittee may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that federal, state, or local standards require maintenance and testing of emergency ICE beyond 100 hours per calendar year.

2. Emergency stationary ICE may be operated for emergency demand response for periods in which the Reliability Coordinator under the North American Electric Reliability Corporation (NERC) Reliability Standard EOP-002-3, Capacity and Energy Emergencies (incorporated by reference, see §60.17), or other authorized entity as determined by the Reliability Coordinator, has declared an Energy Emergency Alert Level 2 as defined in the NERC Reliability Standard EOP-002-3.

Continued ...

3. Emergency stationary ICE may be operated for periods where there is a deviation of voltage or frequency of 5 percent or greater below standard voltage or frequency.

c. Emergency stationary ICE may be operated for up to 50 hours per calendar year in non-emergency situations. The 50 hours of operation in non-emergency situations are counted as part of the 100 hours per calendar year for maintenance and testing and emergency demand response provided in paragraph (b) of this section. Except as provided in paragraph (c)(1) of this section, the 50 hours per year for non-emergency situations cannot be used for peak shaving or non-emergency demand response, or to generate income for a facility to an electric grid or otherwise supply power as part of a financial arrangement with another entity.

1. The 50 hours per year for non-emergency situations can be used to supply power as part of a financial arrangement with another entity if all of the following conditions are met:

i. The engine is dispatched by the local balancing authority or local transmission and distribution system operator;

ii. The dispatch is intended to mitigate local transmission and/or distribution limitations so as to avert potential voltage collapse or line overloads that could lead to the interruption of power supply in a local area or region.

iii. The dispatch follows reliability, emergency operation or similar protocols that follow specific NERC, regional, state, public utility commission or local standards or guidelines.

iv. The power is provided only to the facility itself or to support the local transmission and distribution system.

v. The owner or operator identifies and records the entity that dispatches the engine and the specific NERC, regional, state, public utility commission or local standards or guidelines that are being followed for dispatching the engine. The local balancing authority or local transmission and distribution system operator may keep these records on behalf of the engine owner or operator.

[45CSR16; 40CFR§60.4243(d)]

6.1.9. The permittee must install a non-resettable hour meter.
[45CSR16; 40CFR§60.4237(b)]

6.2. Monitoring Requirements

6.2.1. N/A

6.3. Testing Requirements

6.3.1. N/A

6.4. Recordkeeping Requirements

6.4.1. To demonstrate compliance with sections 6.1.1-6.1.3, the permittee shall maintain records of the hours of operation of the engine (9E). Said records shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
[45CSR13, R13-3070, 7.2.1.]

Continued ...

6.4.2. Owners and operators of all stationary SI ICE must keep records of the following information:

a. All notifications submitted to comply with this subpart and all documentation supporting any notification.

b. Maintenance conducted on the engine.

c. If the stationary SI internal combustion engine is a certified engine, documentation from the manufacturer that the engine is certified to meet the emission standards and information as required in 40 CFR parts 90, 1048, 1054, and 1060, as applicable.

d. If the stationary SI internal combustion engine is not a certified engine or is a certified engine operating in a non-certified manner and subject to §60.4243(a)(2), documentation that the engine meets the emission standards.

[45CSR16; 40CFR§60.4245(a)]

6.4.3. For all stationary SI emergency ICE greater than or equal to 130 HP and less than 500 HP manufactured on or after July 1, 2011 that do not meet the standards applicable to non-emergency engines, the owner or operator of must keep records of the hours of operation of the engine that is recorded through the non-resettable hour meter. The permittee must document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation.
[45CSR16; 40CFR§60.4245(b)]

6.5. Reporting Requirements

6.5.1. If the permittee owns or operates an emergency stationary SI ICE with a maximum engine power more than 100 HP that operates or is contractually obligated to be available for more than 15 hours per calendar year for the purposes specified in §60.4243(d)(2)(ii) and (iii) or that operates for the purposes specified in §60.4243(d)(3)(i), you must submit an annual report according to the following requirements:

a. The report must contain the following information:

1. Company name and address where the engine is located.

2. Date of the report and beginning and ending dates of the reporting period.

3. Engine site rating and model year.

4. Latitude and longitude of the engine in decimal degrees reported to the fifth decimal place.

5. Hours operated for the purposes specified in §§60.4243(d)(2)(ii) and (iii), including the date, start time, and end time for engine operation for the purposes specified in §§60.4243(d)(2)(ii) and (iii).

6. Number of hours the engine is contractually obligated to be available for the purposes specified in §§60.4243(d)(2)(ii) and (iii).

7. Hours spent for operation for the purposes specified in §60.4243(d)(3)(i), including the date, start time, and end time for engine operation for the purposes specified in §60.4243(d)(3)(i). The report must also identify the entity that dispatched the engine and the situation that necessitated the dispatch of the engine.

Continued ...

b. The first annual report must cover the calendar year 2015 and must be submitted no later than March 31, 2016. Subsequent annual reports for each calendar year must be submitted no later than March 31 of the following calendar year.

c. The annual report must be submitted electronically using the subpart specific reporting form in the Compliance and Emissions Data Reporting Interface (CEDRI) that is accessed through EPA's Central Data Exchange (CDX) (www.epa.gov/cdx). However, if the reporting form specific to this subpart is not available in CEDRI at the time that the report is due, the written report must be submitted to the Administrator at the appropriate address listed in §60.4.

[45CSR16; 40CFR§60.4245(e)]

6.6. Compliance Plan

6.6.1. N/A

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment E

Emission Unit Form

Emission Unit Description		FUG (15E) and RPC (17E)
Emission unit ID number: FUG (15E) and RPC (17E)	**Emission unit name:** Process Piping Fugitive Emissions Recip Rod Packing/Engine Crankcase	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.):		
Manufacturer: na	**Model number:** na	**Serial number(s):** na
Construction date: na	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): na		
Maximum Hourly Throughput: na	**Maximum Annual Throughput:** na	**Maximum Operating Schedule:** 8,760
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? ___ Yes _X_No		**If yes, is it?** na ___ Indirect Fired ___Direct Fired
Maximum design heat input and/or maximum horsepower rating: na		**Type and Btu/hr rating of burners:** na
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. na		

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
na			

Emission Unit Form (Continued)

Emission Data **FUG (15E) and RPC (17E)**

Criteria Pollutants	**Pollutant Emissions**					
	FUG	**RPC**	**Total (pph)**	**FUG**	**RPC**	**Total (tpy)**
Carbon Monoxide (CO)	---	---	---	---	---	---
Nitrogen Oxides (NOX)	---	---	---	---	---	---
Lead (Pb)	---	---	---	---	---	---
Particulate Matter (PM2.5)	---	---	---	---	---	---
Particulate Matter (PM10)	---	---	---	---	---	---
Total Particulate Matter (TSP)	---	---	---	---	---	---
Sulfur Dioxide (SO2)	---	---	---	---	---	---
Volatile Organic Compounds (VOC)	7.12	0.17	7.30	31.21	0.30	31.51
Hazardous Air Pollutants	**Pollutant Emissions**					
	FUG	**RPC**	**Total (pph)**	**FUG**	**RPC**	**Total (tpy)**
Benzene	3E-03	2E-03	0.01	0.01	6E-04	0.01
Ethylbenzene	3E-03	2E-03	0.01	0.01	6E-04	0.01
Formaldehyde (HCHO)	---	0.01	0.01	---	2E-03	2E-03
n-Hexane	0.09	2E-03	0.09	0.38	6E-04	0.38
Toluene	3E-03	2E-03	0.01	0.01	6E-04	0.01
2,2,4-Trimethylpentane (TMP)	3E-03	2E-03	0.01	0.01	6E-04	0.01
Xylenes	3E-03	2E-03	0.01	0.01	6E-04	0.01
Other HAP	---	---	---	---	---	---
Total HAP	0.10	0.01	0.12	0.44	4E-03	0.44
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**					
	FUG	**RPC**	**Total (pph)**	**FUG**	**RPC**	**Total (tpy)**
Carbon Dioxide (CO2)	0.05	62.81	62.86	0.23	15.70	15.93
Methane (CH4) (GWP=25)	6.47	13.13	19.60	28.32	57.49	85.81
Nitrous Oxide (N2O) (GWP=298)	---	---	---	---	---	---
CO2 Equivalent (CO2e)	161.70	391.04	552.74	708.23	1,453	2,161

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Vendor Data and AP-42

Applicable Requirements **FUG (15E) and RPC (17E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

7.0 Gas Processing Plant [emission point ID(s): 15E and 17E]

7.1. Limitations and Standards

7.1.1. **Maximum Throughput Limitation.** The total maximum wet natural gas throughput through the Gas Processing Plant shall not exceed 660 mmscf/day.
[45CSR13, R13-3070, 9.1.1.]

7.1.2. You must comply with the standards in paragraphs (a) through (d) of this section for each reciprocating compressor affected facility.

a. You must replace the reciprocating compressor rod packing according to either paragraph (a)(1) or (2) of this section.

1. Before the compressor has operated for 26,000 hours. The number of hours of operation must be continuously monitored beginning upon initial startup of your reciprocating compressor affected facility, or October 15, 2012, or the date of the most recent reciprocating compressor rod packing replacement, whichever is later.

2. Prior to 36 months from the date of the most recent rod packing replacement, or 36 months from the date of startup for a new reciprocating compressor for which the rod packing has not yet been replaced.

3. Collect the emissions from the rod packing using a rod packing emissions collection system which operates under negative pressure and route the rod packing emissions to a process through a closed vent system that meets the requirements of §60.5411(a).

b. You must demonstrate initial compliance with standards that apply to reciprocating compressor affected facilities as required by § 60.5410.

c. You must demonstrate continuous compliance with standards that apply to reciprocating compressor affected facilities as required by § 60.5415.

d. You must perform the required notification, recordkeeping, and reporting as required by § 60.5420.

[40CFR§60.5385; 45CSR16; 45CSR13, R13-3070, 9.1.2., Reciprocating Compressors (17E)]

7.1.3. What equipment leak standards apply to affected facilities at an onshore natural gas processing plant?

This section applies to the group of all equipment, except compressors, within a process unit.

a. You must comply with the requirements of §§ 60.482-1a(a), (b), and (d), 60.482-2a, and 60.482-4a through 60.482-11a, except as provided in § 60.5401.

b. You may elect to comply with the requirements of §§ 60.483-1a and 60.483-2a, as an alternative.

c. You may apply to the Administrator for permission to use an alternative means of emission limitation that achieves a reduction in emissions of VOC at least equivalent to that achieved by the controls required in this subpart according to the requirements of § 60.5402 of this subpart.

Continued ...

d. You must comply with the provisions of § 60.485a of this part except as provided in paragraph (f) of this section.

e. You must comply with the provisions of §§ 60.486a and 60.487a of this part except as provided in §§ 60.5401, 60.5421, and 60.5422 of this part.

f. You must use the following provision instead of § 60.485a(d)(1): Each piece of equipment is presumed to be in VOC service or in wet gas service unless an owner or operator demonstrates that the piece of equipment is not in VOC service or in wet gas service. For a piece of equipment to be considered not in VOC service, it must be determined that the VOC content can be reasonably expected never to exceed 10.0 percent by weight. For a piece of equipment to be considered in wet gas service, it must be determined that it contains or contacts the field gas before the extraction step in the process. For purposes of determining the percent VOC content of the process fluid that is contained in or contacts a piece of equipment, procedures that conform to the methods described in ASTM E169-93, E168-92, or E260-96 (incorporated by reference as specified in § 60.17) must be used.

[40CFR§60.5400; 45CSR16; 45CSR13, R13-3070, 9.1.3., 15E]

7.1.4. What are the exceptions to the equipment leak standards for affected facilities at onshore natural gas processing plants?

a. You may comply with the following exceptions to the provisions of §§ 60.5400(a) and (b).

b. 1. Each pressure relief device in gas/vapor service may be monitored quarterly and within 5 days after each pressure release to detect leaks by the methods specified in § 60.485a(b) except as provided in § 60.5400(c) and in paragraph (b)(4) of this section, and § 60.482-4a(a) through (c) of subpart VVa.

2. If an instrument reading of 500 ppm or greater is measured, a leak is detected.

3. i. When a leak is detected, it must be repaired as soon as practicable, but no later than 15 calendar days after it is detected, except as provided in § 60.482-9a.

ii. A first attempt at repair must be made no later than 5 calendar days after each leak is detected.

4. i. Any pressure relief device that is located in a nonfractionating plant that is monitored only by non-plant personnel may be monitored after a pressure release the next time the monitoring personnel are on-site, instead of within 5 days as specified in paragraph (b)(1) of this section and § 60.482-4a(b)(1) of subpart VVa.

ii. No pressure relief device described in paragraph (b)(4)(i) of this section must be allowed to operate for more than 30 days after a pressure release without monitoring.

c. Sampling connection systems are exempt from the requirements of § 60.482-5a.

d. Pumps in light liquid service, valves in gas/vapor and light liquid service, and pressure relief devices in gas/vapor service that are located at a nonfractionating plant that does not have the design capacity to process 283,200 standard cubic meters per day (scmd) (10 million standard cubic feet per day) or more of field gas are exempt from the routine monitoring requirements of §§ 60.482-2a(a)(1) and 60.482-7a(a), and paragraph (b)(1) of this section.

e. Pumps in light liquid service, valves in gas/vapor and light liquid service, and pressure relief devices in gas/vapor service within a process unit that is located in the Alaskan North Slope are exempt from the routine monitoring requirements of §§ 60.482-2a(a)(1), 60.482-7a(a), and paragraph (b)(1) of this section.

Continued ...

f. An owner or operator may use the following provisions instead of § 60.485a(e):

1. Equipment is in heavy liquid service if the weight percent evaporated is 10 percent or less at 150 °C (302 °F) as determined by ASTM Method D86-96 (incorporated by reference as specified in § 60.17).

2. Equipment is in light liquid service if the weight percent evaporated is greater than 10 percent at 150 °C (302 °F) as determined by ASTM Method D86-96 (incorporated by reference as specified in § 60.17).

g. An owner or operator may use the following provisions instead of § 60.485a(b)(2): A calibration drift assessment shall be performed, at a minimum, at the end of each monitoring day. Check the instrument using the same calibration gas(es) that were used to calibrate the instrument before use. Follow the procedures specified in Method 21 of appendix A-7 of this part, Section 10.1, except do not adjust the meter readout to correspond to the calibration gas value. Record the instrument reading for each scale used as specified in § 60.486a(e)(8). Divide these readings by the initial calibration values for each scale and multiply by 100 to express the calibration drift as a percentage. If any calibration drift assessment shows a negative drift of more than 10 percent from the initial calibration value, then all equipment monitored since the last calibration with instrument readings below the appropriate leak definition and above the leak definition multiplied by (100 minus the percent of negative drift/divided by 100) must be re-monitored. If any calibration drift assessment shows a positive drift of more than 10 percent from the initial calibration value, then, at the owner/operator's discretion, all equipment since the last calibration with instrument readings above the appropriate leak definition and below the leak definition multiplied by (100 plus the percent of positive drift/divided by 100) may be re-monitored.

[40CFR§60.5401; 45CSR16; 45CSR13, R13-3070, 9.1.4.; 15E]

7.1.5. What are the alternative emission limitations for equipment leaks from onshore natural gas processing plants?

a. If, in the Administrator's judgment, an alternative means of emission limitation will achieve a reduction in VOC emissions at least equivalent to the reduction in VOC emissions achieved under any design, equipment, work practice or operational standard, the Administrator will publish, in the Federal Register, a notice permitting the use of that alternative means for the purpose of compliance with that standard. The notice may condition permission on requirements related to the operation and maintenance of the alternative means.

b. Any notice under paragraph (a) of this section must be published only after notice and an opportunity for a public hearing.

c. The Administrator will consider applications under this section from either owners or operators of affected facilities, or manufacturers of control equipment.

d. The Administrator will treat applications under this section according to the following criteria, except in cases where the Administrator concludes that other criteria are appropriate:

1. The applicant must collect, verify and submit test data, covering a period of at least 12 months, necessary to support the finding in paragraph (a) of this section.

2. If the applicant is an owner or operator of an affected facility, the applicant must commit in writing to operate and maintain the alternative means so as to achieve a reduction in VOC emissions at least equivalent to the reduction in VOC emissions achieved under the design, equipment, work practice or operational standard.

[40CFR§60.5402; 45CSR16; 45CSR13, R13-3070, 9.1.5.; 15E]

7.1.6. The provisions for exemption from compliance during periods of startup, shutdown and malfunctions provided for in 40 C.F.R. 60.8(c) do not apply to 40 C.F.R. 60, Subpart OOOO.
[40CFR§60.5370(b); 45CSR16; 15E]

Applicable Requirements **FUG (15E) and RPC (17E)**

For all applicable requirements listed above, provide monitoring/testing/recordkeeping/reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number or citation.
(Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

7.2. Monitoring Requirements

7.2.1. You must determine initial compliance with the standards for each affected facility using the requirements in paragraphs (c) and (f) of this section. The initial compliance period begins on October 15, 2012 or upon initial startup, whichever is later, and ends no later than one year after the initial startup date for your affected facility or no later than one year after October 15, 2012. The initial compliance period may be less than one full year.

c. To achieve initial compliance with the standards for each reciprocating compressor affected facility you must comply with paragraphs (c)(1) through (4) of this section.

1. During the initial compliance period, you must continuously monitor the number of hours of operation or track the number of months since the last rod packing replacement.

2. You must submit the notifications required in §§60.7(a)(1), (3), and (4).

3. You must submit the initial annual report for your reciprocating compressor as required in § 60.5420(b).

4. You must maintain the records as specified in § 60.5420(c)(3) for each reciprocating compressor affected facility.

f. For affected facilities at onshore natural gas processing plants, initial compliance with the VOC requirements is demonstrated if you are in compliance with the requirements of § 60.5400.

[40CFR§60.5410; 45CSR16; 45CSR13, R13-3070, 9.2.1.; Reciprocating Compressors (17E), 15E]

7.2.2. For each reciprocating compressor affected facility, you must demonstrate continuous compliance according to paragraphs (a) through (c) of this section.

a. You must continuously monitor the number of hours of operation for each reciprocating compressor affected facility or track the number of months since initial startup, or October 15, 2012, or the date of the most recent reciprocating compressor rod packing replacement, whichever is later.

b. You must submit the annual report as required in § 60.5420(b) and maintain records as required in § 60.5420(c)(3).

c. You must replace the reciprocating compressor rod packing before the total number of hours of operation reaches 26,000 hours or the number of months since the most recent rod packing replacement reaches 36 months.

d. You must operate the rod packing emissions collection system under negative pressure and continuously comply with the closed vent requirements in §60.5411(a).

[40CFR§§60.5415(c)(1)-(4); 45CSR16; 45CSR13, R13-3070, 9.3.1.; 17E]

7.2.3. For affected facilities at onshore natural gas processing plants, continuous compliance with VOC requirements is demonstrated if you are in compliance with the requirements of § 60.5400 (condition 7.1.3).
[40CFR§60.5415(f); 45CSR16; 45CSR13, R13-3070, 9.3.2.; 15E]

Continued ...

7.3. Testing Requirements

7.3.1. N/A

7.4. Recordkeeping Requirements

7.4.1. **Recordkeeping requirements.** You must maintain the records identified as specified in § 60.7(f) and in this section. All records must be maintained for at least 5 years.

For each reciprocating compressors affected facility, you must maintain the records in paragraphs (a) through (c) of this section.

a. Records of the cumulative number of hours of operation or number of months since initial startup or October 15, 2012, or the previous replacement of the reciprocating compressor rod packing, whichever is later.

b. Records of the date and time of each reciprocating compressor rod packing replacement.

c. Records of deviations in cases where the reciprocating compressor was not operated in compliance with the requirements specified in § 60.5385.

[40CFR§60.5420(c)(3); 45CSR16; 45CSR13, R13-3070, 9.4.3.]

7.4.2. What are my additional recordkeeping requirements for my affected facility subject to VOC requirements for onshore natural gas processing plants?

a. You must comply with the requirements of paragraph (b) of this section in addition to the requirements of § 60.486a.

b. The following recordkeeping requirements apply to pressure relief devices subject to the requirements of § 60.5401(b)(1) of this subpart.

1. When each leak is detected as specified in § 60.5401(b)(2), a weatherproof and readily visible identification, marked with the equipment identification number, must be attached to the leaking equipment. The identification on the pressure relief device may be removed after it has been repaired.

2. When each leak is detected as specified in § 60.5401(b)(2), the following information must be recorded in a log and shall be kept for 2 years in a readily accessible location:

i. The instrument and operator identification numbers and the equipment identification number.

ii. The date the leak was detected and the dates of each attempt to repair the leak.

iii. Repair methods applied in each attempt to repair the leak.

iv. "Above 500 ppm" if the maximum instrument reading measured by the methods specified in paragraph (a) of this section after each repair attempt is 500 ppm or greater.

v. "Repair delayed" and the reason for the delay if a leak is not repaired within 15 calendar days after discovery of the leak.

vi. The signature of the owner or operator (or designate) whose decision it was that repair could not be effected without a process shutdown.

vii. The expected date of successful repair of the leak if a leak is not repaired within 15 days.

viii. Dates of process unit shutdowns that occur while the equipment is unrepaired.

Continued ...

ix. The date of successful repair of the leak.

x. A list of identification numbers for equipment that are designated for no detectable emissions under the provisions of § 60.482-4a(a). The designation of equipment subject to the provisions of § 60.482-4a(a) must be signed by the owner or operator.

[40CFR§60.5421; 45CSR16; 45CSR13, R13-3070, 9.4.4.; 15E]

7.4.3. To demonstrate compliance with section 7.1.1 the permittee shall maintain records of the amount of natural gas processed in the Gas Processing Plant. Said records required shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
[45CSR13, R13-3070, 9.5.1.]

7.5. Reporting Requirements

7.5.1. You must submit the notifications required in §§60.7(a)(1) and (4), and according to paragraphs (a) and (b) of this section, if you own or operate one or more of the affected facilities specified in § 60.5365 that was constructed, modified, or reconstructed during the reporting period.

a. If you own or operate a gas well, pneumatic controller or storage vessel affected facility you are not required to submit the notifications required in § 60.7(a)(1), (3), and (4).

b. i. If you own or operate a gas well affected facility, you must submit a notification to the Administrator no later than 2 days prior to the commencement of each well completion operation listing the anticipated date of the well completion operation. The notification shall include contact information for the owner or operator; the API well number, the latitude and longitude coordinates for each well in decimal degrees to an accuracy and precision of five (5) decimals of a degree using the North American Datum of 1983; and the planned date of the beginning of flowback. You may submit the notification in writing or in electronic format.

ii. If you are subject to state regulations that require advance notification of well completions and you have met those notification requirements, then you are considered to have met the advance notification requirements of paragraph (b)(i) of this section.

[40CFR§60.5420(a); 45CSR13, R13-3070, 9.4.1.]

7.5.2. **Reporting requirements.** You must submit annual reports containing the information specified in paragraphs (a) and (b) of this section to the Administrator and performance test reports as specified in paragraph (c) of this section. The initial annual report is due 30 days after the end of the initial compliance period as determined according to 40CFR§60.5410. Subsequent annual reports are due on the same date each year as the initial annual report. If you own or operate more than one affected facility, you may submit one report for multiple affected facilities provided the report contains all of the information required as specified in 40CFR§§60.5420(b)(1) through (6). Annual reports may coincide with title V reports as long as all the required elements of the annual report are included. You may arrange with the Administrator a common schedule on which reports required by this part may be submitted as long as the schedule does not extend the reporting period.

a. The general information specified in paragraphs (a)(i) through (iv) of this section.

i. The company name and address of the affected facility.

ii. An identification of each affected facility being included in the annual report.

iii. Beginning and ending dates of the reporting period.

iv. A certification by a responsible official of truth, accuracy, and completeness. This certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Continued ...

b. For each reciprocating compressor affected facility, the information specified in paragraphs (b)(i) and (ii) of this section.

i. The cumulative number of hours of operation or the number of months since initial startup, October 15, 2012, or since the previous reciprocating compressor rod packing replacement, whichever is later.

ii. Records of deviations specified in paragraph 40CFR§60.5420(c)(3)(iii) that occurred during the reporting period.

c. i. Within 60 days after the date of completing each performance test (see § 60.8 of this part) as required by this subpart you must submit the results of the performance tests required by this subpart to EPA's WebFIRE database by using the Compliance and Emissions Data Reporting Interface (CEDRI) that is accessed through EPA's Central Data Exchange (CDX) (*www.epa.gov/cdx*). Performance test data must be submitted in the file format generated through use of EPA's Electronic Reporting Tool (ERT) (see *http://www.epa.gov/ttn/chief/ert/index.html*). Only data collected using test methods on the ERT Web site are subject to this requirement for submitting reports electronically to WebFIRE. Owners or operators who claim that some of the information being submitted for performance tests is confidential business information (CBI) must submit a complete ERT file including information claimed to be CBI on a compact disk or other commonly used electronic storage media (including, but not limited to, flash drives) to EPA. The electronic media must be clearly marked as CBI and mailed to U.S. EPA/OAPQS/CORE CBI Office, Attention: WebFIRE Administrator, MD C404-02, 4930 Old Page Rd., Durham, NC 27703. The same ERT file with the CBI omitted must be submitted to EPA via CDX as described earlier in this paragraph. At the discretion of the delegated authority, you must also submit these reports, including the confidential business information, to the delegated authority in the format specified by the delegated authority.

ii. All reports required by this subpart not subject to the requirements in 40CFR§60.5420(a)(2)(i) must be sent to the Administrator at the appropriate address listed in § 63.13 of this part. The Administrator or the delegated authority may request a report in any form suitable for the specific case (e.g., by commonly used electronic media such as Excel spreadsheet, on CD or hard copy). The Administrator retains the right to require submittal of reports subject to paragraph 40CFR§§60.5420(a)(2)(i) and (ii) of this section in paper format.

[40CFR§§60.5420(b)(1), (b)(4), and (b)(7); 45CSR16; 45CSR13, R13-3070, 9.4.2.]

7.5.3. What are my additional reporting requirements for my affected facility subject to VOC requirements for onshore natural gas processing plants?

a. You must comply with the requirements of paragraphs (b) and (c) of this section in addition to the requirements of §§60.487a(a), (b), (c)(2)(i) through (iv), and (c)(2)(vii) through (viii).

b. An owner or operator must include the following information in the initial semiannual report in addition to the information required in §§60.487a(b)(1) through (4): Number of pressure relief devices subject to the requirements of § 60.5401(b) except for those pressure relief devices designated for no detectable emissions under the provisions of § 60.482-4a(a) and those pressure relief devices complying with § 60.482-4a(c).

c. An owner or operator must include the following information in all semiannual reports in addition to the information required in §§60.487a(c)(2)(i) through (vi):

2. Number of pressure relief devices for which leaks were detected as required in § 60.5401(b)(2); and

3. Number of pressure relief devices for which leaks were not repaired as required in § 60.5401(b)(3).

[40CFR§60.5422; 45CSR16; 45CSR13, R13-3070, 9.4.5.; 15E]

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment E

Emission Unit Form

Emission Unit Description		V-01 (16E)
Emission unit ID numbe V-01 (16E)	**Emission unit name:** Amine Process Unit (APU) - Acid Gas	**List any control devices associated with this emission unit:** na

Provide a description of the emissions unit (type. Method of operation, design parameters, etc.):

The ethane product stream is processed in an amine treatment unit to remove carbon dioxide (CO2) prior to off-site shipment via pipeline. The acid gas (>95% CO2) is vented to the atmosphere. The flash gas (>96% Ethane) is routed to the flare.

Manufacturer:	**Model number:**	**Serial number(s):**
na	na	na
Construction date:	**Installation date:**	**Modification date(s):**
na	2013	na

Design Capacity (examples: furnaces - tons/hr, tanks - gallons):

na

Maximum Hourly Throughput:	**Maximum Annual Throughput:**	**Maximum Operating Schedule:**
na	na	8,760 hr/yr

Fuel Usage Data (fill out all applicable fields)

Does this emission unit combust fuel? ___ Yes _X_No	**If yes, is it?** Na ___ Indirect Fired ___Direct Fired
Maximum design heat input and/or maximum horsepower rating: na	**Type and Btu/hr rating of burners:** na

List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each.

na

Describe each fuel expected to be used during the term of the permit.

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
na			

Attachment E

Emission Unit Form (Continued)

Emission Data		V-01 (16E)
Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	---	---
Nitrogen Oxides (NOX)	---	---
Lead (Pb)	---	---
Particulate Matter (PM2.5)	---	---
Particulate Matter (PM10)	---	---
Total Particulate Matter (TSP)	---	---
Sulfur Dioxide (SO2)	---	---
Volatile Organic Compounds (VOC)	0.47	2.07
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	---	---
Ethylbenzene	---	---
Formaldehyde (HCHO)	---	---
n-Hexane	---	---
Toluene	---	---
2,2,4-Trimethylpentane (TMP)	---	---
Xylenes	---	---
Other HAP	---	---
Total HAP	---	---
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	1,313	5,750
Methane (CH4) (GWP=25)	0.01	0.06
Nitrous Oxide (N2O) (GWP=298)	---	---
CO2 Equivalent (CO2e)	1,313	5,751

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Vendor data (DOW ProComp Software) was utilized to develop emissions factors.

Applicable Requirements **V-01 (16E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM05 (Oak Grove Gas Plant)

8.0 Amine Process Vent [emission point ID(s): 16E]

8.1. Limitations and Standards

8.1.1. **Maximum Throughput Limitation.** The maximum ethane feedstock to the amine system shall not exceed 44,000 barrels/day.
[45CSR13, R13-3070, 10.1.1.]

8.1.2. The amine system (16E) shall be designed and operated in accordance with the following:

a. Carbon dioxide will be removed from the ethane product in an amine contacting system.

b. The total ethane product shall be contacted with a amine solution in the contactor where the carbon dioxide in the ethane product is removed.

c. The rich amine from the Contactor is regenerated in the Amine Regenerator where heat input is used to drive the carbon dioxide and water overhead and vented to the atmosphere.

d. The lean amine from the bottom of the Regenerator is recycled back to the Amine Contactor.

[45CSR13, R13-3070, 10.1.2.]

8.1.3. Maximum emissions from the Amine System (16E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Volatile Organic Compounds	~~0.11~~ 0.47	~~0.49~~ 2.07

[45CSR13, R13-3070, 10.1.3.]

_X_ Permit Shield

Applicable Requirements **V-01 (16E)**

For all applicable requirements listed above, provide monitoring/testing/recordkeeping/reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number or citation.
(Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

WVDEP-DAQ Permit R30-05100157-MM05 (Oak Grove Gas Plant)

8.2. Monitoring Requirements

8.2.1. The permittee shall monitor the throughput of ethane feedstock fed to the Amine Process (16E) on a monthly basis.
[45CSR13, R13-3070, 10.2.1.]

8.3. Testing Requirements

8.3.1. N/A

8.4. Recordkeeping Requirements

8.4.1. The permittee shall maintain a record of the ethane product throughput to the Amine Process Vent (16E) to demonstrate compliance with section 8.1.1 of this permit. Said records shall be maintained for a period of five (5) years on site or in a readily accessible off-site location maintained by the permittee. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment E

Emission Unit Form

Emission Unit Description		**TL-1 (14E)**
Emission unit ID numbe TL-1 (14E)	**Emission unit name:** Slop Oil/Condensate Truck Load-Out	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): Slop Oil/Condensate Truck Load-Out		
Manufacturer: na	**Model number:** na	**Serial number(s):** na
Construction date: na	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): na		
Maximum Hourly Throughput: na	**Maximum Annual Throughput:** 4,000,000 gal/yr	**Maximum Operating Schedule:** na
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? ___ Yes _X_No		**If yes, is it?** Na ___ Indirect Fired ___Direct Fired
Maximum design heat input and/or maximum horsepower rating: na		**Type and Btu/hr rating of burners:** na
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. na		
Describe each fuel expected to be used during the term of the permit.		

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
na			

Emission Unit Form (Continued)

Emission Data **TL-1 (14E)**

Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	---	---
Nitrogen Oxides (NOX)	---	---
Lead (Pb)	---	---
Particulate Matter (PM2.5)	---	---
Particulate Matter (PM10)	---	---
Total Particulate Matter (TSP)	---	---
Sulfur Dioxide (SO2)	---	---
Volatile Organic Compounds (VOC)	27.13	18.09
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	0.90	0.60
Ethylbenzene	0.90	0.60
Formaldehyde (HCHO)	---	---
n-Hexane	0.90	0.60
Toluene	0.90	0.60
2,2,4-Trimethylpentane (TMP)	0.90	0.60
Xylenes	0.90	0.60
Other HAP	---	---
Total HAP	5.43	3.62
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	---	---
Methane (CH4) (GWP=25)	---	---
Nitrous Oxide (N2O) (GWP=298)	---	---
CO2 Equivalent (CO2e)	---	---

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

EPA emissions factors, AP-42, and Mass Balance.

Emission Unit Form (Continued)

Applicable Requirements **TL-1 (14E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

9.0 Truck Loadout [emission point ID(s): 14E]

9.1. Limitations and Standards

9.1.1. The maximum quantity of slop oil (condensate) that shall be loaded (14E) shall not exceed 4,000,000 gallons per year.
[45CSR13, R13-3070, 11.1.1.]

9.1.2. The Truck Loadout (14E) shall be operated in accordance with the plans and specifications filed in Permit Application R13-3070~~A~~B unless the changes do not meet the definition of a modification in 45CFR13.
[45CSR13, R13-3070, 11.1.2.]

_X_ Permit Shield

For all applicable requirements listed above, provide monitoring/testing/recordkeeping/reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number or citation.
(Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

9.2. Monitoring Requirements

9.2.1. N/A

9.3. Testing Requirements

9.3.1. N/A

9.4. Recordkeeping Requirements

9.4.1. For the purpose of demonstrating compliance with section 9.1.1, the permittee shall maintain records of the amount of slop oil (condensate) loaded from the Truck Loadout (14E).
[45CSR13, R13-3070, 11.2.1.]

9.4.2. All records required under Section 9.4 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
[45CSR13, R13-3070, 11.2.2.]

9.5. Reporting Requirements

9.5.1. N/A

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment E

Emission Unit Form

Emission Unit Description		**TK-1 (10E) thru TK-4 (13E)**
Emission unit ID numbe TK-1 (10E) thru TK-4 (13E)	**Emission unit name:** 4 x 400 bbl Slop Oil/Condensate Storage Tanks	**List any control devices associated with this emission unit:** na
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): 4 x 400 bbl Slop Oil/Condensate Storage Tanks		
Manufacturer: na	**Model number:** na	**Serial number(s):** na
Construction date: na	**Installation date:** 2013	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): 400 bbl (aech)		
Maximum Hourly Throughput: na	**Maximum Annual Throughput:** 4,000,000 gal/yr total tanks	**Maximum Operating Schedule:** 8,760 hr/yr
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? ___ Yes _X_No		**If yes, is it?** na ___ Indirect Fired ___Direct Fired
Maximum design heat input and/or maximum horsepower rating: na		**Type and Btu/hr rating of burners:** na
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each. na		
Describe each fuel expected to be used during the term of the permit.		

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
na			

Emission Unit Form (Continued)

Emission Data		TK-1 (10E) thru TK-4 (13E)
Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	---	---
Nitrogen Oxides (NOX)	---	---
Lead (Pb)	---	---
Particulate Matter (PM2.5)	---	---
Particulate Matter (PM10)	---	---
Total Particulate Matter (TSP)	---	---
Sulfur Dioxide (SO2)	---	---
Volatile Organic Compounds (VOC)	4.33	18.96
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	0.14	0.63
Ethylbenzene	0.14	0.63
Formaldehyde (HCHO)	---	---
n-Hexane	0.14	0.63
Toluene	0.14	0.63
2,2,4-Trimethylpentane (TMP)	0.14	0.63
Xylenes	0.14	0.63
Other HAP	---	---
Total HAP	0.87	3.79
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	---	---
Methane (CH4) (GWP=25)	---	---
Nitrous Oxide (N2O) (GWP=298)	---	---
CO2 Equivalent (CO2e)	---	---

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

Vendor data and AP-42

Applicable Requirements **TK-1 (10E) thru TK-4 (13E)**

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

10.0 Storage Tanks [emission point ID(s): 10E-13E]

10.1. Limitations and Standards

10.1.1. The maximum throughput to the storage tanks (10E-13E) shall not exceed the following:

Emission Point ID#	Emission Unit Description	Maximum Annual Throughput (gallons/year)
10E	Slop Oil (Condensate) Tank (00-ST-826)	1,000,000
11E	Slop Oil (Condensate) Tank (00-ST-827)	1,000,000
12E	Slop Oil (Condensate) Tank (00-ST-844)	1,000,000
13E	Slop Oil (Condensate) Tank (00-ST-845)	1,000,000

[45CSR13, R13-3070, 12.1.1.]

_X_ Permit Shield

For all applicable requirements listed above, provide monitoring/testing/recordkeeping/reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number or citation.
(Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

10.2. Monitoring Requirements

10.2.1. N/A

10.3. Testing Requirements

10.3.1. N/A

10.4. Recordkeeping Requirements

10.4.1. For the purpose of demonstrating compliance with section 10.1.1, the permittee shall maintain records of the maximum tank throughput of the storage tanks (10E-13E).
[45CSR13, R13-3070, 12.2.1.]

10.4.2. All records required under Section 10.4 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
[45CSR13, R13-3070, 12.2.2.]

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment E
Emission Unit Form

Emission Unit Description		**CE-01 (22E), RPC-3 (23E), SSM-2 (24E), FUG-3 (25E) FCS**
Emission unit ID number: CE-01 (22E), RPC-3 (23E), SSM-2 (24E), and FUG-3 (25E)	**Emission unit name:** Compressor Engine, Rod Packing/ Crankcase, Start/Stop, and Fugitives	**List any control devices associated with this emission unit:** 1-OxCat
Provide a description of the emissions unit (type. Method of operation, design parameters, etc.): Natural Gas-Fired Compressor Engine		
Manufacturer: Caterpillar (CAT)	**Model number:** G3516B 4SLB	**Serial number(s):**
Construction date: 2015	**Installation date:** 2016	**Modification date(s):** na
Design Capacity (examples: furnaces - tons/hr, tanks - gallons): 1,380 bhp		
Maximum Hourly Throughput: na	**Maximum Annual Throughput:** na	**Maximum Operating Schedule:** 8,760 hr/hr
Fuel Usage Data (fill out all applicable fields)		
Does this emission unit combust fuel? _X_ Yes ___No		**If yes, is it?** ___ Indirect Fired _X_Direct Fired
Maximum design heat input and/or maximum horsepower rating: 1,380 bhp		**Type and Btu/hr rating of burners:** na
List the primary fuel type(s) and if applicable, the secondary fuel type(s). For each fuel type listed, provide the maximum hourly and annual fuel usage for each.		
Describe each fuel expected to be used during the term of the permit.		

Fuel Type	Max Sulfur Content	Max Ash Content	BTU Value
Natural Gas	<0.1%	na	1,020 Btu/scf

Emission Unit Form (Continued)

Emission Data	CE-01 (22E), RPC-3 (23E), SSM-2 (24E), FUG-3 (25E) FCS	
Criteria Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Monoxide (CO)	0.89	3.89
Nitrogen Oxides (NOX)	1.52	6.66
Lead (Pb)	---	---
Particulate Matter (PM2.5)	0.11	0.49
Particulate Matter (PM10)	0.11	0.49
Total Particulate Matter (TSP)	0.11	0.49
Sulfur Dioxide (SO2)	0.01	0.03
Volatile Organic Compounds (VOC)	1.29	5.64
Hazardous Air Pollutants	**Pollutant Emissions**	
	PPH	**TPY**
Benzene	1E-03	0.01
Ethylbenzene	1E-04	6E-04
Formaldehyde (HCHO)	4E-01	1.60
n-Hexane	4E-03	0.02
Toluene	1E-03	0.01
2,2,4-Trimethylpentane (TMP)	8E-04	4E-03
Xylenes	6E-04	3E-03
Other HAP	0.06	0.25
Total HAP	0.43	1.89
Regulated Pollutants other than Criteria and HAP	**Pollutant Emissions**	
	PPH	**TPY**
Carbon Dioxide (CO2)	1,530	6,703
Methane (CH4) (GWP=25)	7.27	31.85
Nitrous Oxide (N2O) (GWP=298)	2E-03	0.01
CO2 Equivalent (CO2e)	1,713	7,502

List the method(s) used to calculate the potential emissions (include dates of any stack tests conducted, versions of software used, source and dates of emission factors, etc.).

List all applicable requirements for this emission unit. For each applicable requirement, include the underlying rule/regulation citation and/or construction permit with the condition number.
(Note: Title V permit condition numbers alone are not the underlying applicable requirements).
If an emission limit is calculated based on the type of source and design capacity or if a standard is based on a design parameter, this information should also be included.

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

11.0 Francis Compressor Station [emission point ID(s): 22E-25E]

11.1. Limitations and Standards

11.1.1. The emission units/sources shall be installed, maintained, and operated so as to minimize any fugitive escape of pollutants, shall not exceed the listed maximum design capacities, and shall use (if applicable) the specified control devices.
[45CSR13, R13-3289, 4.1.1.]

11.1.2. **Compressor Engine**
The compressor engine, identified as CE-01, shall meet the following requirements:

a. The engine shall be a Caterpillar, G3516B 4SLB 1,380 hp compressor engine and shall only be fired by natural gas;

b. At all times the engine is in operation, a Catalytic Combustion Corporation Model REM-2415F-D-32HB-HFX4 oxidation catalyst (or one with at least as effective emissions control) shall be used for emissions control. If a different Make/Model of emission control device is used, prior to operation with the new control device, a vendor specification sheet shall be submitted to the DAQ verifying the new post-control emissions of the engine;

c. The maximum emissions from the engine, as controlled by the oxidation catalyst specified under 11.1.2(b), shall not exceed the limits given in the following table:

Table 11.1.2(c): Compressor Engine Emission Limits

Pollutant	PPH(1)	TPY
CO	0.89	3.89
NOx	1.52	6.66
$PM_{2.5}/PM_{10}/PM$(2)	0.11	0.49
VOC	1.29	5.64
Formaldehyde	0.37	1.60

(1) PPH emissions based on specific model of engine, engine size, and control technology.
(2) Includes condensables.

Compliance with the emission limits for NO_x, CO, and VOC will ensure compliance with the limits in 40 CFR §60.4233(e).

d. As the annual emissions are based on 8,760 hours of operation, there is no annual limit on hours of operation or natural gas combusted on an annual basis;

e. The emission limitations specified in Table 11.1.2(c) shall apply at all times except during periods of start-up and shut-down provided that the duration of these periods does not exceed 30 minutes per occurrence. The permittee shall operate the engine in a manner consistent with good air pollution control practices for minimizing emissions at all times, including periods of start-up and shut-down. The emissions from start-up and shut-down shall be included in the twelve (12) month rolling total of emissions. The permittee shall comply with all applicable start-up and shut-down requirements in accordance with 40 CFR Part 60, Subpart JJJJ and 40 CFR Part 63, Subpart ZZZZ.

Continued ...

f. **40 CFR 60, Subpart JJJJ**
Owners and operators of stationary SI ICE with a maximum engine power greater than or equal to 75 KW (100 HP) (except gasoline and rich burn engines that use LPG) must comply with the emission standards in Table 1 to this subpart for their stationary SI ICE.
[45CSR16; 40 CFR §60.4233(e)]

g. **40 CFR 60, Subpart OOOOa**
You must reduce GHG (in the form of a limitation on emissions of methane) and VOC emissions by complying with the standards in paragraphs (a) through (d) of §63.5385a for each reciprocating compressor affected facility.

1. You must replace the reciprocating compressor rod packing according to either paragraph §§63.5385a(a)(1) or (2), or you must comply with paragraph §63.5385a(a)(3) of this section.

i. On or before the compressor has operated for 26,000 hours. The number of hours of operation must be continuously monitored beginning upon initial startup of your reciprocating compressor affected facility, or the date of the most recent reciprocating compressor rod packing replacement, whichever is later.
[45CSR16; 40 CFR §60.5385a(a)(1)]

ii. Prior to 36 months from the date of the most recent rod packing replacement, or 36 months from the date of startup for a new reciprocating compressor for which the rod packing has not yet been replaced.
[45CSR16; 40 CFR §60.5385a(a)(2)]

iii. Collect the methane and VOC emissions from the rod packing using a rod packing emissions collection system that operates under negative pressure and route the rod packing emissions to a process through a closed vent system that meets the requirements of §60.5411a(a) and (d).
[45CSR16; 40 CFR §60.5385a(a)(3)]

h. **40 CFR 63, Subpart ZZZZ**
An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section must meet the requirements of this part by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines or 40 CFR part 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under this part.
[45CSR34; 40 CFR §63.6590(c)]

1. A new or reconstructed stationary RICE located at an area source;
[45CSR34; 40 CFR §63.6590(c)(1)]

[45CSR13, R13-3289, 4.1.2.]

11.1.3. **Oxidation Catalysts**
Use of oxidation catalysts shall be in accordance with the following:

a. Lean-burn natural gas compressor engine(s) equipped with oxidation catalyst air pollution control devices shall be fitted with a closed-loop automatic air/fuel ratio feedback controller to ensure emissions of regulated pollutants do not exceed the emission limits listed under Table 11.1.2(c) for any engine/oxidation catalyst combination under varying load. The closed-loop, automatic air/fuel ratio controller shall control a fuel metering valve to ensure a lean-rich mixture;

b. For natural gas compressor engine(s), the permittee shall monitor the temperature to the inlet of the catalyst and in accordance with manufacturer's specifications; a high temperature alarm shall shut off the engine before thermal deactivation of the catalyst occurs. If the engine shuts off due to high temperature, the permittee shall also check for thermal deactivation of the catalyst before normal operations are resumed; and

c. The permittee shall follow a written operation and maintenance plan that provides the periodic and annual maintenance requirements of the oxidation catalyst (this plan may be based on manufacturer's recommendations on operation and maintenance).

Continued ...

[45CSR13, R13-3289, 4.1.3.]

11.1.4. **Fugitive Emissions**
The permittee shall mitigate the release of fugitive emissions according to the following requirements:

a. The permittee shall not exceed, at the Francis Compressor Station, the number and type of components (valves, pump seals, connectors, etc.) in gas/vapor or light liquid (as applicable) listed in Attachment N of Permit Application R13-3289, unless an increase in components does not result in an emissions increase in excess of the amounts listed under 45CSR§13-2.17(a) or (b) that would define the increase as a modification;

b. The permittee shall install, maintain, and operate all above-ground piping, valves, pumps, etc. that service lines in the transport of potential sources of regulated air pollutants to minimize any fugitive escape of regulated air pollutants (leak). Any above-ground piping, valves, pumps, etc. that shows signs of excess wear and that have a reasonable potential for fugitive emissions of regulated air pollutants shall be repaired or replaced as needed;

c. The number of compressor blowdowns and cold starts at the Francis Compressor Station shall each not exceed 208 events per year. However, in lieu of the event limits given in this section, if the permittee can accurately determine the quantity of gas released during each event, the permittee may show compliance with 11.1.4(c) by limiting total annual gas released to less than 1,930 mscf; and

d. The permittee shall meet the given control effectiveness on the specified components by instituting an LDAR program meeting the following leak definitions:

Table 11.1.4(d): LDAR Control Effectiveness[1]

Component - Service	Control %	Leak Definition
Valves - Gas	92	500 ppm_v
Valves - Light Liquid	88	500 ppm_v
Pumps - Light Liquid	69	10,000 ppm_v[2]
Connectors - All Services	93	500 ppm_v

(1) As based on Table 5-2 of document EPA-453/R-95-017 - "Protocol for Equipment Leak Emission Estimates."
(2) As based on monthly monitoring.

e. Due to the Francis Compressor Station being located at a onshore natural gas processing plant (Oak Grove Natural Gas Processing Facility), ~~the permittee shall meet all requirements as given under 40 CFR 60, Subpart OOOOa that incorporate the LDAR requirements of Subpart VVa applicable to equipment and processes at the Francis Compressor Station.~~ pursuant to §60.5401a(f)(2), the permittee shall meet all the LDAR requirements as given under 40 CFR 60, Subpart OOOOa, Section §60.5400a. If, due to action taken by USEPA or through litigation, Subpart OOOOa becomes no longer applicable to the components listed under Table 11.1.4(d), the components listed under Table 11.1.4(d) will meet the requirements given for those components under 40 CFR 60, Subpart VVa.
[45CSR13, R13-3289, 4.1.4.]

11.1.5. The permittee must operate and maintain stationary SI ICE that achieve the emission standards as required in §60.4233 over the entire life of the engine.
[45CSR16; 40CFR§60.4234]

11.1.6. Table 3 to 40 C.F.R. 60, Subpart JJJ shows which parts of the General Provisions in §§60.1 through 60.19. apply to this facility.
[45CSR16; 40CFR§60.4246]

Applicable Requirements	CE-01 (22E), RPC-3 (23E), SSM-2 (24E), FUG-3 (25E) FCS

For all applicable requirements listed above, provide monitoring/testing/recordkeeping/reporting which shall be used to demonstrate compliance. If the method is based on a permit or rule, include the condition number or citation.
(Note: Each requirement listed above must have an associated method of demonstrating compliance. If there is not already a required method in place, then a method must be proposed.)

WVDEP-DAQ Permit R30-05100157-MM03 and MM04 (Oak Grove Gas Plant)

11.2. Monitoring Requirements

11.2.1. **Oxidation Catalyst**
The permittee shall meet the following Monitoring, Compliance Demonstration, Recording and Reporting Requirements for the oxidation catalyst:

a. The permittee shall regularly inspect, properly maintain and/or replace catalytic reduction devices and auxiliary air pollution control devices to ensure functional and effective operation of each compressor engine's physical and operational design. The permittee shall ensure proper operation, maintenance and performance of catalytic reduction devices and auxiliary air pollution control devices by:

2. Maintaining proper operation of the automatic air/fuel ratio controller or automatic feedback controller.

3. Following the catalyst manufacturer emissions related operating and maintenance recommendations, or develop, implement, or follow a site-specific maintenance plan.

b. To demonstrate compliance with section 11.1.3, the permittee shall maintain records of the maintenance performed on each RICE and/or generator; and

c. To demonstrate compliance with section 11.1.3(c), the permittee shall maintain a copy of the site specific maintenance plan or manufacturer maintenance plan.

[45CSR13, R13-3289, 4.2.1.]

11.2.2. **40 CFR 60, Subpart JJJJ**
The permittee shall comply with all applicable monitoring, compliance demonstration and record-keeping requirements as given under 40 CFR 60, Subpart JJJJ including the following:

If you are an owner or operator of a stationary SI internal combustion engine and must comply with the emission standards specified in §60.4233(d) or (e), you must demonstrate compliance according to one of the methods specified in paragraphs (b)(1) and (2) of this section.
[45CSR16; 40 CFR §60.4243(b)]

a. Purchasing a non-certified engine and demonstrating compliance with the emission standards specified in §60.4233(d) or (e) and according to the requirements specified in §60.4244, as applicable, and according to paragraphs (b)(2)(i) and (ii) of this section.
[45CSR16; 40 CFR §60.4243(b)(2)]

1. If you are an owner or operator of a stationary SI internal combustion engine greater than 500 HP, you must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance.
[45CSR16; 40 CFR §60.4243(b)(2)(ii)]

[45CSR13, R13-3289, 4.2.2.]

Continued ...

11.2.3. For the purposes of determining compliance with 11.1.4(c), the permittee shall monitor and record the monthly and rolling twelve month records of the number of compressor blowdowns and cold starts at the facility. The information will further include the duration, estimated volume of gas vented, and reason for event.
[45CSR13, R13-3289, 4.2.3.]

11.3. Testing Requirements

11.3.1. At such reasonable time(s) as the Secretary may designate, in accordance with the provisions of 3.3 of this permit, the permittee shall conduct or have conducted test(s) to determine compliance with the emission limitations established in this permit and/or applicable regulations.
[45CSR13, R13-3289, 4.3.1.]

11.3.2. **Compressor Engine**
The permittee shall, pursuant to the timing and other requirements of 40 CFR 60, Subpart JJJJ, conduct, or have conducted, performance testing on the compressor engine to determine the emission rates of CO, NO_x, and VOCs. The testing shall, in addition to meeting all applicable requirements under 40 CFR 60, Subpart JJJJ, be in accordance with 3.3.1. Results of the this performance testing shall, unless granted in writing a waiver by the Director, be used to determine compliance with the CO, NO_x, and VOC emission limits given under 11.1.2(c).
[45CSR13, R13-3289, 4.3.2.]

11.3.3. Owners and operators of stationary SI ICE who conduct performance tests must follow the procedures in paragraphs (a) through (f) of this section.

a. Each performance test must be conducted within 10 percent of 100 percent peak (or the highest achievable) load and according to the requirements in §60.8 and under the specific conditions that are specified by Table 2 to this subpart.

Table 2 to Subpart JJJJ of Part 60—Requirements for Performance Tests

For each	Complying with the requirement to	The permittee must	Using	According to the following requirements
1. Stationary SI internal combustion engine demonstrating compliance according to §60.4244.	a. limit the concentration of NO_X in the stationary SI internal combustion engine exhaust.	i. Select the sampling port location and the number/location of traverse points at the exhaust of the stationary internal combustion engine;	(1) Method 1 or 1A of 40 CFR part 60, appendix A-1, if measuring flow rate	(a) Alternatively, for NO_X, O_2, and moisture measurement, ducts ≤6 inches in diameter may be sampled at a single point located at the duct centroid and ducts >6 and ≤12 inches in diameter may be sampled at 3 traverse points located at 16.7, 50.0, and 83.3% of the measurement line ('3-point long line'). If the duct is >12 inches in diameter *and* the sampling port location meets the two and half-diameter criterion of Section 11.1.1 of Method 1 of 40 CFR part 60, appendix A, the duct

Continued ...

For each	Complying with the requirement to	The permittee must	Using	According to the following requirements
				may be sampled at '3-point long line'; otherwise, conduct the stratification testing and select sampling points according to Section 8.1.2 of Method 7E of 40 CFR part 60, appendix A.
		ii. Determine the O_2 concentration of the stationary internal combustion engine exhaust at the sampling port location;	(2) Method 3, 3A, or 3B[b] of 40 CFR part 60, appendix A-2 or ASTM Method D6522-00 (Reapproved 2005)[ae]	(b) Measurements to determine O_2 concentration must be made at the same time as the measurements for NO_X concentration.
		iii. If necessary, determine the exhaust flowrate of the stationary internal combustion engine exhaust;	(3) Method 2 or 2C of 40 CFR part 60, appendix A-1 or Method 19 of 40 CFR part 60, appendix A-7	
		iv. If necessary, measure moisture content of the stationary internal combustion engine exhaust at the sampling port location; and	(4) Method 4 of 40 CFR part 60, appendix A-3, Method 320 of 40 CFR part 63, appendix A, or ASTM Method D 6348-03[e]	(c) Measurements to determine moisture must be made at the same time as the measurement for NO_X concentration.
		v. Measure NO_X at the exhaust of the stationary internal combustion engine; if using a control device, the sampling site must be located at the outlet of the control device.	(5) Method 7E of 40 CFR part 60, appendix A-4, ASTM Method D6522-00 (Reapproved 2005)[ae], Method 320 of 40 CFR part 63, appendix A, or ASTM Method D 6348-03[e]	(d) Results of this test consist of the average of the three 1-hour or longer runs.
	b. limit the concentration of CO in the stationary SI internal combustion engine exhaust.	i. Select the sampling port location and the number/location of traverse points at the exhaust of the stationary internal combustion engine;	(1) Method 1 or 1A of 40 CFR part 60, appendix A-1, if measuring flow rate	(a) Alternatively, for CO, O_2, and moisture measurement, ducts ≤6 inches in diameter may be sampled at a single point located at the duct centroid and ducts >6 and ≤12 inches in diameter may be sampled at 3 traverse points located at 16.7, 50.0, and 83.3% of the measurement line ('3-point long line'). If the duct is >12 inches in diameter *and* the sampling port location meets the two and half-diameter criterion of Section 11.1.1 of Method 1 of 40 CFR part 60, appendix A, the duct may be sampled at '3-point long line'; otherwise, conduct the stratification testing and select sampling points according to Section 8.1.2 of Method 7E of 40 CFR part 60, appendix A.

Continued ...

For each	Complying with the requirement to	The permittee must	Using	According to the following requirements
		ii. Determine the O_2 concentration of the stationary internal combustion engine exhaust at the sampling port location;	(2) Method 3, 3A, or 3B[b] of 40 CFR part 60, appendix A-2 or ASTM Method D6522-00 (Reapproved 2005)[ae]	(b) Measurements to determine O_2 concentration must be made at the same time as the measurements for CO concentration.
		iii. If necessary, determine the exhaust flowrate of the stationary internal combustion engine exhaust;	(3) Method 2 or 2C of 40 CFR part 60, appendix A-1 or Method 19 of 40 CFR part 60, appendix A-7	
		iv. If necessary, measure moisture content of the stationary internal combustion engine exhaust at the sampling port location; and	(4) Method 4 of 40 CFR part 60, appendix A-3, Method 320 of 40 CFR part 63, appendix A, or ASTM Method D 6348-03[e]	(c) Measurements to determine moisture must be made at the same time as the measurement for CO concentration.
		v. Measure CO at the exhaust of the stationary internal combustion engine; if using a control device, the sampling site must be located at the outlet of the control device.	(5) Method 10 of 40 CFR part 60, appendix A4, ASTM Method D6522-00 (Reapproved 2005)[ae], Method 320 of 40 CFR part 63, appendix A, or ASTM Method D 6348-03[e]	(d) Results of this test consist of the average of the three 1-hour or longer runs.
	c. limit the concentration of VOC in the stationary SI internal combustion engine exhaust	i. Select the sampling port location and the number/location of traverse points at the exhaust of the stationary internal combustion engine;	(1) Method 1 or 1A of 40 CFR part 60, appendix A-1, if measuring flow rate	(a) Alternatively, for VOC, O_2, and moisture measurement, ducts ≤6 inches in diameter may be sampled at a single point located at the duct centroid and ducts >6 and ≤12 inches in diameter may be sampled at 3 traverse points located at 16.7, 50.0, and 83.3% of the measurement line ('3-point long line'). If the duct is >12 inches in diameter and the sampling port location meets the two and half-diameter criterion of Section 11.1.1 of Method 1 of 40 CFR part 60, appendix A, the duct may be sampled at '3-point long line'; otherwise, conduct the stratification testing and select sampling points according to Section 8.1.2 of Method 7E of 40 CFR part 60, appendix A.
		ii. Determine the O_2 concentration of the stationary internal combustion engine exhaust at the sampling port location;	(2) Method 3, 3A, or 3B[b] of 40 CFR part 60, appendix A-2 or ASTM Method D6522-00 (Reapproved 2005)[ae]	(b) Measurements to determine O_2 concentration must be made at the same time as the measurements for VOC concentration.

Continued ...

For each	Complying with the requirement to	The permittee must	Using	According to the following requirements
		iii. If necessary, determine the exhaust flowrate of the stationary internal combustion engine exhaust;	(3) Method 2 or 2C of 40 CFR part 60, appendix A-1 or Method 19 of 40 CFR part 60, appendix A-7	
		iv. If necessary, measure moisture content of the stationary internal combustion engine exhaust at the sampling port location; and	(4) Method 4 of 40 CFR part 60, appendix A-3, Method 320 of 40 CFR part 63, appendix A, or ASTM Method D 6348-03[e]	(c) Measurements to determine moisture must be made at the same time as the measurement for VOC concentration.
		v. Measure VOC at the exhaust of the stationary internal combustion engine; if using a control device, the sampling site must be located at the outlet of the control device.	(5) Methods 25A and 18 of 40 CFR part 60, appendices A-6 and A-7, Method 25A with the use of a methane cutter as described in 40 CFR 1065.265, Method 18 of 40 CFR part 60, appendix A-6[cd], Method 320 of 40 CFR part 63, appendix A, or ASTM Method D 6348-03[e]	(d) Results of this test consist of the average of the three 1-hour or longer runs.

[a]Also, you may petition the Administrator for approval to use alternative methods for portable analyzer.

[b]You may use ASME PTC 19.10-1981, Flue and Exhaust Gas Analyses, for measuring the O2 content of the exhaust gas as an alternative to EPA Method 3B. AMSE PTC 19.10-1981 incorporated by reference, see 40 CFR 60.17

[c]You may use EPA Method 18 of 40 CFR part 60, appendix A-6, provided that you conduct an adequate pre-survey test prior to the emissions test, such as the one described in OTM 11 on EPA's Web site (http://www.epa.gov/ttn/emc/prelim/otm11.pdf).

[d]You may use ASTM D6420-99 (2004), Test Method for Determination of Gaseous Organic Compounds by Direct Interface Gas Chromatography/Mass Spectrometry as an alternative to EPA Method 18 for measuring total nonmethane organic. ASTM D6420-99(2004) incorporated by reference; see 40 CFR 60.17.

[e]Incorporated by reference; see 40 CFR 60.17.

b. You may not conduct performance tests during periods of startup, shutdown, or malfunction, as specified in §60.8(c). If your stationary SI internal combustion engine is non-operational, you do not need to startup the engine solely to conduct a performance test; however, you must conduct the performance test immediately upon startup of the engine.

c. You must conduct three separate test runs for each performance test required in this section, as specified in §60.8(f). Each test run must be conducted within 10 percent of 100 percent peak (or the highest achievable) load and last at least 1 hour.

d. To determine compliance with the NO_X mass per unit output emission limitation, convert the concentration of NO_X in the engine exhaust using Equation 1 of this section:

$$ER = \frac{C_d \times 1.912 \times 10^{-3} \times Q \times T}{HP - hr} \qquad \text{(Eq. 1)}$$

Continued ...

Where:

ER = Emission rate of NO_X in g/HP-hr.

C_d = Measured NO_X concentration in parts per million by volume (ppmv).

1.912×10^{-3} = Conversion constant for ppm NO_X to grams per standard cubic meter at 20 degrees Celsius.

Q = Stack gas volumetric flow rate, in standard cubic meter per hour, dry basis.

T = Time of test run, in hours.

HP-hr = Brake work of the engine, horsepower-hour (HP-hr).

e. To determine compliance with the CO mass per unit output emission limitation, convert the concentration of CO in the engine exhaust using Equation 2 of this section:

$$ER = \frac{C_d \times 1.164 \times 10^{-3} \times Q \times T}{HP - hr} \quad \text{(Eq. 2)}$$

Where:

ER = Emission rate of CO in g/HP-hr.

C_d = Measured CO concentration in ppmv.

1.164×10^{-3} = Conversion constant for ppm CO to grams per standard cubic meter at 20 degrees Celsius.

Q = Stack gas volumetric flow rate, in standard cubic meters per hour, dry basis.

T = Time of test run, in hours.

HP-hr = Brake work of the engine, in HP-hr.

f. For purposes of this subpart, when calculating emissions of VOC, emissions of formaldehyde should not be included. To determine compliance with the VOC mass per unit output emission limitation, convert the concentration of VOC in the engine exhaust using Equation 3 of this section:

$$ER = \frac{C_d \times 1.833 \times 10^{-3} \times Q \times T}{HP - hr} \quad \text{(Eq. 3)}$$

Where:

ER = Emission rate of VOC in g/HP-hr.

C_d = VOC concentration measured as propane in ppmv.

1.833×10^{-3} = Conversion constant for ppm VOC measured as propane, to grams per standard cubic meter at 20 degrees Celsius.

Q = Stack gas volumetric flow rate, in standard cubic meters per hour, dry basis.

T = Time of test run, in hours.

HP-hr = Brake work of the engine, in HP-hr.

Continued ...

g. If the owner/operator chooses to measure VOC emissions using either Method 18 of 40 CFR part 60, appendix A, or Method 320 of 40 CFR part 63, appendix A, then it has the option of correcting the measured VOC emissions to account for the potential differences in measured values between these methods and Method 25A. The results from Method 18 and Method 320 can be corrected for response factor differences using Equations 4 and 5 of this section. The corrected VOC concentration can then be placed on a propane basis using Equation 6 of this section.

$$RF_i = \frac{C_{Mi}}{C_{Ai}} \qquad \text{(Eq. 4)}$$

Where:

RF_i = Response factor of compound i when measured with EPA Method 25A.

C_{Mi} = Measured concentration of compound i in ppmv as carbon.

C_{Ai} = True concentration of compound i in ppmv as carbon.

$$C_{icorr} = RF_i \times C_{imeas} \qquad \text{(Eq. 5)}$$

Where:

C_{icorr} = Concentration of compound i corrected to the value that would have been measured by EPA Method 25A, ppmv as carbon.

C_{imeas} = Concentration of compound i measured by EPA Method 320, ppmv as carbon.

$$C_{Peq} = 0.6098 \times C_{icorr} \qquad \text{(Eq. 6)}$$

Where:

C_{Peq} = Concentration of compound i in mg of propane equivalent per DSCM.

[45CSR16; 40CFR§60.4244]

11.4. Recordkeeping Requirements

11.4.1. **Record of Maintenance of Air Pollution Control Equipment.** 1-OXCAT, the permittee shall maintain accurate records of all required pollution control equipment inspection and/or preventative maintenance procedures.
[45CSR13, R13-3289, 4.4.2.]

11.4.2. The permittee must keep records of the following information:

a. All notifications submitted to comply with this subpart and all documentation supporting any notification.

b. Maintenance conducted on the engine.

c. If the stationary SI internal combustion engine is a certified engine, documentation from the manufacturer that the engine is certified to meet the emission standards and information as required in 40 CFR parts 90, 1048, 1054, and 1060, as applicable.

d. If the stationary SI internal combustion engine is not a certified engine or is a certified engine operating in a non-certified manner and subject to §60.4243(a)(2), documentation that the engine meets the emission standards.

Continued ...

[45CSR16; 40CFR§60.4245(a)]

Applicable Requirements **CE-01 (22E), RPC-3 (23E), SSM-2 (24E), FUG-3 (25E) FCS**

11.5. Reporting Requirements

11.5.1. Owners and operators of stationary SI ICE greater than or equal to 500 HP that have not been certified by an engine manufacturer to meet the emission standards in §60.4231 must submit an initial notification as required in §60.7(a)(1). The notification must include the information in paragraphs (c)(1) through (5) of this section.

a. Name and address of the owner or operator;

b. The address of the affected source;

c. Engine information including make, model, engine family, serial number, model year, maximum engine power, and engine displacement;

d. Emission control equipment; and

e. Fuel used.

[45CSR16; 40CFR§60.4245(c)]

11.5.2. Owners and operators of stationary SI ICE that are subject to performance testing must submit a copy of each performance test as conducted in §60.4244 within 60 days after the test has been completed.
[45CSR16; 40CFR§60.4245(d)]

11.6. Compliance Plan

11.6.1. N/A

Are you in compliance with all applicable requirements for this emission unit? _X_Yes ___No

If no, complete the **Schedule of Compliance Form** as **ATTACHMENT F**.

Attachment F

Compliance Schedule

(Not Applicable)

For each emission unit not in compliance with an applicable requirement, fill out a Schedule of Compliance Form as Attachment F.

Attachment G

Air Pollution Control Devices (APCD) Forms

For each control device listed in the Title V Equipment Table, fill out and provide an Air Pollution Control Device Form as Attachment G.

- Process Flare (FL-1 (08E))
- Oxidation Catalyst (1-OxCat (22E))

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Attachment G

Emission Unit Form

Emission Unit Description		**FL-1 (8E)**
Control device ID number: FL-01 (8E)	**List all emission units associated with this control device.** TXP Blowdowns TXP Start-Up and Dry-Out Balance of Plant (BOP) Volumes Filter Change-Out Compressor Maintenance Amine Unit Flash Gas Gas Pig Trap Blowdown Compressor Dry Gas Seals Other/Miscelaneous Off-Spec Ethane Liquid Pig Trap Blowdown TXP Tanks Liquid Dry-Out Pump Maintienance Purge Gas and Pilot Gas	
Manufacturer: Zeeco USA LLC	**Model number:** Flare Tip - AFTA-20/80 - Air Assist	**Installation date:** 2014

Type of Air Pollution Control Device:

___ Baghouse/Fabric Filter	___ Venturi Scrubber	___ Multicyclone
___ Carbon Bed Adsorber	___ Packed Tower Scrubber	___ Single Cyclone
___ Carbon Drum(s)	___ Other Wet Scrubber	___ Cyclone Bank
___ Catalytic Incinerator	___ Condenser	___ Settling Chamber
___ Thermal Incinerator	**_X_ Flare**	___ Other (describe) _____
___ Wet Plate Electrostatic Precipitator	___ Dry Plate Electrostatic Precipitator	

List the pollutants for which this device is intended to control and the capture and control efficiencies.

Pollutants	Capture Efficiency	Control Efficiency
VOC	100.0%	99.0%
V-HAP	100.0%	99.0%
CH4	100.0%	99.0%

Explain the characteristic design parameters of this control device (flow rates, pressure drops, number of bags, size, temperatures, etc.).

Design Flow Rate:	208,000 lb/hr (Peak)	Flare system is designed for 99% destruction efficiency
Design Smokeless Rate:	87,350 lb/hr	
Max Exit Velocity:	1,196 ft/sec	

Is this device subject to the CAM requirements of 40 C.F.R. 64? ___ Yes _X_ No

If Yes, Complete Attachment H na

If No, Provide justification:

This rule does not apply because there are no pollutant-specific emission units subject to an emissions limitation or standard (e.g., NSPS, NESHAP, HAP, NSR, PSD, SIP), with pre-controlled emissions greater than Title V major source thresholds, that require an add-on control device to achieve compliance.

Describe the parameters monitored and/or methods used to indicate performance of this control device.

The pilot flame shall be present at all times when emissions may be vented to it.
The presence of the pilot flame shall be monitored.
The flare shall be operated with no visible emissions except for a total of five minutes in any two consecutive minutes.

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Attachment G

Emission Unit Form

Emission Unit Description		**1-OxCat (CE-01 (22E)) (FCS)**
Control device ID number: 1-OxCat (CE-01 (22E)) (FCS)	**List all emission units associated with this control device.** CE-01 - 1,380 bhp CAT G3516B Compressor Engine	
Manufacturer: Catalytic Combustion	**Model number:** QT-115-2264-1	**Installation date:** 2016

Type of Air Pollution Control Device:

___ Baghouse/Fabric Filter	___ Venturi Scrubber	___ Multicyclone
___ Carbon Bed Adsorber	___ Packed Tower Scrubber	___ Single Cyclone
___ Carbon Drum(s)	___ Other Wet Scrubber	___ Cyclone Bank
___ Catalytic Incinerator	___ Condenser	___ Settling Chamber
___ Thermal Incinerator	___ Flare	_X_ **Other (describe):**
___ Wet Plate Electrostatic Precipitator	___ Dry Plate Electrostatic Precipitator	**Oxidation Catalyst**

List the pollutants for which this device is intended to control and the capture and control efficiencies.

Pollutants	Capture Efficiency	Control Efficiency
NOx	---	---
CO	100.0%	90.0%
VOC	100.0%	70.0%
Formaldehyde	100.0%	70.0%
V-HAP	100.0%	70.0%

Explain the characteristic design parameters of this control device (flow rates, pressure drops, number of bags, size, temperatures, etc.).

na

Is this device subject to the CAM requirements of 40 C.F.R. 64? ___ Yes _X_ No

If Yes, Complete Attachment H na

If No, Provide justification:

This rule does not apply because there are no pollutant-specific emission units subject to an emissions limitation or standard (e.g., NSPS, NESHAP, HAP, NSR, PSD, SIP), with pre-controlled emissions greater than Title V major source thresholds, that require an add-on control device to achieve compliance.

Describe the parameters monitored and/or methods used to indicate performance of this control device.

As per applicable requirements in NSPS JJJJ and NSPS OOOO.

Attachment H

Compliance Assurance Monitoring (CAM)

(Not Applicable)

Fill out and provide Compliance Assurance Monitoring (CAM) Form(s), if applicable, for each Pollutant Specific Emission Unit (PSEU) as Attachment H.

This rule does not apply because there are no pollutant-specific emission units subject to an emissions limitation or standard (e.g., NSPS, NESHAP, HAP, NSR, PSD, SIP), with pre-controlled emissions greater than Title V major source thresholds, that require an add-on control device to achieve compliance.

Supplement 01

Process Description

A. Project Overview

Oak Grove Gas Plant:

B. Stabilizer
C. Molecular Sieve Dehydration Unit
D. Cryogenic Turboexpansion (TXP) Process
E. Heaters
F. Process Flare
G. Standby Generator Engine
H. Storage Tanks
I. Truck Load-Out
J. Amine Process Unit
K. Compressor Rod Packing and Dry Gas Seal Leaks

Francis Compressor Station:

L. Compressor Engine Emissions – 1,380 bhp CAT G3516B (CE-01/22E) (FCS)
M. Compressor Rod Packing and Engine Crankcase Leaks (RPC-3/23E) (FCS)
N. Start/Stop/Maintenance (Including Blowdown) (SSM-2/24E) (FCS)
O. Piping and Equipment Fugitives (FUG-3/25E) (FCS)

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 01
Process Description

A. Project Overview

Williams Ohio Valley Midstream LLC owns and operates the Oak Grove Gas Plant (and co-located Francis Compressor Station) in Marshall County (See Attachment A – Area (Topo) Map). The facility is designed to process 600 MMscfd of natural gas received via pipeline. Three product streams are generated:

1. Residue Gas (i. e., dry, “clean”, methane (CH4)) is compressed for off-site shipment via natural gas transmission pipeline.
2. Ethane (C2H6) Liquid (amine treated to remove CO2) is pumped for off-site shipment via liquid pipeline.
3. Natural Gas Liquids (NGL (C3+), including stabilized condensate, are also pumped for off-site shipment via liquid pipeline.

Oak Grove Gas Plant:

B. Stabilizer

The facility operations commence with a slug catcher to remove free liquids from the inlet natural gas. The raw condensate stream enters the stabilizer unit where it is heated to remove the lighter end hydrocarbons (methane, ethane, and propane). These lighter end hydrocarbons are compressed and commingled with raw inlet gas for further processing. The stabilized condensate liquids are commingled with other natural gas liquids (NGLs) for off-site shipment.

The stabilizer is a totally enclosed system, so the only emissions are fugitives from piping and equipment. These emissions are controlled by implementation of a leak detection and repair (LDAR) program.

C. Molecular Sieve Dehydration Unit

Mole sieves are used to remove water from the inlet gas stream as requisite for the following cryogenic processes. The operation starts with the wet gas entering the adsorption tower at the top which contains the molecular sieve desiccant. The gas exits the bottom of the vessel dry. While one tower is adsorbing, the other tower is regenerating. For regeneration, gas is heated up to 550 ˚F and is sent to the tower in regeneration to extract the water from the molecular sieves. As the saturated gas leaves the top of the vessel, it is cooled in a condenser and then the condensed water is separated. The two towers switch between adsorbing and regenerating on a fixed cycle.

The mole sieves are totally enclosed systems, so the only emissions are fugitives from piping and equipment. These emissions are controlled by implementation of a leak detection and repair (LDAR) program.

D. Cryogenic Turboexpansion (TXP) Process

The cryogenic process utilizes an expansion turbine to drop the temperature of the Inlet Gas to approximately minus 120 degrees Fahrenheit. This rapid temperature drop condenses much of the ethane (C2H6) and most of the other hydrocarbons (primarily propane (C3H8), butane (C4H10) and pentane (C5H12)), with de-minimis hexane, benzene, toluene, ethyl-benzene, xylene, etc. (together C6+)), while maintaining methane (CH4) in gaseous form.

The TXPs are totally enclosed systems, so the only emissions are fugitives from piping and equipment. These emissions are controlled by implementation of a leak detection and repair (LDAR) program.

E. Heaters

Natural gas-fueled heaters are used at the facility in the various gas processing areas. Emissions are generated from combustion of natural gas.

F. Process Flare

The process flare is used to safely combust waste gas streams generated during routine operations, general maintenance activities, and in the event of an upset. The amount of gas routed to the flare during a given event will vary widely. Emissions are of two types:

1) Combustion gases estimated as per AP-42 emission factors, plus
2) Incomplete combustion gases estimated at 99% control efficiency.

G. Standby Generator Engine

A gas-fired (propane) standby generator is used to provide electrical power for various activities at the site in the event of loss of purchase power.

H. Storage Tanks

There are numerous tanks at the facility used to store various materials such as produced water, lube oil, heat medium (oil), amine, diesel fuel, and motor gasoline. The slop oil/condensate tanks are the only tanks with significant emissions to the atmosphere. All other storage tanks at the site have de-minimis emissions.

I. Truck Load-Out

There are de-minimis VOC emissions from truck loading of slop oil/condensate.

J. Amine Process Unit

The ethane product stream is further processed in an amine treatment unit to remove carbon dioxide (CO2) prior to off-site shipment via pipeline. The acid gas (>95% CO2) is vented to the atmosphere. The flash gas (>96% Ethane) is routed to the flare.

K. Compressor Rod Packing and Dry Gas Seal Leaks

Emissions are generated from reciprocating and centrifugal compressors that are utilized throughout the plant. The compressors generate emissions from the wear of mechanical joints, seals, and rotating surfaces over time. The rod packing leaks from the stabilized gas reciprocating compressors are routed to the Flare whereas the rod packing leaks from the regen gas compressors are vented to atmosphere.

Francis Compressor Station:

L. Compressor Engine Emissions – 1,380 bhp CAT G3516B (CE-01/22E) (FCS)

One (1) natural gas-fueled CAT G3516B compressor engine is proposed at the facility. This will be a new, four stroke, lean burn (4SLB) engine w/ an oxidation catalyst (OxCat).

M. Compressor Rod Packing and Engine Crankcase Leaks (RPC-3/23E) (FCS)

The compressors (engine and electric motor driven) and engine operations result in emissions from the wear of mechanical joints, seals, and rotating surfaces over time.

N. Start/Stop/Maintenance (Including Blowdown) (SSM-2/24E) (FCS)

During routine operation, the compressor engine will undergo periods of startup and shutdown. Often when the engine is shutdown, the natural gas contained within the compressor and associated piping is vented to the atmosphere. Similarly, the electric motor driven compressor will be blown down to atmosphere during periods of maintenance. Additionally, there will be other infrequent and (often) de-minimis emissions from various maintenance activities at the facility that are not necessarily associated with compressor blowdowns.

O. Piping and Equipment Fugitives (FUG-3/25E) (FCS)

Piping and process equipment generate leaks from different component types (connectors, valves, pumps, etc.)

Supplement 02

Regulatory Discussion

A. Applicability of New Source Review (NSR) Regulations

1. Prevention of Significant Deterioration (PSD)
2. Nonattainment New Source Review (NNSR)
3. Hazardous Air Pollutants (HAPs)
4. Title V Operating Permits (TVOP)

B. Applicability of Federal Regulations

1. NSPS A, General Provisions
2. NSPS A, Control Devices – Flares
3. NSPS D (also Da and Db), Steam Generating Units
4. NSPS Dc – Steam Generating Units
5. NSPS K (also Ka and Kb), Volatile Organic Liquid Storage Vessels
6. NSPS GG, Stationary Gas Turbines
7. NSPS KKK – Leaks from Natural Gas Processing Plants
8. NSPS LLL – Onshore Natural Gas Processing: SO2 Emissions
9. NSPS IIII – Compression Ignition Reciprocating Internal Combustion Engines (RICE)
10. NSPS JJJJ – Stationary Spark Ignition (SI) Internal Combustion Engines (ICE)
11. NSPS KKKK – Stationary Combustion Turbines
12. NSPS OOOO – Oil and Natural Gas Production, Transmission and Distribution
13. NESHAP Part 61 – Designated Source Standards
14. NESHAP A (Part 63 (aka MACT) – General Provisions
15. NESHAP HH – Oil and Natural Gas Production Facilities
16. NESHAP HHH – Natural Gas Transmission and Storage Facilities
17. NESHAP YYYY – Stationary Combustion Turbines
18. NESHAP ZZZZ – Stationary Reciprocating Internal Combustion Engines (RICE)
19. NESHAP DDDDD – Industrial-Commercial-Institutional Boilers and Process Heaters
20. NESHAP JJJJJ – Industrial-Commercial-Institutional Boilers – Area Sources
21 RMP – Chemical Accident Prevention (and Risk Management Plan)
22. CAM – Compliance Assurance Monitoring
23. GHG – Mandatory Greenhouse Gases (GHG) Reporting

C. Applicability of Source Aggregation

Continued…

Supplement 02
Regulatory Discussion
(Continued)

D. Applicability of State Regulations

1. Particulate Air Pollution from Combustion of Fuel
2. Prevent and Control of Objectionable Odors
3. Control of Air Pollution from Combustion of Refuse
4. Prevention and Control of Air Pollution – Sulfur Oxides
5. Permits for Construction, Modification, Relocation and Operation
6. Permits for Construction and Major Modifications of Major Sources
7. Standards of Performance for New Stationary Sources (40 CFR Part 60)
8. Permits for Construction and Modification (Nonattainment)
9. Regulation of Volatile Organic Compounds (VOC)
10. Air Quality Management Fees Program
11. Prevent and Control Emissions of Toxic Air Pollutants
12. Air Pollution Emissions Banking and Trading
13. Emission Statements for VOC and NOX
14. Requirements for Operating Permits
15. Emission Standards for Hazardous Air Pollutants (HAP)

Supplement 02
Regulatory Discussion

A. Applicability of New Source Review (NSR) Regulations

The following New Source Review (NSR) regulations are potentially applicable to natural gas processing facilities (aka: gas plants). Applicability to the subject facility has been determined as follows:

1. Prevention of Significant Deterioration (PSD) [Not Applicable]

This rule does not apply. The facility is a "PSD Minor Source" for each regulated pollutant, as follows:

- NOx: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- VOC: PSD Synthetic Minor Source with Controlled PTE < 250 tpy
- SO2: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- PM10/2.5: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO2e: Not Applicable - Facility is NOT PSD Major for any other pollutant

Important Notes:

* WVDEP requires that fugitive emissions be included in major source determinations at natural gas processing plants.
* Greenhouse Gases (GHG) are not treated as air pollutants for major source determinations.

2. Non-Attainment New Source Review (NNSR) [Not Applicable]

This rule does not apply. The facility is in the Franklin Hill Tax District of Marshall County, West Virginia, which is currently classified as "Non-Attainment" for Sulfur Dioxide (SO2-2010); however, the PTE for SO2 at the facility is less than the applicable threshold (100 tpy). Marshall County is classified as "Attainment, Unclassified, or Maintenance" for all other national ambient air quality standards (NAAQS). (http://www3.epa.gov/airquality/greenbook/ancl.html)

3. Major Source of Hazardous Air Pollutants (HAPs) [Not Applicable]

This rule does not apply. The facility qualifies as a "HAP Area Source" for each regulated pollutant, as follows:

- Each HAP: HAP Area Source with Controlled Individual HAP PTE < 10 tpy
- Total HAPs: HAP Area Source with Controlled Total of All HAPs PTE < 25 tpy

4. Title V Operating Permit (TVOP) [Applicable]

This rule does apply. The facility qualifies as a "Major Source" as follows:

- NOx: TVOP Major Source with Controlled PTE > 100 tpy
- CO: TVOP Major Source with Controlled PTE > 100 tpy

- VOC: TVOP Major Source with Controlled PTE > 100 tpy
- SO2: TVOP Natural Minor Source with Pre-Controlled PTE < 100 tpy
- PM10/2.5: TVOP Natural Minor Source with Pre-Controlled PTE < 100 tpy
- Each HAP: TVOP Synthetic Area Source with Controlled PTE < 10 tpy
- Total HAPs: TVOP Synthetic Area Source with Controlled PTE < 25 tpy

Important Notes:

* WVDEP requires that fugitive emissions be included in major source determinations at natural gas processing plants.
* Greenhouse Gases (GHG) are not treated as air pollutants for major source determinations.

B. Applicability of Federal Regulations

The following federal regulations are potentially applicable to gas plants. Applicability to the facility has been determined as follows:

1. NSPS A, General Provisions

40CFR§60.1-§60.19 [Applicable]

This rule does apply to all sources subject to an NSPS (unless a specific provision is excluded within the source NSPS). Requirements may include:

a. Notification and Recordkeeping (§60.7)
b. Performance Testing (§60.8)
c. Standards and Maintenance (§60.11)
d. Monitoring (§60.13)
e. Control Device Requirements (Flares, Equipment Leaks) (§60.18)
f. Notification and Reporting (§60.19)

2. NSPS A, Control Devices - Flares

40CFR§60.18(b) [Applicable]

This rule does apply because there is a flare at the subject facility that is used to comply with an applicable subpart of 40 CFR parts 60 or 61. The requirements apply only to facilities covered by subparts referring to this section. (§60.18(a)).

3. NSPS Dc, Steam Generating Units

40CFR§60.40c-§60.48c [Applicable]

This rule does apply to the TXP1 Heat Medium Heater (H-01), TXP2 and TXP3 Regen Gas Heaters (H-03 and H-04), De-Ethanizer Hot Oil Heaters (H-05 and H-06), and Amine Process Regen Gas Heater (H-07), because each has a maximum design heat input (MDHI) capacity ≥ 10 MMBtu/hr and ≤ 100 MMBtu/hr (§60.40c(a)).

Requirements include recording and maintaining records of the amount of natural gas fuel combusted during each calendar month (§60.48c(g)(2)).

This rule does not apply to the TXP1 Regen Gas Heater (H-02) because it has an MDHI capacity < 10 MMBtu/hr (§60.40c(a)).

4. NSPS Kb, Volatile Organic Liquid Storage Vessels
40CFR§60.110b-§60.117b [Not Applicable]

This rule does not apply because there is no tank with capacity ≥ 75 m3 (471.7 bbl or 19,813 gal) that is used to store volatile organic liquids (VOL) at the facility (§60.110b(a)).

5. NSPS GG, Stationary Gas Turbines
40CFR§60.330-§60.335 [Not Applicable]

This rule does not apply because there is no stationary gas turbine at the subject facility with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel-fired. (§60.330).

6. NSPS KKK, Leaks from Natural Gas Processing Plants
40CFR§60.630-§60.636 [Not Applicable]

This rule does not apply because the plant construction commenced after 08/23/11 (§60.630). (However, see Section 11. - NSPS OOOO, below.)

7. NSPS LLL, Onshore Natural Gas Processing: SO2 Emissions
40CFR§60.640-§60.648 [Not Applicable]

This rule does not apply because there is no gas sweetening operation at the facility (§60.640(a)).

8. NSPS IIII, Compression Ignition Reciprocating Internal Combustion Engines
40CFR§60.4200-§60.4219 [Not Applicable]

This rule does not apply because there is no stationary compression ignition engine at the facility (§60.4200(a)).

9. NSPS JJJJ, Stationary Spark Ignition (SI) Internal Combustion Engines (ICE)
40CFR§60.4230-§60.4248 [Applicable]

This rule does apply to the Standby Generator Engine (GEN-1) because it was constructed (ordered), modified, or reconstructed after 06/12/06, is an emergency engine manufactured on or after 01/01/09, and has a maximum engine power > 19 KW (25 HP (§60.4230(a)(4)(iii)).

The Standby Emergency Generator Engine is EPA Certified and will be operated and maintained according to the manufacturer's emission related written instructions. As such, no emission testing is required (§60.4243(a)(1)).

This rule does apply to the 1,380 bhp Caterpillar G3516B compressor engine (CE-01/22E) (FCS) because the maximum engine power is greater than 500 HP and the engine was manufactured on or after 07/01/07 (§60.4230(a)(4)(i)).

Requirements include NOx, CO, and VOC emission limits (§60.4233(e-f)); operating limits (§60.4243); performance testing (§60.4244); and notification and recordkeeping (§60.4245).

10. NSPS KKKK, Stationary Combustion Turbines

40CFR§60.4300-§60.4420 [Not Applicable]

This rule does not apply because there is no stationary gas turbine at the subject facility with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the higher heating value of the fuel-fired. (§60.4305(a)).

11. NSPS OOOO, Crude Oil and Natural Gas Production, Transmission and Distribution

40CFR§60.5360-§60.5430 [Applicable]

This rule does apply to the existing reciprocating compressors and to the existing equipment leaks because the facility is a natural gas processing plant constructed, reconstructed, or modified after August 23, 2011.

Requirements include replacement of the reciprocating compressor rod packing before the compressor has operated 26,000 hours or prior to 36 months from the date of the most recent rod packing replacement.

Additional requirements include monitoring and expeditious repair of valves, flanges, connectors, pumps, pressure relief devices and open-ended valves or lines (aka, LDAR). The equipment leak standards are specified in §60.5400.

Also, notification, recordkeeping, and reporting as specified in §60.5420.

This rule does not apply to the centrifugal compressors because they use dry seals with relatively low VOC emissions.

This rule does not apply to the pneumatic controllers because they are “no-bleed” design or use compressed air.

This rule does not apply to storage tanks because no tank has the potential to emit more than 6 tons per year of VOC.

Finally, this rule does not apply because there is no glycol dehydrator and no sweetening unit at the subject facility.

12. NSPS OOOOa, Crude Oil and Natural Gas Facilities

40CFR§60.5360a-§60.5430a [Applicable]

This rule does apply to the new equipment leaks because the facility commenced construction, modification, or reconstruction after September 18, 2015.

Requirements include monitoring and repair of valves, flanges, connectors, pumps, pressure relief devices and open-ended valves or lines. The equipment leak standards are specified in §60.5400a. Also, subject to the notification, recordkeeping, and reporting as specified in §60.5420a.

This rule does apply to the reciprocating compressor driven by the CAT G3516B engine (CE-01/22E) (FCS) and the electric motor driven reciprocating compressor because the FCS is located within the natural gas production segment and the compressors commenced construction after 09/18/15 (§60.5360a and §60.5365a(c)).

Requirements include replacing rod packing systems on a specified schedule (§60.5385a(a)) and notification, monitoring, recordkeeping and reporting (§60.5410a(c), §60.5415a(c), §60.5420a(b)(1) and §60.5420a(b)(4)).

13. NESHAP Part 61 - Designated Source Standards

40CFR§61.01-§61.359 [Not Applicable]

This rule does not apply because the subject facility is not a NESHAP Designated Facility (or Source).

Specifically, NESHAP J - Equipment Leaks (Fugitive Emission Sources) of Benzene and NESHAP V - Equipment Leaks (Fugitive Emission Sources) do not apply because all the fluids (liquid or gas) at the subject facility are < 10 wt% volatile hazardous air pollutant (VHAP) ((§61.111 and §61.241).

14. NESHAP A (Part 63 (aka, MACT)) - General Provisions

40CFR§63.1§63.16 [Applicable]

This rule does apply because the facility is subject to one or more Subparts under 40CFR§63 National Emission Standards for Hazardous Air Pollutant for Source Categories.

(Note: The Standby Emergency Generator Engine (GEN-1) and the Compressor Engine (CE-01/22E) (FCS) are subject to NESHAP ZZZZ and comply with this regulation by complying with NSPS JJJJ (§63.6590(a)(2)(iii)), no other requirements apply.)

15. NESHAP HH, Oil and Natural Gas Production Facilities

40CFR§63.760-§63.779 [Not Applicable]

This rule does not apply because the facility is an area source of HAPs and does not operate a triethylene glycol dehydration unit (§63.760(b)(2)).

This rule does not apply to storage vessels (tanks), compressors, or ancillary equipment because the subject facility is an area source of HAP emissions (§63.760(b)(2)).

In no case does this rule apply to engines or turbines.

16. NESHAP HHH, Natural Gas Transmission and Storage Facilities

40CFR§63.1270-§63.1289 [Not Applicable]

This rule does not apply because the facility is NOT a natural gas transmission or storage facility transporting or storing natural gas prior to local distribution (§63.1270(a)).

17. NESHAP YYYY, Stationary Combustion Turbines

40CFR§63.6080-§63.6175 [Not Applicable]

This rule does not apply because there is no stationary gas turbine at the facility (§63.6080).

18. NESHAP ZZZZ, Stationary Reciprocating Internal Combustion Engines (RICE)

40CFR§63.6580-§63.6675 [Applicable]

This rule does apply to the 224 bhp Olympian G150LG2 Standby Generator Engine (GEN-1) and the 1,380 bhp CAT G3516B Compressor Engine (CE-01/22E) (FCS). Because each engine is “new” or “reconstructed”; i.e., commenced construction or reconstruction on or after 06/12/06, the only requirement is compliance with 40CFR§60.4230-§60.4248 (NSPS JJJJ) for Spark Ignition Internal Combustion Engines (§63.6590(a)(2)(iii)).

19. NESHAP DDDDD, Industrial, Commercial, and Institutional Boilers and Process Heaters – Major Sources

40CFR§63.7480 – §63.7575 [Not Applicable]

This rule does not apply because the facility is NOT a major source of HAP (§63.7485).

20. NESHAP JJJJJJ, Industrial, Commercial, and Institutional Boilers and Process Heaters – Area Sources

40CFR§63.11193 – §63.11237 [Not Applicable]

This rule does not apply because all boilers and process heaters at the at the subject facility are gas-fired (§63.11195(e)).

21. Compliance Assurance Monitoring (CAM)

40CFR§64.1-§64.10 [Not Applicable]

This rule does not apply because the pre-control emissions of each pollutant specific emission unit (PSEU) are less than Major Source Threshold Levels (§64.2).

22. Chemical Accident Prevention Provisions (RMP)

40CFR§68.1-§68.220 [Applicable]

This rule does apply because the facility stores more than a threshold quantity of regulated substance in a process (§68.115).

23. Mandatory Greenhouse Gases (GHG) Reporting

40CFR§98.1-§98.9 [Applicable]

This rule does apply because the CO2e emissions from all stationary sources combined within the hydrocarbon basin as defined in 40 CFR Part 98 are ≥ 25,000 metric ton/yr (§98.2(a)(3)).

Requirements include monitoring, recordkeeping, and annual reporting of GHG from stationary fuel combustion sources (§98.2(a)(3)).

C. Applicability of Source Aggregation

The Williams Ohio Valley Midstream LLC's (OVM) Oak Grove Gas Plant (OGGP), and the Francis Compressor Station (FCS) have been aggregated for the purpose of determining permit requirements and whether emission thresholds have been met for CAA programs such as Title V, Prevention of Significant Deterioration (PSD) and National Emission Standards for Hazardous Air Pollutants (NESHAP).

The operations of the subject facility have not been aggregated with any other gas production, midstream service facilities, or transportation operations because there are no oil and gas facilities or operations that are "contiguous and adjacent" to the subject facility. Furthermore, there are no related facilities or operations that meet the common-sense notion of a plant and/or are under common control.

D. Applicability of State Regulations

The following State regulations are potentially applicable to gas plants. Applicability to the facility has been determined as follows:

1. Particulate Air Pollution from Combustion of Fuel

45CSR2 [Applicable]

This rule does apply to the natural gas-fired heaters (H-01 thru H-07); limiting opacity to 10% based on a six-minute block average.

Because the heat input is ≥ 10 MMBtu/hr, these units (except H-02 and H-07) are also subject to Sections 4 (emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions.

2. Prevent and Control of Objectionable Odors

45CSR4 [Applicable]

This rule does apply and states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable. No odors have been deemed objectionable.

3. Control of Air Pollution from Combustion of Refuse

45CSR6 [Applicable]

This rule does apply to the Process Flare (FLR-1).

The Process Flare (FLR-1) is required to be smokeless except for periods not to exceed a total of 5 minutes during any 2 consecutive hours. The particulate matter emissions should be negligible and the flare will comply with the applicable emission standard. The facility will demonstrate compliance by maintaining records of the amount of waste gas consumed by the flare and the hours of operation. The facility will also monitor the flare pilot flame and record any malfunctions that may cause no flame to be present during facility operation.

4. Prevent and Control Air Pollution – Sulfur Oxides

45CSR10 [Applicable]

This rule does apply to the gas-fueled heaters w/ a Maximum Design Heat Input (MDHI) rating > 10 MMBtu/hr (H-01, and H-03 thru H-07) (§45-10-10.1). Requirements are specified in 45CSR10 Sections 3 (emission standard), 6 (registration), 7 (permits), and 8 (testing, monitoring, recordkeeping, reporting).

5. Permits for Construction, Modification, Relocation and Operation

45CSR13 [Applicable]

This rule does apply. Appropriate 45CSR13 permits have been issued to Williams Ohio Valley Midstream LLC (OVM) for the Oak Grove Gas Plant and the co-located Francis Compressor Station. There are no requested modifications to the current Title V Operating Permit R30-051-00157-2016 (MM03 thru MM05), nor to the underlying New Source Review Construction Permits R13-3070C-10/17/19 and R13-3289B-10/12/17.

6. Permits for Construction and Modification of Major Stationary Sources for the Prevention of Significant Deterioration

45CSR14 [Not Applicable]

The rule does not apply because the facility is neither a new PSD major source of pollutants nor a modification to an existing PSD major source.

7. Standards of Performance for New Stationary Sources (40 CFR Part 60)

45CSR16 [Applicable]

This rule does apply to this source by reference of §40CFR60 Subparts Dc, OOOO, and OOOOa. The subject facility is subject to the notification, testing, monitoring, recordkeeping and reporting requirements of these Subparts .

8. Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution Which Cause or Contribute to Nonattainment

45CSR19 [Not Applicable]

This rule does not apply. The FCS location is designated as either “Maintenance” or “Attainment/Unclassified” for all criteria pollutants, except for sulfur dioxide. The plant-wide potential-to-emit (PTE) sulfur dioxide is less than applicable thresholds.

9. Regulation of Volatile Organic Compounds (VOC)

45CSR21 [Not Applicable]

This rule does not apply because the facility is not located in Putnam County, Kanawha County, Cabell County, Wayne County, or Wood County

10. Air Quality Management Fees Program

45CSR22 [Applicable]

This rule does apply. It establishes a program to collect fees for certificates to operate and for permits to construct, modify or relocate sources of air pollution.

11. Prevent and Control Emissions of Toxic Air Pollutants

45CSR27 [Not Applicable]

This rule does not apply because equipment is used in the production and distribution of petroleum products is exempt, provided that the product contains no more than 5% benzene by weight (§45-22-2.4).

12. Air Pollution Emissions Banking and Trading

45CSR28 [Not Applicable]

This rule does not apply. The facility does not choose to participate in the voluntarily statewide air pollutant emissions trading program.

13. Emission Statements for VOC and NOX

45CSR29 [Not Applicable]

This rule does not apply because facility is not located in Putnam, Kanawha, Cabell, Wayne, Wood, or Greenbrier Counties (§45-29-1).

14. Requirements for Operating Permits

45CSR30 [Applicable]

This rule does apply. The facility qualifies as a "Major Source" as follows:

- NOx: TVOP Major Source with Controlled PTE > 100 tpy
- CO: TVOP Major Source with Controlled PTE > 100 tpy
- VOC: TVOP Major Source with Controlled PTE > 100 tpy
- SO2: TVOP Natural Minor Source with Pre-Controlled PTE < 100 tpy
- PM10/2.5: TVOP Natural Minor Source with Pre-Controlled PTE < 100 tpy
- Each HAP: TVOP Synthetic Area Source with Controlled PTE < 10 tpy
- Total HAPs: TVOP Synthetic Area Source with Controlled PTE < 25 tpy

Important Notes:

* WVDEP requires that fugitive emissions be included in major source determinations at natural gas processing plants.
* Greenhouse Gases (GHG) are not treated as air pollutants for major source determinations.

15. Emission Standards for Hazardous Air Pollutants (HAP)

45CSR34 [Not Applicable]

This rule does not apply because although the facility is subject to a Subpart under 40CFR§61 (MACT) or 40CFR§63 (NESHAP), specifically NESHAP ZZZZ, it is a non-major area source of hazardous air pollutants.

(Note: In accordance with §45-34-4 - 4.1.d, provisions under Subpart ZZZZ of 40 CFR Part 63 which apply to non-major area sources of hazardous air pollutants described in 40 CFR §63.6585(c) shall be excluded from applicability of 45CSR34).

Supplement 03

Emission Calculations

---

§45-30-4.3.c.8 - The application forms shall include calculations or test data on which the information is based.

Summaries:

- Potential to Emit (PTE) – Criteria – Controlled
- Potential to Emit (PTE) – Hazardous Air Pollutants (HAP) – Controlled
- Potential to Emit (PTE) – Greenhouse Gases (GHG) – Controlled
- Potential to Emit (PTE) – Regulated Pollutants – Pre-Controlled

Unit Specific:

Oak Grove Gas Plant

- TXP1 Heat Medium Heater (H-01 (1E))
- TXP1 Regeneration Gas Heater (H-02 (2E))
- TXP2 & TXP3 Regeneration Gas Heaters (H-03 and -04 (3E and 4E))
- De-Ethanizer Hot Oil Heaters (H-05 and -06 (5E and 6E))
- De-Ethanizer Regeneration Gas Heater (H-07 (7E))
- Process Flare (FL-1 (8E))
- Standby Generator Engine (500 hr/yr) (GEN-1 (9E))
- Slop Oil/Condensate Storage Tanks (TK-01 thru -04 (10E thru 13E))
- Slop Oil/Condensate Truck Load-Out (TL-1 (14E))
- Amine Process Unit Vent (V-01 (16E))
- Rod Packing Leaks – Reciprocating Compressors (RPC (17E))
- Dry Gas Seal Leaks – Centrifugal Compressors (DGS (18E))
- Piping and Equipment Fugitives (Gas & Light Liquid) (FUG-G, FUG-L, FUG-M (15E))

Francis Compressor Station

- Compressor Engine Emissions – 1,380 bhp CAT G3516B (CE-01/22E)
- Compressor Rod Packing and Engine Crankcase Leaks (RPC-3/23E)
- Start/Stop/Maintenance (Including Blowdown) (SSM-2/24E)
- Piping and Equipment Fugitives (FUG-3/25E)

AP-42 and GHG Emission Factors

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Potential to Emit (PTE) – Criteria

Unit ID	Point ID	Description	Site Rating	NOX		CO		VOC		SO2		PM10/2.5	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Oak Grove Gas Plant (OGGP)													
H-01	1E	TXP1 Heat Medium Heater	26.26 MMBtu/hr	2.57	11.28	2.16	9.47	0.15	0.64	0.02	0.07	0.20	0.86
H-02	2E	TXP1 Regeneration Gas Heater	9.40 MMBtu/hr	0.92	4.04	0.77	3.39	0.05	0.23	0.01	0.02	0.07	0.31
H-03	3E	TXP2 Regeneration Gas Heater	20.30 MMBtu/hr	0.73	3.20	0.81	3.56	0.39	1.69	0.01	0.05	0.26	1.16
H-04	4E	TXP3 Regeneration Gas Heater	20.30 MMBtu/hr	0.73	3.20	0.81	3.56	0.39	1.69	0.01	0.05	0.26	1.16
H-05	5E	DeC2 Hot Oil Heater	68.33 MMBtu/hr	2.46	10.77	2.53	11.07	0.38	1.67	0.04	0.18	0.51	2.23
H-06	6E	DeC2 Hot Oil Heater	68.33 MMBtu/hr	2.46	10.77	2.53	11.07	0.38	1.67	0.04	0.18	0.51	2.23
H-07	7E	DeC2 Regeneration Gas Heater	10.44 MMBtu/hr	1.02	4.48	0.86	3.77	0.06	0.25	0.01	0.03	0.08	0.34
FL-1	8E	Process Flare	630.19 MMscf/yr	638.12	73.27	1,274	146.28	177.30	20.36	1.54	0.19	19.50	2.39
GEN-1	9E	Standby Generator	224 bhp	0.99	0.25	1.98	0.49	0.54	0.13	1E-03	3E-04	0.04	0.01
TK-1	10E	Slop Oil/Condensate Tank	400 bbl	---	---	---	---	1.08	4.74	---	---	---	---
TK-2	11E	Slop Oil/Condensate Tank	400 bbl	---	---	---	---	1.08	4.74	---	---	---	---
TK-3	12E	Slop Oil/Condensate Tank	400 bbl	---	---	---	---	1.08	4.74	---	---	---	---
TK-4	13E	Slop Oil/Condensate Tank	400 bbl	---	---	---	---	1.08	4.74	---	---	---	---
TL-1	14E	Truck Load-Out - Slop Oil/Condensate	4,000,000 bbl	---	---	---	---	27.13	18.09	---	---	---	---
V-01	16E	Amine Process Unit Vent	44,000 bbl/day	---	---	---	---	0.47	2.07	---	---	---	---
RPC-1	17E	Rod Packing - Reciprocating Compressors	3 Recips	---	---	---	---	0.17	0.30	---	---	---	---
DGS	18E	Dry Gas Seals - Centrifugal Compressors	8 Centrifugal	---	---	---	---	0.76	3.33	---	---	---	---
FUG-G	15E	Piping and Equipment Fugitives - Gas	---	---	---	---	---	2.35	10.31	---	---	---	---
FUG-L		Piping and Equipment Fugitives - Light Liquid	---	---	---	---	---	4.75	20.82	---	---	---	---
FUG-M		Piping and Equipment Fugitives - Mix Gas/Liq	---	---	---	---	---	0.02	0.07	---	---	---	---
		Sub-Total OGGP PTE:		**650.01**	**121.26**	**1,286.38**	**192.66**	**219.62**	**102.29**	**1.67**	**0.76**	**21.43**	**10.68**
Francis Compressor Station (FCS)													
CE-01	22E	CAT G3516B Compressor Engine (OxCat)	1,380 bhp	1.52	6.66	0.89	3.89	1.29	5.64	0.01	0.03	0.11	0.49
RPC-3	23E	Rod Packing/Crankcase Leaks	2 Recips	---	---	---	---	1.32	5.76	---	---	---	---
SSM-2	24E	Start/Stop/Maintenance (i.e., Blowdown)	2 Recips	---	---	---	---	---	16.02	---	---	---	---
FUG-3-G	25E	Piping and Equipment Fugitives - Gas	---	---	---	---	---	0.24	1.03	---	---	---	---
FUG-3-L		Piping and Equipment Fugitives - Light Liquid	---	---	---	---	---	0.22	0.98	---	---	---	---
FUG-3-M		Piping and Equipment Fugitives - Mix Gas/Liq	---	---	---	---	---	0.07	0.30	---	---	---	---
		Sub-Total FCS PTE:		**1.52**	**6.66**	**0.89**	**3.89**	**3.13**	**29.74**	**0.01**	**0.03**	**0.11**	**0.49**
Total Oak Grove Gas Plant													
		Sub-Total OGGP PTE:		**650.01**	**121.26**	**1,286.38**	**192.66**	**219.62**	**102.29**	**1.67**	**0.76**	**21.43**	**10.68**
		Sub-Total FCS PTE:		**1.52**	**6.66**	**0.89**	**3.89**	**3.13**	**29.74**	**0.01**	**0.03**	**0.11**	**0.49**
		Grand-Total OGGP and FCS PTE:		**651.53**	**127.93**	**1,287.27**	**196.55**	**222.75**	**132.03**	**1.68**	**0.79**	**21.55**	**11.18**
		WV NSR THRESHOLD:		6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy		6 lb/hr *AND* 10 tpy	
		TVOP THRESHOLD:			100 tpy		100 tpy		100 tpy		100 tpy		100 tpy

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hr/yr.

2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).

3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

4 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP (i-octane), acetaldehyde, acrolein, and methanol.

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Potential to Emit (PTE) – Hazardous Air Pollutants (HAP)

Unit ID	Point ID	Benzene		Ethylbenzene		Formaldehyde		n-Hexane		Toluene		2,2,4-TMP		Xylenes		Other HAP		Total HAP	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Oak Grove Gas Plant (OGGP)																			
H-01	1E	5E-05	2E-04	---	---	2E-03	0.01	0.05	0.20	9E-05	4E-04	---	---	---	---	5E-05	2E-04	0.05	0.21
H-02	2E	2E-05	8E-05	---	---	7E-04	3E-03	0.02	0.07	3E-05	1E-04	---	---	---	---	2E-05	8E-05	0.02	0.08
H-03	3E	4E-05	2E-04	---	---	1E-03	0.01	0.04	0.16	7E-05	3E-04	---	---	---	---	4E-05	2E-04	0.04	0.16
H-04	4E	4E-05	2E-04	---	---	1E-03	0.01	0.04	0.16	7E-05	3E-04	---	---	---	---	4E-05	2E-04	0.04	0.16
H-05	5E	1E-04	6E-04	---	---	0.01	0.02	0.12	0.53	2E-04	1E-03	---	---	---	---	1E-04	6E-04	0.13	0.55
H-06	6E	1E-04	6E-04	---	---	0.01	0.02	0.12	0.53	2E-04	1E-03	---	---	---	---	1E-04	6E-04	0.13	0.55
H-07	7E	2E-05	9E-05	---	---	8E-04	3E-03	0.02	0.08	3E-05	2E-04	---	---	---	---	2E-05	9E-05	0.02	0.08
FL-1	8E	4.49	0.52	6.09	0.70	0.34	0.04	5.48	0.63	5.30	0.61	6.55	0.75	6.11	0.70	9E-03	1E-03	34.38	3.95
GEN-1	9E	3E-03	9E-04	5E-05	1E-05	0.04	0.01	---	---	1E-03	3E-04	---	---	4E-04	1E-04	0.02	0.01	0.07	0.02
TK-1	10E	0.04	0.16	0.04	0.16	---	---	0.04	0.16	0.04	0.16	0.04	0.16	0.04	0.16	---	---	0.22	0.95
TK-2	11E	0.04	0.16	0.04	0.16	---	---	0.04	0.16	0.04	0.16	0.04	0.16	0.04	0.16	---	---	0.22	0.95
TK-3	12E	0.04	0.16	0.04	0.16	---	---	0.04	0.16	0.04	0.16	0.04	0.16	0.04	0.16	---	---	0.22	0.95
TK-4	13E	0.04	0.16	0.04	0.16	---	---	0.04	0.16	0.04	0.16	0.04	0.16	0.04	0.16	---	---	0.22	0.95
TL-1	14E	0.90	0.60	0.90	0.60	---	---	0.90	0.60	0.90	0.60	0.90	0.60	0.90	0.60	---	---	5.43	3.62
V-01	16E	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
RPC-1	17E	2E-03	6E-04	2E-03	6E-04	---	---	2E-03	6E-04	2E-03	6E-04	2E-03	6E-04	2E-03	6E-04	---	---	0.01	4E-03
DGS	18E	2E-03	0.01	2E-03	0.01	---	---	2E-03	0.01	2E-03	0.01	2E-03	0.01	2E-03	0.01	---	---	0.01	0.05
FUG-G	15E	2E-03	0.01	2E-03	0.01	---	---	0.03	0.11	2E-03	0.01	2E-03	0.01	2E-03	0.01	---	---	0.03	0.15
FUG-L		1E-03	0.01	1E-03	0.01	---	---	0.06	0.26	1E-03	0.01	1E-03	0.01	1E-03	0.01	---	---	0.07	0.29
FUG-M		4E-06	2E-05	4E-06	2E-05	---	---	2E-04	9E-04	4E-06	2E-05	4E-06	2E-05	4E-06	2E-05	---	---	2E-04	1E-03
Sub-Total OGGP:		**5.55**	**1.78**	**7.15**	**1.96**	**0.40**	**0.12**	**7.02**	**3.98**	**6.36**	**1.87**	**7.61**	**2.01**	**7.2E+00**	**1.96**	**0.03**	**0.01**	**41.28**	**13.68**
Francis Compressor Station (FCS)																			
CE-01	22E	1E-03	0.01	1E-04	6E-04	0.37	1.60	4E-03	0.02	1E-03	0.01	8E-04	4E-03	6E-04	3E-03	0.06	0.25	0.43	1.89
RPC-3	23E	2E-03	0.01	2E-03	0.01	0.01	0.05	0.01	0.06	2E-03	0.01	2E-03	0.01	2E-03	0.01	---	---	0.03	0.15
SSM-2	24E	4E-03	0.02	4E-03	0.02	---	---	0.04	0.17	4E-03	0.02	4E-03	0.02	4E-03	0.02	---	---	0.06	0.27
FUG-3-G	25E	3E-04	1E-03	3E-04	1E-03	---	---	3E-03	0.01	3E-04	1E-03	3E-04	1E-03	3E-04	1E-03	---	---	4E-03	0.02
FUG-3-L		2E-03	0.01	2E-03	0.01	---	---	0.01	0.05	2E-03	0.01	2E-03	0.01	2E-03	0.01	---	---	0.02	0.10
FUG-3-M		7E-04	3E-03	7E-04	3E-03	---	---	3E-03	0.02	7E-04	3E-03	7E-04	3E-03	7E-04	3E-03	---	---	0.01	0.03
Sub-Total FCS PTE:		**0.01**	**0.05**	**0.01**	**0.04**	**0.38**	**1.65**	**0.08**	**0.33**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**	**0.04**	**0.06**	**0.25**	**0.56**	**2.45**
Total Oak Grove Gas Plant																			
Sub-Total OGGP:		**5.55**	**1.78**	**7.15**	**1.96**	**0.40**	**0.12**	**7.02**	**3.98**	**6.36**	**1.87**	**7.61**	**2.01**	**7.17**	**1.96**	**0.03**	**0.01**	**41.28**	**13.68**
Sub-Total FCS PTE:		**0.01**	**0.05**	**0.01**	**0.04**	**0.38**	**1.65**	**0.08**	**0.33**	**0.01**	**0.05**	**0.01**	**0.05**	**0.01**	**0.04**	**0.06**	**0.25**	**0.56**	**2.45**
Grand-Total PTE:		**5.56**	**1.82**	**7.16**	**2.00**	**0.78**	**1.77**	**7.09**	**4.31**	**6.37**	**1.92**	**7.62**	**2.05**	**7.18**	**2.00**	**0.09**	**0.26**	**41.84**	**16.13**
NSR THRESHOLD:		2 lb/hr *OR* 0.5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 0.5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy		2 lb/hr *OR* 5 tpy	
TVOP THRESHOLD:			10 tpy		10 tpy		10 tpy		10 tpy		10 tpy		10 tpy		10 tpy		10 tpy		25 tpy

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr.

2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).

3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

4 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP (i-octane), acetaldehyde, acrolein, and methanol.

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Potential to Emit (PTE) – Greenhouse Gases (GHG)

Unit ID	Point ID	Description	Heat Input MMBtu/hr (HHV)	Hours of Operation hr/yr	CO2 GWP: 1 tpy	CO2e tpy	CH4 GWP: 25 tpy	CO2e tpy	N2O GWP: 298 tpy	CO2e tpy	TOTAL CO2e lb/yr	TOTAL CO2e tpy
Oak Grove Gas Plant (OGGP)												
H-01	1E	TXP1 Heat Medium Heater	26.26	8,760	13,456	13,456	0.25	6.34	0.03	7.56	3,075	13,470
H-02	2E	TXP1 Regeneration Gas Heater	9.40	8,760	4,816	4,816	0.09	2.27	0.01	2.70	1,101	4,821
H-03	3E	TXP2 Regeneration Gas Heater	20.30	8,760	10,401	10,401	0.62	15.56	0.02	5.84	2,380	10,422
H-04	4E	TXP3 Regeneration Gas Heater	20.30	8,760	10,401	10,401	0.62	15.56	0.02	5.84	2,380	10,422
H-05	5E	DeC2 Hot Oil Heater	68.33	8,760	35,008	35,008	0.66	16.49	0.07	19.66	8,001	35,044
H-06	6E	DeC2 Hot Oil Heater	68.33	8,760	35,008	35,008	0.66	16.49	0.07	19.66	8,001	35,044
H-07	7E	DeC2 Regeneration Gas Heater	10.44	8,760	5,350	5,350	0.10	2.52	0.01	3.00	1,223	5,356
FL-1	8E	Process Flare	121.22	8,760	83,066	83,066	24.92	623.12	0.68	203.76	19,154	83,893
GEN-1	9E	Standby Generator	2.19	500	76.02	76.02	4E-03	0.09	7E-04	0.22	305.32	76.33
TK-1	10E	Slop Oil/Condensate Tank	---	8,760	---	---	---	---	---	---	---	---
TK-2	11E	Slop Oil/Condensate Tank	---	8,760	---	---	---	---	---	---	---	---
TK-3	12E	Slop Oil/Condensate Tank	---	8,760	---	---	---	---	---	---	---	---
TK-4	13E	Slop Oil/Condensate Tank	---	8,760	---	---	---	---	---	---	---	---
TL-1	14E	Truck Load-Out - Slop Oil/Condensate	---	---	---	---	---	---	---	---	---	---
V-01	16E	Amine Process Unit Vent	---	8,760	5,750	5,750	0.06	1.56	---	---	1,313	5,751
RPC-1	17E	Rod Packing - Reciprocating Compressors	---	8,760	15.70	15.70	57.49	1,437	---	---	331.75	1,453
DGS	18E	Dry Gas Seals - Centrifugal Compressors	---	8,760	0.07	0.07	60.88	1,522	---	---	347.48	1,522
FUG-G	15E	Piping and Equipment Fugitives - Gas	---	8,760	0.23	0.23	28.27	706.80	---	---	161.42	707.03
FUG-L		Piping and Equipment Fugitives - Light Liquid	---	8,760	---	---	---	---	---	---	---	---
FUG-M		Piping and Equipment Fugitives - Mix Gas/Liq	---	8,760	3.9E-04	3.9E-04	0.05	1.20	---	---	0.28	1.20
		Sub-Total OGGP PTE:			**203,348**	**203,348**	**174.69**	**4,367**	**0.90**	**268.25**	**47,773**	**207,984**
Francis Compressor Station (FCS)												
CE-01	22E	CAT G3516B Compressor Engine (OxCat)	11.29	8,760	6,703	6,703	31.85	796.21	0.01	3.25	1,713	7,502
RPC-3	23E	Rod Packing/Crankcase Leaks	---	8,760	58.19	58.19	11.55	288.79	---	---	79.22	346.98
SSM-2	24E	Start/Stop/Maintenance (i.e., Blowdown)	---	---	---	---	35.25	881.36	---	---	---	881.36
FUG-3-G	25E	Piping and Equipment Fugitives - Gas	---	8,760	0.02	0.02	2.28	57.05	---	---	13.03	57.06
FUG-3-L		Piping and Equipment Fugitives - Light Liquid	---	8,760	---	---	---	---	---	---	---	---
FUG-3-M		Piping and Equipment Fugitives - Mix Gas/Liq	---	8,760	2E-03	2E-03	0.19	4.76	---	---	1.09	4.76
		Sub-Total FCS PTE:			**6,761**	**6,761**	**81.13**	**2,028**	**0.01**	**3.25**	**1,806**	**8,792**
Total Oak Grove Gas Plant												
		Sub-Total OGGP PTE:			**203,348**	**203,348**	**174.69**	**4,367**	**0.90**	**268.25**	**47,773**	**207,984**
		Sub-Total FCS PTE:			**6,761**	**6,761**	**81.13**	**2,028**	**0.01**	**3.25**	**1,806**	**8,792**
		Grand-Total OGGP and FCS PTE:			**210,109**	**210,109**	**255.82**	**6,395**	**0.91**	**271.50**	**49,579**	**216,776**

Notes:

1 - Emissions are based on operation at 100% of rated load for 8760 hr/yr; excepting only GEN-1.

2 - Engine CO2 and CH4 emissions are based on vendor specifications.

3 - Fugitive CH4 emissions are based on EPA Fugitive Emission Factors for Oil and Gas Production Operations.

4 - All other GHG emissions are based on default values in 40CFR98, Subpart C, Table C-1.

5 - High Heat Value (HHV) = Low Heat Value (LHV) / 0.90.

6 - Greenhouse Gases (GHG) are not treated as air pollutants for major source determinations.

Potential to Emit (PTE) – Pre-Control

Unit ID	Point ID	Description	NOX		CO		VOC		n-Hexane		TOTAL HAP		CO2E	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Oak Grove Gas Plant (OGGP)														
H-01	1E	TXP1 Heat Medium Heater	2.57	11.28	2.16	9.47	0.15	0.64	0.05	0.20	0.05	0.21	3,075	13,470
H-02	2E	TXP1 Regeneration Gas Heater	0.92	4.04	0.77	0.77	0.05	0.23	0.02	0.07	0.02	0.08	1,101	4,821
H-03	3E	TXP2 Regeneration Gas Heater	0.73	3.20	0.81	3.56	0.39	1.69	0.04	0.16	0.04	0.16	2,380	10,422
H-04	4E	TXP3 Regeneration Gas Heater	0.73	3.20	0.81	3.56	0.39	1.69	0.04	0.16	0.04	0.16	2,380	10,422
H-05	5E	DeC2 Hot Oil Heater	2.46	10.77	2.53	11.07	0.38	1.67	0.12	0.53	0.13	0.55	8,001	35,044
H-06	6E	DeC2 Hot Oil Heater	2.46	10.77	2.53	11.07	0.38	1.67	0.12	0.53	0.13	0.55	8,001	35,044
H-07	7E	DeC2 Regeneration Gas Heater	1.02	4.48	0.86	3.77	0.06	0.25	0.02	0.08	0.02	0.08	1,223	5,356
FL-1	8E	Process Flare	---	---	---	---	17,730	2,036	548.28	62.95	3,404	390.76	542,681	62,312
GEN-1	9E	Standby Generator	0.99	4.33	1.98	8.66	0.54	2.36	---	---	0.07	0.31	305.32	1,337
TK-1	10E	Slop Oil/Condensate Tank	---	---	---	---	1.08	4.74	0.04	0.16	0.22	0.95	---	---
TK-2	11E	Slop Oil/Condensate Tank	---	---	---	---	1.08	4.74	0.04	0.16	0.22	0.95	---	---
TK-3	12E	Slop Oil/Condensate Tank	---	---	---	---	1.08	4.74	0.04	0.16	0.22	0.95	---	---
TK-4	13E	Slop Oil/Condensate Tank	---	---	---	---	1.08	4.74	0.04	0.16	0.22	0.95	---	---
TL-1	14E	Truck Load-Out - Slop Oil/Condensate	---	---	---	---	---	18.09	---	0.60	---	3.62	---	---
V-01	16E	Amine Process Unit Vent	---	---	---	---	0.47	2.07	---	---	---	---	1,313	5,751
RPC-1	17E	Rod Packing - Reciprocating Compressors	---	---	---	---	0.17	0.30	2E-03	6.1E-04	0.01	4E-03	391.04	1,453
DGS	18E	Dry Gas Seals - Centrifugal Compressors	---	---	---	---	0.76	3.33	2E-03	0.01	0.01	0.05	347.48	1,522
FUG-G	15E	Piping and Equipment Fugitives - Gas	---	---	---	---	19.25	84.34	0.21	0.93	0.28	1.24	1,321	5,784
FUG-L		Piping and Equipment Fugitives - Light Liquid	---	---	---	---	34.24	149.95	0.43	1.88	0.47	2.08	---	---
FUG-M		Piping and Equipment Fugitives - Mix Gas/Liq	---	---	---	---	0.15	0.64	2E-03	0.01	2E-03	0.01	2.41	10.57
		Sub-Total OGGP PTE:	**11.89**	**52.08**	**12**	**51.93**	**17,792**	**2,324**	**549.47**	**68.74**	**3,406**	**403.66**	**572,521**	**192,750**
Francis Compressor Station (FCS)														
CE-01	22E	CAT G3516B Compressor Engine (OxCat)	1.52	6.66	8.88	38.91	4.29	18.79	0.01	0.05	1.44	6.29	1,713	6,703
RPC-3	23E	Rod Packing/Crankcase Leaks	---	---	---	---	1.32	5.76	0.01	0.06	0.03	0.15	79.22	346.98
SSM-2	24E	Start/Stop/Maintenance (i.e., Blowdown)	---	---	---	---	3.66	16.02	0.04	0.17	0.06	0.27	201.22	881.36
FUG-3-G	25E	Piping and Equipment Fugitives - Gas	---	---	---	---	1.82	7.95	0.02	0.09	0.03	0.13	100.43	439.90
FUG-3-L		Piping and Equipment Fugitives - Light Liquid	---	---	---	---	1.24	5.43	0.06	0.27	0.12	0.54	---	---
FUG-3-M		Piping and Equipment Fugitives - Mix Gas/Liq	---	---	---	---	0.23	0.99	0.01	0.05	0.02	0.10	3.55	15.57
		Sub-Total FCS PTE:	**1.52**	**6.66**	**8.88**	**38.91**	**12.55**	**54.95**	**0.16**	**0.70**	**1.71**	**7.49**	**2,097**	**8,387**
Total Oak Grove Gas Plant														
		Sub-Total OGGP PTE:	**11.89**	**52.08**	**12.5**	**51.93**	**17,792**	**2,324**	**549.47**	**68.74**	**3,406**	**403.66**	**572,521**	**192,750**
		Sub-Total FCS PTE:	**1.52**	**6.66**	**8.88**	**38.91**	**12.55**	**54.95**	**0.16**	**0.70**	**1.71**	**7.49**	**2,097**	**8,387**
		Grand-Total OGGP and FCS PTE:	**13.41**	**58.74**	**21.3**	**90.84**	**17,804**	**2,379**	**549.63**	**69.44**	**3,407**	**411.15**	**574,618**	**201,137**

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hr/yr.

2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).

3 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

4 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP (i-octane), acetaldehyde, acrolein, and methanol.

TXP1 Hot Oil Heater (H-01/1E)Emissions

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
H-01/1E	**TXP1 Hot Oil Heater** 23.69 MMBtu/hr (LHV) **26.26 MMBtu/hr (HHV)** **8,760 hr/yr** 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) 207,509 MMBtu/yr (LHV) 230,064 MMBtu/yr (HHV) 25,748 January 0, 1900 225.55 MMscf/yr	EPA AP-42 Table 1.4-1	NOX	100.00	0.10	2.57	11.28	---	**2.57**	**11.28**
		EPA AP-42 Table 1.4-1	CO	84.00	0.0824	2.16	9.47	---	**2.16**	**9.47**
		EPA AP-42 Table 1.4-2	VOC	5.68	5.6E-03	0.15	0.64	---	**0.15**	**0.64**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.9E-04	0.02	0.07	---	**0.02**	**0.07**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	0.01	0.20	0.86	---	**0.20**	**0.86**
		EPA AP-42 Table 1.4-3	Benzene	2.10E-03	2.06E-06	5E-05	2E-04	---	**5E-05**	**2E-04**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	HCHO	7.50E-02	7.35E-05	2E-03	0.01	---	**2E-03**	**0.01**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80E+00	1.76E-03	0.05	0.20	---	**0.05**	**0.20**
		EPA AP-42 Table 1.4-3	Toluene	3.40E-03	3.33E-06	9E-05	4E-04	---	**9E-05**	**4E-04**
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.90E-03	1.86E-06	5E-05	2E-04	---	**5E-05**	**2E-04**
		SUM	Tot HAP	1.88E+00	1.85E-03	0.05	0.21	---	**0.05**	**0.21**
		40CFR98 - Table C-1	CO2	119,317	1.17E+02	3,072	13,456	---	**3,072**	**13,456**
		40CFR98 - Table C-2	CH4	2.25	2.20E-03	0.06	0.25	---	**0.06**	**0.25**
		40CFR98 - Table C-2	N2O	2.25E-01	2.20E-04	0.01	0.03	---	**0.01**	**0.03**
		40CFR98 - Table A-1	CO2e	119,440	117.10	3,075	13,470	---	**3,075**	**13,470**

Notes:
1 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
3 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylenes), 2,2,4-TMP (iso-octane), acetaldehyde, acrolein, and methanol (MeOH).
4 - Emission factors in AP-42 are NOT EPA-recommended emission limits. Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

TXP1 Regen Gas Heater (H-02/2E) Emissions

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
H-02/2E	**TXP1 Regen Gas Heater** 8.48 MMBtu/hr (LHV) **9.40 MMBtu/hr (HHV)** **8,760 hr/yr** 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) 74,271 MMBtu/yr (LHV) 82,344 MMBtu/yr (HHV) 9,216 scf/hr 80.73 MMscf/yr	EPA AP-42 Table 1.4-1	NOX	100.00	0.10	0.92	4.04	---	**0.92**	**4.04**
		EPA AP-42 Table 1.4-1	CO	84.00	0.08	0.77	3.39	---	**0.77**	**3.39**
		EPA AP-42 Table 1.4-2	VOC	5.68	5.6E-03	0.05	0.23	---	**0.05**	**0.23**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.9E-04	0.01	0.02	---	**0.01**	**0.02**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	0.01	0.07	0.31	---	**0.07**	**0.31**
		EPA AP-42 Table 1.4-3	Benzene	2.10E-03	2.06E-06	2E-05	8E-05	---	**2E-05**	**8E-05**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	HCHO	7.50E-02	7.35E-05	7E-04	3E-03	---	**7E-04**	**3E-03**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80E+00	1.76E-03	0.02	0.07	---	**0.02**	**0.07**
		EPA AP-42 Table 1.4-3	Toluene	3.40E-03	3.33E-06	3E-05	1E-04	---	**3E-05**	**1E-04**
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.90E-03	1.86E-06	2E-05	8E-05	---	**2E-05**	**8E-05**
		SUM	Tot HAP	1.88E+00	1.85E-03	0.02	0.08	---	**0.02**	**0.08**
		40CFR98 - Table C-1	CO2	119,317	1.17E+02	1,100	4,816	---	**1,100**	**4,816**
		40CFR98 - Table C-2	CH4	2.25	2.20E-03	0.02	0.09	---	**0.02**	**0.09**
		40CFR98 - Table C-2	N2O	2.25E-01	2.20E-04	2E-03	0.01	---	**2E-03**	**0.01**
		40CFR98 - Table A-1	CO2e	119,440	117.10	1,101	4,821	---	**1,101**	**4,821**

Notes:
1 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
3 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylenes), 2,2,4-TMP (iso-octane), acetaldehyde, acrolein, and methanol (MeOH).
4 - Emission factors in AP-42 are NOT EPA-recommended emission limits. Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

TXP2 & TXP3 Regen Gas Heaters (H-03/3E and H-04/4E) Emissions

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
H-03/3E and H-04/4E (each)	**TXP2 & TXP3 Regen Gas Heaters (each)** 18.31 MMBtu/hr (LHV) **20.30 MMBtu/hr (HHV)** **8,760 hr/yr** 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) 160,394 MMBtu/yr (LHV) 177,828 MMBtu/yr (HHV) 19,902 scf/hr 174.34 MMscf/yr	Vendor Data	NOX	36.72	0.04	0.73	3.20	---	**0.73**	**3.20**
		Vendor Data	CO	40.80	0.04	0.81	3.56	---	**0.81**	**3.56**
		Vendor Data	VOC	19.38	1.9E-02	0.39	1.69	---	**0.39**	**1.69**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.9E-04	0.01	0.05	---	**0.01**	**0.05**
		Vendor Data	PM10/2.5	13.26	0.01	0.26	1.16	---	**0.26**	**1.16**
		EPA AP-42 Table 1.4-3	Benzene	2.10E-03	2.06E-06	4E-05	2E-04	---	**4E-05**	**2E-04**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	HCHO	7.50E-02	7.35E-05	1E-03	0.01	---	**1E-03**	**0.01**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80E+00	1.76E-03	0.04	0.16	---	**0.04**	**0.16**
		EPA AP-42 Table 1.4-3	Toluene	3.40E-03	3.33E-06	7E-05	3E-04	---	**7E-05**	**3E-04**
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.90E-03	1.86E-06	4E-05	2E-04	---	**4E-05**	**2E-04**
		SUM	Tot HAP	1.88E+00	1.85E-03	0.04	0.16	---	**0.04**	**0.16**
		40CFR98 - Table C-1	CO2	119,317	116.98	2,375	10,401	---	**2,375**	**10,401**
		Vendor Data	CH4	7.14	0.01	0.14	0.62	---	**0.14**	**0.62**
		40CFR98 - Table C-2	N2O	0.22	2.2E-04	4E-03	0.02	---	**4E-03**	**0.02**
		40CFR98 - Table A-1	CO2e	119,562	117.22	2,380	10,422	---	**2,380**	**10,422**

Notes:
1 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
3 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylenes), 2,2,4-TMP (iso-octane), acetaldehyde, acrolein, and methanol (MeOH).
4 - Emission factors in AP-42 are NOT EPA-recommended emission limits. Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

ZEECO BURNER DATA SHEETS

BASIS OF EMISSIONS INFORMATION

				Rev.
Furnace Temperature (°F)	1,508			
Excess Combustion Air (%)	15% Gas			
Combustion Air Temperature (°F)	100			
Relative Humidity (%)	70%			
Heat Release for Guarantee (MM Btu/hr)	18.200	to	9.100 LHV	1

EMISSIONS INFORMATION	PREDICTED		GUARANTEED	
	(ppmv)	(#/MMBtu)	(ppmv)	(#/MMBtu)
NOx Design	9	0.011	30	0.036
NOx Rich Rjctn	9	0.011	30	0.036
CO - Gas	0	0.000	50	0.040
UHC - Gas	1	0.001	15	0.007
Particulate - Gas	2	0.002	15	0.013
VOC - Gas	0	0.000	15	0.019

De-Ethanizer Hot Oil HeaterS (H-05/5E and H-06/6E) Emissions

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
H-05/5E and H-06/6E) (each)	**De-Ethanizer Hot Oil Heaters (each)** 61.63 MMBtu/hr (LHV) **68.33 MMBtu/hr (HHV)** **8,760 hr/yr** 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) 539,864 MMBtu/yr (LHV) 598,545 MMBtu/yr (HHV) 66,987 scf/hr 586.81 MMscf/yr	Vendor Data	NOX	36.72	0.04	2.46	10.77	---	**2.46**	**10.77**
		Vendor Data	CO	37.74	0.04	2.53	11.07	---	**2.53**	**11.07**
		EPA AP-42 Table 1.4-2	VOC	5.68	5.6E-03	0.38	1.67	---	**0.38**	**1.67**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.9E-04	0.04	0.18	---	**0.04**	**0.18**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	0.01	0.51	2.23	---	**0.51**	**2.23**
		EPA AP-42 Table 1.4-3	Benzene	2.10E-03	2.06E-06	1E-04	6E-04	---	**1E-04**	**6E-04**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	HCHO	7.50E-02	7.35E-05	0.01	0.02	---	**0.01**	**0.02**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80E+00	1.76E-03	0.12	0.53	---	**0.12**	**0.53**
		EPA AP-42 Table 1.4-3	Toluene	3.40E-03	3.33E-06	2E-04	1E-03	---	**2E-04**	**1E-03**
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.90E-03	1.86E-06	1E-04	6E-04	---	**1E-04**	**6E-04**
		SUM	Tot HAP	1.88E+00	1.85E-03	0.13	0.55	---	**0.13**	**0.55**
		40CFR98 - Table C-1	CO2	119,317	1.17E+02	7,993	35,008	---	**7,993**	**35,008**
		40CFR98 - Table C-2	CH4	2.25	2.20E-03	0.15	0.66	---	**0.15**	**0.66**
		40CFR98 - Table C-2	N2O	2.25E-01	2.20E-04	0.02	0.07	---	**0.02**	**0.07**
		40CFR98 - Table A-1	CO2e	119,440	117.10	8,001	35,044	---	**8,001**	**35,044**

Notes:
1 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
3 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylenes), 2,2,4-TMP (iso-octane), acetaldehyde, acrolein, and methanol (MeOH).
4 - Emission factors in AP-42 are NOT EPA-recommended emission limits. Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

FABER BURNER COMPANY
#13011
BURNER DATA
Page 3 of 4

F. Gas Pilot Data:
Natural Gas at 1000 BTU/SCF & 0.6 S.G., 630 SCFH required at 1 PSIG at the pilot.

G. Turndown Data:
10:1 on Natural Gas
4:1 on Natural Gas (with emissions guarantee)

H. Excess Air Design Data:
15% on Natural Gas @ MCR

I. EMISSION GUARANTEES

Not to Exceed:	Natural Gas	
	Lbs/MMBTU	PPM
NOx	0.036	30
CO	0.037	50

Parts Per Million (PPM) @ 3% O2 Dry

DeC2 Regeneration Gas Heater (H-07/7E) Emissions

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
H-07/7E	**DeC2 Regen Gas Heater** 9.42 MMBtu/hr (LHV) **10.44 MMBtu/hr (HHV)** **8,760 hr/yr** 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) 82,504 MMBtu/yr (LHV) 91,472 MMBtu/yr (HHV) 10,237 scf/hr 89.68 MMscf/yr	EPA AP-42 Table 1.4-1	NOX	100.00	9.80E-02	1.02	4.48	---	**1.02**	**4.48**
		EPA AP-42 Table 1.4-1	CO	84.00	8.24E-02	0.86	3.77	---	**0.86**	**3.77**
		EPA AP-42 Table 1.4-2	VOC	5.68	5.56E-03	0.06	0.25	---	**0.06**	**0.25**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.88E-04	0.01	0.03	---	**0.01**	**0.03**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	7.45E-03	0.08	0.34	---	**0.08**	**0.34**
		EPA AP-42 Table 1.4-3	Benzene	2.10E-03	2.06E-06	2.1E-05	9.4E-05	---	**2E-05**	**9E-05**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	HCHO	7.50E-02	7.35E-05	7.7E-04	3.4E-03	---	**8E-04**	**3E-03**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80E+00	1.76E-03	0.02	0.08	---	**0.02**	**0.08**
		EPA AP-42 Table 1.4-3	Toluene	3.40E-03	3.33E-06	3.5E-05	1.5E-04	---	**3E-05**	**2E-04**
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.90E-03	1.86E-06	1.9E-05	8.5E-05	---	**2E-05**	**9E-05**
		SUM	Tot HAP	1.88E+00	1.85E-03	0.02	0.08	---	**0.02**	**0.08**
		40CFR98 - Table C-1	CO2	119,317	1.17E+02	1,221	5,350	---	**1,221**	**5,350**
		40CFR98 - Table C-2	CH4	2.25	2.20E-03	0.02	0.10	---	**0.02**	**0.1**
		40CFR98 - Table C-2	N2O	2.25E-01	2.20E-04	2.3E-03	0.01	---	**2E-03**	**0.01**
		40CFR98 - Table A-1	CO2e	119,440	117.10	1,223	5,356	---	**1,223**	**5,356**

Notes:
1 - The fuel heating value will vary, 920 Btu/scf (LHV) is at the low end of the range and results in a high (conservative) fuel consumption estimate.
2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.
3 - HCHO is formaldehyde; Total HAP includes, but not limited to, HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylenes), 2,2,4-TMP (iso-octane), acetaldehyde, acrolein, and methanol (MeOH).
4 - Emission factors in AP-42 are NOT EPA-recommended emission limits. Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

Process Flare (FL-1 (8E)) Emissions

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
				lb/MMscf	lb/MMBtu	lb/hr (Ave)	tpy	%	lb/hr (Ave)	tpy
FL-1 (8E)	**Process Flare-01**	TCEQ 2010 Flare Study	NOX	Varies	1.38E-01	---	---	---	**638.12**	**73.27**
		TCEQ 2010 Flare Study	CO	Varies	2.76E-01	---	---	---	**1,274**	**146.28**
	Peak (Hourly)	Mass Balance	VOC	6,461	3.83	17,730	2,036	99%	**177.30**	**20.36**
	208,000 lb/hr (Peak)	EPA AP-42 Table 1.4-2	SO2	0.60	3.33E-04	---	---	---	**1.54**	**0.19**
	2,566,068 scf/hr (Peak)	EPA AP-42 Table 1.4-2	PM10/2.5	7.60	4.22E-03	---	---	---	**19.50**	**2.39**
	4,624 MMBtu/hr (HHV)	Mass Balance	Benzene	163.59	0.10	448.93	51.55	99%	**4.49**	**0.52**
	1,802 Btu/scf (HHV)	Mass Balance	Ethylbenzene	221.99	0.13	609.20	69.95	99%	**6.09**	**0.70**
		EPA AP-42 Table 1.4-3	HCHO	0.12	7.35E-05	---	---	---	**0.34**	**0.04**
	8,760 hr/yr	Mass Balance	n-Hexane	199.79	0.12	548.28	62.95	99%	**5.48**	**0.63**
		Mass Balance	Toluene	193.17	0.11	530.10	60.87	99%	**5.30**	**0.61**
	Average (Annual)	Mass Balance	2,2,4-TMP	238.85	0.14	655.47	75.26	99%	**6.55**	**0.75**
	71,940 scf/hr	Mass Balance	Xylenes	222.72	0.13	611.18	70.18	99%	**6.11**	**0.70**
	121.22 MMBtu/hr (HHV)	EPA AP-42 Table 1.4-3	Other HAP	3.1E-03	1.86E-06	---	---	---	**0.01**	**1E-03**
	1,061,889 MMBtu/yr	Sum	Tot HAP	1,240.25	0.74	3,404	390.76	99%	**34.38**	**3.95**
	630.19 MMscf/yr	40CFR98 Table C-1	CO2	263,621	156.45	---	---	---	**723,433**	**83,066**
	1,685 Btu/scf (HHV)	Mass Balance	CH4	7,910	4.69	21,707	2,492	99%	**217.07**	**24.92**
		40CFR98 - Table C-2	N2O	2.17	1.29E-03	---	---	---	**5.96**	**0.68**
		40CFR98 - Table A-1	CO2e	462,022	274.19	542,681	62,312	---	**730,635**	**83,893**

Notes: 1 - Flare design peak and short-term (lb/hr) emissions are based on an emergency ethane release
Flow rate = 208,000 lb/hr, MW = 30.76 lb/lb-mol, and heating value = 1,802 Btu/scf (HHV).

2 - Heat Input (See 'Att H - Waste Gas Summary' and 'Att H - Waste Gas Btu Analysis' spreadsheets):

Component	Waste Gas (to Flare)				
	Mol% (Vol%)	MMscf/yr	scf/hr (ave)	Btu/scf (HHV)	lb/MMscf
Nitrogen	0.1%	0.46	52.07	---	61.04
CO2	0.1%	0.52	59.61	---	96.10
Methane	18.7%	117.92	13,460.69	188.98	7,910
Ethane	76.8%	484.17	55,271.11	1,244	60,879
VOC	4.3%	27.11	3,094.90	252.40	6,461
Benzene	0.08%	0.50	57.17	2.85	163.59
E-Benzene	0.08%	0.50	57.08	3.94	221.99
n-Hexane	0.09%	0.55	63.29	3.87	199.79
Toluene	0.08%	0.50	57.23	3.40	193.17
2,2,4-TMP	0.08%	0.50	57.08	4.59	238.85
Xylenes	0.08%	0.50	57.27	3.95	222.72
TOTAL	**100.0%**	**630.19**	**71,938**	**1,685**	**75,407**
		vs. 85.5		vs. 1,300	

3 - CO2e Emission Factor (See 'Att H - Waste Gas Summary'):

40CFR98	kg/MMBtu	lb/MMBtu	Wgt%	lb/MMBtu
Methane	53.06	116.98	12.6%	14.74
Ethane	59.60	131.40	96.9%	127.38
VOC	62.87	138.60	10.3%	14.34
Conservative Estimate:			**119.9%**	**156.45**

4 - Waste Gas volumes to the flare are conservatively estimated as as follows:

Stream Description	Estimated Gas Volume to Process Flare (FLR-1 (8E))	scf/hr (ave)	MMscf/yr
Inlet Gas	TXP Blowdowns	2,146	18.80
	TXP Start-Up and Dry-out	2,383	20.88
	Balance of Plant Volumes	197	1.73
	Filters Change-Out	43	0.38
	Compressor Maintenance	2,493	21.84
	Amine Unit Flash Gas	1,297	4.54
	Gas Pig Trap Blowdown	920	8.06
	Compressor Dry Gas Seals	56	0.49
	Other/Misc/Contingency (20%)	1,752	15.34
	SubTotal:	**10,509**	**92.06**
Ethane	Ethane	57,078	500.00
	SubTotal:	**57,078**	**500.00**
NGL	Liquid Pig Trap Blowdown	6	0.06
	TXP Tanks Liquid Dry-Out	100	0.88
	Pump Maintenance	22	0.19
	SubTotal:	**128**	**1.12**
Residue Gas	Purge Gas	4,000	35.04
	Pilot Gas	225	1.971
	SubTotal:	**4,225**	**37.01**
	Grand-Total:	**71,940**	**630.19**
		5,425 lb/hr	

Standby Generator Engine Emissions

Unit ID (Point ID)	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions			
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/MMBtu	lb/hr	tpy
GEN-1 (9E)	**Generator Engine (Propane) (EPA Certified)**	NSPS JJJJ	NOx	2.00	0.45	0.99	4.33	na	2.00	0.45	**0.99**	**0.25**
		NSPS JJJJ	CO	4.00	0.90	1.98	8.66	na	4.00	0.90	**1.98**	**0.49**
		NMHC+CH4	THC	1.23	0.28	0.61	2.66	na	1.23	0.28	**0.61**	**0.15**
	Olympian G150LG2	NMNEHC*120%	NMHC	1.20	0.27	0.59	2.60	na	1.20	0.27	**0.59**	**0.15**
	224 bhp	NSPS JJJJ	NMNEHC	1.00	0.23	0.49	2.16	na	1.00	0.23	**0.49**	**0.12**
	150 ekW	NMNEHC + HCHO	VOC	1.09	0.25	0.54	2.36	na	1.09	0.25	**0.54**	**0.13**
	Manufactured ≥ 07/01/10	AP-42 Table 3.2-3	SO2	2.61E-03	5.88E-04	1.3E-03	0.01	na	3E-03	6E-04	**1E-03**	**3E-04**
	NSPS JJJJ Affected	AP-42 Table 3.2-3	PM10/2.5	8.62E-02	1.94E-02	0.04	0.19	na	0.09	0.02	**0.04**	**0.01**
		AP-42 Table 3.2-3	Benzene	6.74E-03	1.58E-03	3.5E-03	0.02	na	0.01	2E-03	**3E-03**	**9E-04**
	500 hr/yr	AP-42 Table 3.2-3	Ethylbenzene	1.06E-04	2.48E-05	5.4E-05	2.4E-04	na	1E-04	2E-05	**5E-05**	**1E-05**
		AP-42 Table 3.2-3	HCHO	8.74E-02	2.05E-02	0.04	0.20	na	0.09	0.02	**0.04**	**0.01**
	8,815 Btu/bhp-hr (LHV)	AP-42 Table 3.2-3	n-Hexane	---	---	---	---	na	---	---	**---**	**---**
	9,794 Btu/bhp-hr (HHV)	AP-42 Table 3.2-3	Toluene	2.38E-03	5.58E-04	1.2E-03	0.01	na	2E-03	6E-04	**1E-03**	**3E-04**
		AP-42 Table 3.2-3	2,2,4-TMP	---	---	---	---	na	---	---	**---**	**---**
	2.19 MMBtu/hr (HHV)	AP-42 Table 3.2-3	Xylenes	8.32E-04	1.95E-04	4.3E-04	1.9E-03	na	8E-04	2E-04	**4E-04**	**1E-04**
		AP-42 Table 3.2-3	Other HAP	4.02E-02	9.42E-03	0.02	0.09	na	0.04	0.01	**0.02**	**0.01**
	878 scf/hr	SUM	Total HAP	1.38E-01	3.23E-02	0.07	0.31	0.0%	0.14	0.03	**0.07**	**0.02**
	0.44 MMscf/yr	40CFR98 - Table C-1	CO2	616	138.60	304	1,332	na	615.78	138.60	**304.09**	**76.02**
		40CFR98 - Table C-2	CH4	0.03	6.61E-03	0.01	0.06	na	0.03	0.01	**0.01**	**4E-03**
	2,250 Btu/scf (LHV)	40CFR98 - Table C-2	N2O	5.88E-03	1.32E-03	2.9E-03	0.01	na	0.01	1E-03	**3E-03**	**7E-04**
	2,500 Btu/scf (HHV)	40CFR98 - Table A-1	CO2e	618	139	305	1,337	na	618.26	139.16	**305.32**	**76.33**

Notes: 1 - The emissions are based on operation at 100% of rated load.

2 - Pre-Controlled emissions assume 8,760 hr/hr and Controlled emissions are based on 500 hr/yr.

Table 1 to Subpart JJJJ of Part 60—NO_X, CO, and VOC Emission Standards for Stationary Non-Emergency SI Engines ≥100 HP (Except Gasoline and Rich Burn LPG), Stationary SI Landfill/Digester Gas Engines, and Stationary Emergency Engines >25 HP

Engine type and fuel	Maximum engine power	Manufacture date	Emission standards[a]					
			g/HP-hr			ppmvd at 15% O_2		
			NO_X	CO	VOC[d]	NO_X	CO	VOC[d]
Non-Emergency SI Natural Gas[b] and Non-Emergency SI Lean Burn LPG[b]	100≤HP<500	7/1/2008	2.0	4.0	1.0	160	540	86
		1/1/2011	1.0	2.0	0.7	82	270	60
Non-Emergency SI Lean Burn Natural Gas and LPG	500≤HP<1,350	1/1/2008	2.0	4.0	1.0	160	540	86
		7/1/2010	1.0	2.0	0.7	82	270	60
Non-Emergency SI Natural Gas and Non-Emergency SI Lean Burn LPG (except lean burn 500≤HP<1,350)	HP≥500	7/1/2007	2.0	4.0	1.0	160	540	86
	HP≥500	7/1/2010	1.0	2.0	0.7	82	270	60
Landfill/Digester Gas (except lean burn 500≤HP<1,350)	HP<500	7/1/2008	3.0	5.0	1.0	220	610	80
		1/1/2011	2.0	5.0	1.0	150	610	80
	HP≥500	7/1/2007	3.0	5.0	1.0	220	610	80
		7/1/2010	2.0	5.0	1.0	150	610	80
Landfill/Digester Gas Lean Burn	500≤HP<1,350	1/1/2008	3.0	5.0	1.0	220	610	80
		7/1/2010	2.0	5.0	1.0	150	610	80
Emergency	25<HP<130	1/1/2009	c10	387	N/A	N/A	N/A	N/A
	HP≥130		2.0	4.0	1.0	160	540	86

[a]Owners and operators of stationary non-certified SI engines may choose to comply with the emission standards in units of either g/HP-hr or ppmvd at 15 percent O_2.

[b]Owners and operators of new or reconstructed non-emergency lean burn SI stationary engines with a site rating of greater than or equal to 250 brake HP located at a major source that are meeting the requirements of 40 CFR part 63, subpart ZZZZ, Table 2a do not have to comply with the CO emission standards of Table 1 of this subpart.

[c]The emission standards applicable to emergency engines between 25 HP and 130 HP are in terms of NO_X + HC.

[d]For purposes of this subpart, when calculating emissions of volatile organic compounds, emissions of formaldehyde should not be included.

[76 FR 37975, June 28, 2011]

Slop Oil/Condensate Storage Tank Emissions

Storage Tank PTE Calculations - Working, Breathing and Flashing Emissions

Unit ID	Tank ID	Material Stored	Capacity		Turnovers per Year	Throughput		Working Losses	Breathing Losses	Flashing Losses	Total Losses	VOC 100%		Hex, BTEX, TMP (Ea) 3.33%		Total HAP 20.00%	
			gal	bbl		gal/yr	bbl/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TK-1	10E	Slop Oil/Condensate	16,800	400	60	1,000,000	23,810	6,840	2,644	---	9,484	1.08	4.74	0.04	0.16	0.22	0.95
TK-2	11E	Slop Oil/Condensate	16,800	400	60	1,000,000	23,810	6,840	2,644	---	9,484	1.08	4.74	0.04	0.16	0.22	0.95
TK-3	12E	Slop Oil/Condensate	16,800	400	60	1,000,000	23,810	6,840	2,644	---	9,484	1.08	4.74	0.04	0.16	0.22	0.95
TK-4	13E	Slop Oil/Condensate	16,800	400	60	1,000,000	23,810	6,840	2,644	---	9,484	1.08	4.74	0.04	0.16	0.22	0.95
		Total:	**67,200**	**1,600**	**60**	**4,000,000**	**95,238**					**4.33**	**18.96**	**0.14**	**0.63**	**0.87**	**3.79**

Notes:□ 1 - EPA TANKS 4.0.9d was used to determine the Slop Oil/Condensate Tank Working and Breathing (Standing) Losses.

2 - The ProMax process simulation software was used to estimate Flashing Losses from the slop oil/condensate storage tanks. The process simulation shows no flashing losses from the storage tanks.

Oak Grove TK-01 thru TK-04 - Vertical Fixed Roof Tank
Moundsville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Slop Hydrocarbon Liquids	All	56.69	48.70	64.69	52.55	8.3448	7.2610	9.5477	51.3324			96.32	
2,2-Dimethylbutane						3.9522	3.2597	4.7496	86.1770	0.0031	0.0027	86.18	Option 1: VP50 = 3.355 VP60 = 4.247
2-Methylpentane						2.5136	2.0480	3.0623	86.1800	0.0345	0.0195	86.18	Option 2: A=6.8391, B=1135.41, C=226.57
3-Methylpentane						2.2529	1.8262	2.7534	86.1770	0.0235	0.0119	86.18	Option 1: VP50 = 1.884 VP60 = 2.435
Benzene						1.0648	0.8464	1.3282	78.1100	0.0014	0.0003	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1069	0.8846	1.3736	84.1600	0.0126	0.0031	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Cyclopentane						3.8828	3.1865	4.6754	70.1300	0.0044	0.0038	70.13	Option 1: VP50 = 3.287 VP60 = 4.177
Decane (-n)						0.0310	0.0257	0.0372	142.2900	0.0336	0.0002	142.29	Option 1: VP50 = .026411 VP60 = .033211
Ethane						477.7693	431.8129	527.0337	30.0700	0.0005	0.0516	30.07	Option 1: VP50 = 438.71 VP60 = 497.04
Heptane (-n)						0.5535	0.4327	0.7028	100.2000	0.2499	0.0311	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						1.7546	1.4148	2.1588	86.1700	0.0787	0.0310	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Iso-Butane						36.1072	31.2831	41.4341	58.1300	0.0088	0.0715	58.13	Option 1: VP50 = 31.982 VP60 = 38.144
Iso-Pentane						8.8178	7.3924	10.4372	72.1500	0.0250	0.0495	72.15	Option 1: VP50 = 7.592 VP60 = 9.423
Methylcyclopentane						1.5933	1.2851	1.9601	84.1600	0.0105	0.0038	84.16	Option 2: A=6.8628, B=1186.059, C=226.04
n-Butane						24.6056	21.0778	28.5399	58.1300	0.0335	0.1854	58.13	Option 1: VP50 = 21.583 VP60 = 26.098
Nonane (-n)						0.0607	0.0499	0.0736	128.2600	0.1096	0.0015	128.26	Option 1: VP50 = .051285 VP60 = .065278
Octane (-n)						0.1345	0.1091	0.1655	114.2300	0.3096	0.0094	114.23	Option 1: VP50 = .112388 VP60 = .145444
Pentane (-n)						6.3491	5.2897	7.5784	72.1500	0.0407	0.0580	72.15	Option 3: A=27691, B=7.558
Propane						103.0798	90.9417	116.2827	44.1100	0.0201	0.4654	44.11	Option 1: VP50 = 92.73 VP60 = 108.19

Identification

User Identification:	Oak Grove TK-01 thru TK-04
City:	Moundsville
State:	West Virginia
Company:	Williams Ohio Valley Midstream
Type of Tank:	Vertical Fixed Roof Tank
Description:	400 bbl slop liquids storage tank

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	20.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,800.00
Turnovers:	59.52
Net Throughput(gal/yr):	1,000,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

Roof Characteristics

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

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

Emissions Report for: Annual

Oak Grove TK-01 thru TK-04 - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Slop Hydrocarbon Liquids	6,840.14	2,644.02	9,484.17
Propane	3,183.55	1,230.58	4,414.13
Nonane (-n)	10.23	3.95	14.18
Decane (-n)	1.60	0.62	2.22
iso-Butane	489.26	189.12	678.39
n-Butane	1,268.18	490.21	1,758.39
iso-Pentane	338.92	131.01	469.93
Pentane (-n)	396.96	153.44	550.40
Cyclopentane	26.22	10.13	36.35
2,2-Dimethylbutane	18.78	7.26	26.04
2-Methylpentane	133.54	51.62	185.15
3-Methylpentane	81.57	31.53	113.10
Hexane (-n)	212.25	82.04	294.29
Methylcyclopentane	25.83	9.98	35.81
Benzene	2.26	0.87	3.13
Cyclohexane	21.45	8.29	29.74
Heptane (-n)	212.77	82.24	295.01
Octane (-n)	64.06	24.76	88.83
Ethane	352.72	136.34	489.06

Truck Load-Out (TLO-1/14E)

Unit ID	Description	S	P	MW	T	CE	L_L	T-Put	VOC AP-42 Sect 5.2		Hex, BTEX, TMP (ea) 3.33% of VOC		Total HAP 20.0% of VOC	
		sat. fac.	psia	lb/lb-mol	°R	%	lb/Mgal	Mgal/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TLO-1/14E	Slop Oil/Condensate	1.45	5.00	51.33	512.55	---	9.05	4,000	27.13	18.09	0.90	0.60	5.43	3.62

Notes: 1 - Emission factors and formulas are from AP-42 Section 5.2 "Transportation and Marketing of Petroleum Liquids":

$L_L = 12.46 \times S \times P \times MW / T \times (1 - CE)$

where:
- L_L = Loading loss, lb/1000 gal of liquid loaded.
- S = Saturation factor, use 1.45 for "splash loading".
- P = True vapor pressure of liquid loaded, psia. Estimated as shown.
- MW = molecular weight of vapors, lb/lb-mol. Obtained from EPA TANKS 4.0.
- T = Temperature of bulk liquid loaded, °R = °F + 460. Obtained from EPA TANKS 4.0.
- CE = Overall emission reduction efficiency (collection efficiency x control efficiency).

5 - Estimated load-out at: **50** gpm; which results in: **1,334** hr/yr of operation.

6 - **Emission factors in AP-42 are NOT EPA-recommended emission limits.** Because emission factors essentially represent an average of a range of emission rates, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Amine Process Unit (V-01)

Unit ID	Description	Flow Rate				VOC (Propane) 0.456%		CO2 1.271%		CH4 1.204%		CO2e CH4 GWP: 25	
		MMscfd	lb/hr	Safety	lb/hr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
V-01 (16E)	Flash Gas	0.0124	40.65	2.50	101.63	NA - See Process Flare (FLR-1 (8E))							
					Pre-Control:	**NA - See Process Flare (FLR-1 (8E))**							
					Flash Gas Control:	**99%**		**---**		**99%**		**---**	
					Controlled:	**NA - See Process Flare (FLR-1 (8E))**							

Unit ID	Description	Flow Rate				VOC (Propane) 0.034%		CO2 93.739%		CH4 0.001%		CO2e CH4 GWP: 25	
		MMscfd	lb/hr	Safety	lb/hr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
V-01 (16E)	Acid Gas	0.1237	560.15	2.50	1,400.38	0.47	2.07	1,313	5,750	0.01	0.06	1,313	5,751
					Total:	**0.47**	**2.07**	**1,313**	**5,750**	**0.01**	**0.06**	**1,313**	**5,751**

Notes: 1 - Amine unit emissions based on process simulation done by the Dow Chemical Company Gas Treating Technology Group.

2 - The amine unit flash gas will either be used as fuel gas or burned in the flare. Worst-case assumption is the flash gas is sent to the flare for destruction.

3 - No changes have been made to the flash tank offgas flow rate or composition as the previous permit application shows higher emissions.

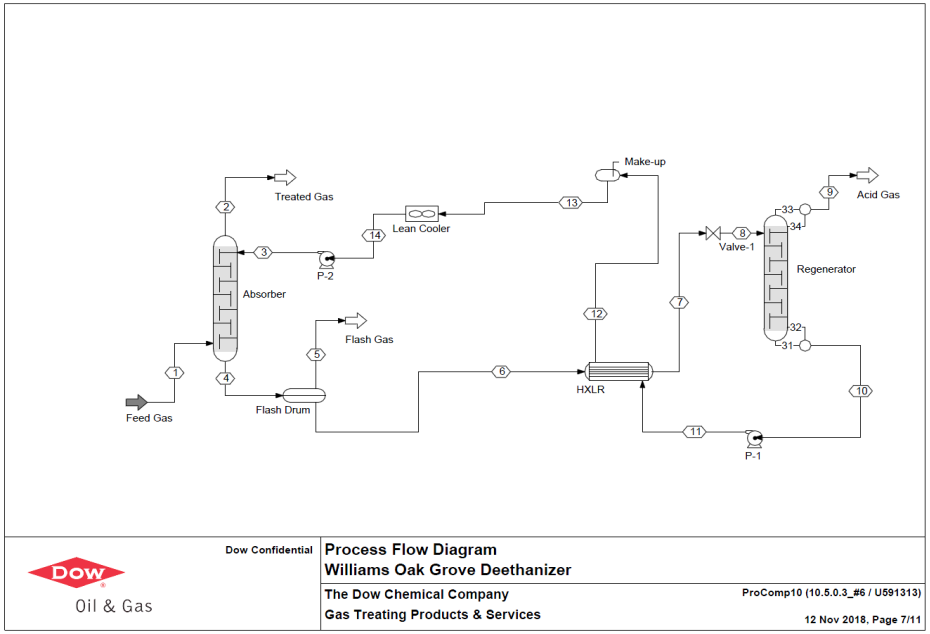
DOW Oil & Gas

Simulation Summary

Williams Oak Grove Deethanizer

Outlet Streams

STREAM-ID		2	5	9
Stream Name		Treated Gas	Flash Gas	
Outlet Block		Treated Gas	Flash Gas	Acid Gas
Temperature	deg F	96.9713	81.1599	120.0000
Pressure	Psi (g)	369.3963	70.0000	5.0000
Vapor Fraction (mol/mol)	-	1.0000	1.0000	1.0000
Flowrate	lb/hr	2.1660E+05	33.4835	560.1532
Volume Flow (Liquid)	USgal/min			
Volume Flow (Vapor)	MMSCFD @60F	65.5058	1.0134E-02	0.1237
Water	mass %	0.1545	0.3361	3.9103
Carbon Dioxide	mass %	1.9127E-03	1.7943E-02	93.7392
Hydrogen Sulfide	mass %	3.9114E-05	8.9418E-04	0.1784
Nitrogen	mass %	3.5036E-03	1.2731E-03	5.6793E-06
Methane	mass %	8.0073E-02	7.1365E-02	1.0165E-03
Ethane	mass %	98.7505	98.4694	2.1371
Propane	mass %	1.0088	1.1029	3.3805E-02
TOTAL	mass %	100.0000	100.0000	100.0000



Compressor Rod Packing and Engine Crankcase (RPC-1/17E) Emissions

Unit Description	No. of Recip Comp-ressors	Cyl per Recip Comp-ressor	scfh per Cylinder	Contin-gency	Total Leak Rate	VOC 200 lb/MMscf		HCHO --- lb/MMscf		Hex,BTEX,TMP(Ea) --- lb/MMscf		Total HAP --- lb/MMscf		CO2 --- lb/MMscf		CH4 42,275 lb/MMscf		CO2e CH4 GWP = 25 lb/MMscf	
					MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Recip Rod Packing-1 - Residue	3	6.0	15	15%	2.72	0.06	0.27	---	---	---	---	---	---	---	---	13.13	57.49	328.16	1,437
Recip Rod Packing-2 - Stabilizer Ovhd	4	Stabilizer Gas Compressor Rod Packing Emissions are routed to the Process Flare (FL-1 (8E))																	

Crankcase Emissions (Combustion Gas) — **Operating hr/yr: 500**

Unit Description	GEN-1 Horsepower (bhp)	Leak Rate 0.50 scf/bhp-hr MMscf/yr	Safety Factor	VOC 22.70 lb/MMscf		HCHO 1.89 lb/MMscf		Hex,BTEX,TMP(Ea) 0.50 lb/MMscf		Total HAP 2.98 lb/MMscf		CO2 12,803 lb/MMscf		CH4 1 lb/MMscf		CO2e CH4 GWP = 25 lb/MMscf	
				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engine Crankcase - GEN-1	224	0.98	250%	0.11	0.03	0.01	2E-03	2E-03	6E-04	0.01	4E-03	62.81	15.70	3E-03	7E-04	62.88	15.72
Total Plant-Wide RPC Emissions:				**0.17**	**0.30**	**0.01**	**2E-03**	**2E-03**	**6E-04**	**0.01**	**4E-03**	**62.81**	**15.70**	**13.13**	**57.49**	**391.04**	**1,453**

Notes:

1 - Misc. equipment leaks is a broad category covering leaks of natural gas from sealed surfaces, such as packing and gaskets, resulting from the wear of mechanical joints, seals, and rotating surfaces over time. It also includes the crankcase emissions from reciprocating engines.

2 - Rod packing leaks include three (3) TXP1 residue gas reciprocating compressors. Note that the rod packing leaks from the stabilizeo overhead reciprocating compressors are routed to the Flare.

3 - To be conservative, and to account for potential future changes, the following "worst-case" Residue gas characteristics were assumed:

Pollutant	Representative Gas Analysis	Worst-Case Assumption
CO2	--- lb/MMscf	--- lb/MMscf
CH4	40,322 lb/MMscf	42,275 lb/MMscf
VOC	--- lb/MMscf	200 lb/MMscf
Total HAP	--- lb/MMscf	--- lb/MMscf

4 - Estimates of Recip Compressor Leaks are based on vendor data w/ an appropriate contingency.

5 - Engine crankcase emissions are based on vendor data: "As a general rule, blow-by (i.e., crankcase emissions) on a *new* engine is approximately 0.5 scf/bhp-hr." A "safety factor" is used to account for increasing blow-by as the engines "wear".

6 - Crankcase emissions, from standby generator (GEN-1), are estimated as follows:

(Data from Olympian G150LG2 Data Sheet and Emissions Calculation Spreadsheet.)

Tot Engine Exhaust (TEEx) (Vol) 1,507 acf/min 12 MMscf/yr TEEx*

Pollutant	GEN-1 PTE	Crankcase Emission Factor**
Crankcase THC emissions (Mass)	0.15 tpy THC	25.58 lb THC / MMscf TEEx
Crankcase VOC emissions (Mass)	0.13 tpy VOC	22.70 lb VOC / MMscf TEEx
Crankcase HCHO emissions (Mass)	0.01 tpy HCHO	1.89 lb HCHO / MMscf TEEx
Crankcase H,BTEX,T (ea) emissions (Mass)	1E-03 tpy BTEX	0.22 lb BTEX / MMscf TEEx
Crankcase HAP (tot) emissions (Mass)	0.02 tpy HAP	2.98 lb HAP / MMscf TEEx
Crankcase CO2 emissions (Mass)	76 tpy CO2	12,803 lb CO2 / MMscf TEEx
Crankcase CH4 emissions (Mass)	4E-03 tpy CH4	1 lb CH4 / MMscf TEEx
Crankcase CH4 emissions (Mass)	7E-04 tpy N2O	1E-01 lb CH4 / MMscf TEEx
Crankcase CO2e emissions (Mass)	76 tpy CO2e	12,854 lb CO2e /MMscf TEEx

* Conversion from acf/min to scf/yr based on 500 hr/yr, 1,550 oF exhaust temp, and 68 oF std temp.

** Crankcase EmFact = PTE (tpy) from a G150LG2 Engine ÷ Tot Engine Exhaust (TEEx) (MMscf/yr).

Centrifugal Compressor - Dry Gas Seal (DGS/18E) Emissions

Unit Description	No. of Turbine Compressors	Leak Rate Per Centrifugal Compressor		Contingency	Total Leak Rate	VOC 13,600 lb/MMscf		HCHO na lb/MMscf		Hex,BTEX,TMP-Ea 33 lb/MMscf		Total HAP 200 lb/MMscf		CO2 300 lb/MMscf		CH4 37,300 lb/MMscf		CO2e CH4 GWP = 25 lb/MMscf	
		scf/hr	MMscf/yr		MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
DGS/18E - Compressors - Inlet	3	16.2	0.14	15%	0.49	0.76	3.33	---	---	2E-03	0.01	0.01	0.05	0.02	0.07	2.08	9.13	52.13	228.35

Unit Description	No. of Turbine Compressors	Leak Rate Per Centrifugal Compressor		Contingency	Total Leak Rate	VOC --- lb/MMscf		HCHO na lb/MMscf		Hex,BTEX,TMP-Ea --- lb/MMscf		Total HAP --- lb/MMscf		CO2 --- lb/MMscf		CH4 42,275 lb/MMscf		CO2e CH4 GWP = 25 lb/MMscf	
		scf/hr	MMscf/yr		MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
DGS/18E Compressors - Resid	5	48.6	0.43	15%	2.45	---	---	---	---	---	---	---	---	---	---	11.81	51.74	295.34	1,294
TOTAL DRY GAS SEAL LEAKS:						**0.76**	**3.33**	**---**	**---**	**2E-03**	**0.01**	**0.01**	**0.05**	**0.02**	**0.07**	**13.90**	**60.88**	**347.48**	**1,522**

Notes: 1 - Centrifugal compressors in inlet gas service include mole sieve regeneration gas compressors.

2 - Centrifugal compressors in residue gas service include TXP1, TXP2, and TXP3 expander/compressors and TXP2/TXP3 residue gas compressors.

3 - To be conservative, and to account for potential future changes, the following "worst-case" Gas characteristics were assumed:

Inlet Gas	Representative Gas Analysis	Worst-Case Assumption
CO2	219 lb/MMscf	300 lb/MMscf
CH4	31,049 lb/MMscf	37,300 lb/MMscf
VOC	11,271 lb/MMscf	13,600 lb/MMscf
Total HAP	127 lb/MMscf	200 lb/MMscf

Residue Gas	Representative Gas Analysis	Worst-Case Assumption
CO2	--- lb/MMscf	--- lb/MMscf
CH4	40,322 lb/MMscf	42,275 lb/MMscf
VOC	--- lb/MMscf	200 lb/MMscf
Total HAP	--- lb/MMscf	--- lb/MMscf

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Process Piping Fugitive Emissions (FUG/15E) - Page 01 of 02

Unit	Description	Component (Unit) Type (Gas/Vapor)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	THC Emission lb/hr	VOC 24.017 Wgt% lb/hr	VOC 24.017 Wgt% tpy	n-Hexane 0.265 Wgt% lb/hr	n-Hexane 0.265 Wgt% tpy	BTEX,TMP (Ea) 0.018 Wgt% lb/hr	BTEX,TMP (Ea) 0.018 Wgt% tpy	Total HAP 0.353 Wgt% lb/hr	Total HAP 0.353 Wgt% tpy	CO2 0.530 Wgt% lb/hr	CO2 0.530 Wgt% tpy	CH4 65.870 Wgt% lb/hr	CH4 65.870 Wgt% tpy	CO2e GWP = 25 lb/hr	CO2e GWP = 25 tpy
FUG-G 15E	Process Piping Fugitives (Gas/Vapor)	Valves	5,887	0.00992	92%	4.67	1.12	4.92	0.01	0.05	8E-04	4E-03	0.02	0.07	0.02	0.11	3.08	13.48	76.97	337.11
		Pump Seals	---	na	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Pressure Relief	187	0.01940	---	3.63	0.87	3.82	0.01	0.04	6E-04	3E-03	0.01	0.06	0.02	0.08	2.39	10.47	59.76	261.76
		Connectors	34,021	0.00044	93%	1.05	0.25	1.10	3E-03	0.01	2E-04	8E-04	4E-03	0.02	0.01	0.02	0.69	3.03	17.30	75.76
		Flanges	3,363	0.00086	93%	0.20	0.05	0.21	5E-04	2E-03	4E-05	2E-04	7E-04	3E-03	1E-03	5E-03	0.13	0.58	3.33	14.60
		Open-ended lines	27	0.00441	---	0.12	0.03	0.13	3E-04	1E-03	2E-05	9E-05	4E-04	2E-03	6E-04	3E-03	0.08	0.34	1.96	8.59
		Compressors	17	0.00750	---	0.13	0.03	0.13	3E-04	1E-03	2E-05	1E-04	5E-04	2E-03	7E-04	3E-03	0.08	0.37	2.10	9.20
		SubTotal:	**43,502**	**SubTotal (Controlled):**			**2.35**	**10.31**	**0.03**	**0.11**	**2E-03**	**0.01**	**0.03**	**0.15**	**0.05**	**0.23**	**6.45**	**28.27**	**161.42**	**707.03**
				SubTotal (PRE-Controlled):			**19.25**	**84.34**	**0.21**	**0.93**	**0.01**	**0.06**	**0.28**	**1.24**	**0.42**	**1.86**	**52.81**	**231.30**	**1,321**	**5,784**

Unit	Description	Component (Unit) Type (Light Liquid)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	THC Emission lb/hr	VOC 100.000 Wgt% lb/hr	VOC 100.000 Wgt% tpy	n-Hexane 1.254 Wgt% lb/hr	n-Hexane 1.254 Wgt% tpy	BTEX,TMP (Ea) 0.026 Wgt% lb/hr	BTEX,TMP (Ea) 0.026 Wgt% tpy	Total HAP 1.384 Wgt% lb/hr	Total HAP 1.384 Wgt% tpy	CO2 -- Wgt% lb/hr	CO2 -- Wgt% tpy	CH4 -- Wgt% lb/hr	CH4 -- Wgt% tpy	CO2e GWP = 25 lb/hr	CO2e GWP = 25 tpy
FUG-L 15E	Process Piping Fugitives (Light Oil)	Valves	5,001	0.00551	88%	3.31	3.31	14.49	0.04	0.18	9E-04	4E-03	0.05	0.20	---	---	---	---	---	---
		Pump Seals	68	0.02866	69%	0.60	0.60	2.65	0.01	0.03	2E-04	7E-04	0.01	0.04	---	---	---	---	---	---
		Pressure Relief	31	0.01653	---	0.51	0.51	2.25	0.01	0.03	1E-04	6E-04	0.01	0.03	---	---	---	---	---	---
		Connectors	7,142	0.00046	93%	0.23	0.23	1.01	3E-03	0.01	6E-05	3E-04	3E-03	0.01	---	---	---	---	---	---
		Flanges	3,575	0.00024	93%	0.06	0.06	0.27	8E-04	3E-03	2E-05	7E-05	8E-04	4E-03	---	---	---	---	---	---
		Open-ended lines	12	0.00309	---	0.04	0.04	0.16	5E-04	2E-03	1E-05	4E-05	5E-04	2E-03	---	---	---	---	---	---
		Compressors	---	0.01653	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		SubTotal:	**15,829**	**SubTotal (Controlled):**			**4.75**	**20.82**	**0.06**	**0.26**	**1E-03**	**0.01**	**0.07**	**0.29**	**---**	**---**	**---**	**---**	**---**	**---**
				SubTotal (PRE-Controlled):			**34.24**	**149.95**	**0.43**	**1.88**	**0.01**	**0.04**	**0.47**	**2.08**	**---**	**---**	**---**	**---**	**---**	**---**

Notes: 1 - Assumed 8,760 hours per year of fugitive emissions.

2 - Updated component counts from recent LDAR monitoring w/: 15% Contingency

3 - Gas/Vapor emissions calculated using EPA Protocol for Equipment Leak Emission Estimates, 1995, EPA-453/R-95-017

TABLE 2.4 O&G PROD (AVE)	Gas/Vapor kg/hr	Gas/Vapor lb/hr	Light Oil kg/hr	Light Oil lb/hr
Valves	4.50E-03	0.00992	2.50E-03	0.00551
Pump Seals	na	na	1.30E-02	0.02866
Other[4]	8.80E-03	0.01940	7.50E-03	0.01653
Connectors	2.00E-04	0.00044	2.10E-04	0.00046
Flanges	3.90E-04	0.00086	1.10E-04	0.00024
Open-ended lines	2.00E-03	0.00441	1.40E-03	0.00309

4 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.

5 - THC = total hydrocarbons, including methane (CH4) and ethane (C2H6).

6 - VOC = non-methane/non-ethane THC (C3+).

7 - HAP = hazardous air pollutants as designated by EPA, primarily n-hexane/BTEX.

8 - The following gas characteristics were assumed:

Pollutant	Gas/Vapor Estimated	Light Oil Estimated	Pollutant	Gas/Vapor Estimated	Light Oil Estimated
Carbon Dioxide	0.530 Wgt%	-- Wgt%	**Toluene**	0.018 Wgt%	0.038 Wgt%
Methane	65.870 Wgt%	-- Wgt%	**Ethylbenzene**	0.018 Wgt%	0.008 Wgt%
VOC (Propane)	24.017 Wgt%	100.000 Wgt%	**Xylenes**	0.018 Wgt%	0.054 Wgt%
n-Hexane	0.265 Wgt%	1.254 Wgt%	**2,2,4-TMP**	0.018 Wgt%	0.008 Wgt%
Benzene	0.018 Wgt%	0.023 Wgt%	**Total HAP:**	0.353 Wgt%	1.384 Wgt%

9 - LDAR Control Credit from "Leak Detection and Repair Compliance Assistance Guidance —A Best Practices Guide" Table 4-1, w/ Quarterly Monitoring and 500 ppm Leak Definition.

Equipment Type and Service	Control Effectiveness (% Reduction) Monthly Monitoring 10,000 ppmv Leak Definition	Quarterly Monitoring 10,000 ppmv Leak Definition	500 ppm Leak Definition[a]
Chemical Process Unit			
Valves – Gas Service[b]	87	67	92
Valves – Light Liquid Service[c]	84	61	88
Pumps – Light Liquid Service[c]	69	45	75
Connectors – All Services			93

Williams Ohio Valley Midstream LLC
Oak Grove Gas Plant
Application for 45CSR30 Title V Permit Renewal
Supplement 03 - Emission Calculations

Process Piping Fugitive Emissions (FUG/15E) - Page 02 of 02

Unit	Description	Component (Unit) Type (Light Liquid)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	THC Emission lb/hr	VOC 100.000 Wgt% lb/hr	VOC tpy	n-Hexane 1.254 Wgt% lb/hr	n-Hexane tpy	BTEX,TMP (Ea) 0.026 Wgt% lb/hr	BTEX,TMP (Ea) tpy	Total HAP 1.384 Wgt% lb/hr	Total HAP tpy	CO2 0.530 Wgt% lb/hr	CO2 tpy	CH4 65.870 Wgt% lb/hr	CH4 tpy	CO2e GWP = 25 lb/hr	CO2e tpy
FUG-M 15E	Process Piping Fugitives (Mixture)	Valves	13	0.00992	88%	0.02	0.02	0.07	1.9E-04	8.5E-04	4.0E-06	1.8E-05	2.1E-04	9.4E-04	8.2E-05	3.6E-04	0.01	0.04	0.25	1.12
		Pump Seals	---	0.02866	69%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Pressure Relief	---	0.01940	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Connectors	21	0.00046	93%	6.8E-04	7E-04	3E-03	9E-06	4E-05	2E-07	8E-07	9E-06	4E-05	4E-06	2E-05	4E-04	2E-03	0.01	0.05
		Flanges	9	0.00086	93%	5.4E-04	5E-04	2E-03	7E-06	3E-05	1E-07	6E-07	7E-06	3E-05	3E-06	1E-05	4E-04	2E-03	0.01	0.04
		Open-ended lines	---	0.00441	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Compressors	---	0.01940	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	SubTotal:		**43**	**SubTotal (Controlled):**			**0.02**	**0.07**	**2E-04**	**9E-04**	**4E-06**	**2E-05**	**2E-04**	**1E-03**	**9E-05**	**4E-04**	**0.01**	**0.05**	**0.28**	**1.20**
				SubTotal (PRE-Controlled):			**0.15**	**0.64**	**2E-03**	**0.01**	**4E-05**	**2E-04**	**2E-03**	**0.01**	**8E-04**	**3E-03**	**0.10**	**0.42**	**2.41**	**10.57**
	Grand Total:		**59,374**	**TOTAL (Controlled):**			**7.12**	**31.21**	**0.09**	**0.38**	**3E-03**	**0.01**	**0.10**	**0.44**	**0.05**	**0.23**	**6.47**	**28.32**	**161.70**	**708.23**
				TOTAL (PRE-Controlled):			**53.64**	**234.93**	**0.64**	**2.82**	**0.02**	**0.10**	**0.76**	**3.32**	**0.43**	**1.86**	**52.91**	**231.72**	**1,323**	**5,795**

Notes: 1 - Assumed 8,760 hours per year of fugitive emissions.

2 - Updated component counts from recent LDAR monitoring w/: 15.0% Safety Margin

3 - Gas/Vapor emissions calculated using EPA Protocol for Equipment Leak Emission Estimates, 1995, EPA-453/R-95-017

TABLE 2.4 O&G PROD (AVE)	Mixture (Max) kg/hr	Mixture (Max) lb/hr
Valves	4.50E-03	0.00992
Pump Seals	1.30E-02	0.02866
Other[4]	8.80E-03	0.01940
Connectors	2.10E-04	0.00046
Flanges	3.90E-04	0.00086
Open-ended lines	2.00E-03	0.00441

4 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.

5 - THC = total hydrocarbons, including methane (CH4) and ethane (C2H6).

6 - VOC = non-methane/non-ethane THC (C3+).

7 - HAP = hazardous air pollutants as designated by EPA, primarily n-hexane/BTEX.

8 - The following gas characteristics were assumed:

Pollutant	Mixture (Max) Estimated	Pollutant	Mixture (Max) Estimated
Carbon Dioxide	0.530 Wgt%	Toluene	0.038 Wgt%
Methane	65.870 Wgt%	Ethylbenzene	0.018 Wgt%
VOC (Propane)	100.000 Wgt%	Xylenes	0.054 Wgt%
n-Hexane	1.254 Wgt%	2,2,4-TMP	0.018 Wgt%
Benzene	0.023 Wgt%	Total HAP:	1.384 Wgt%

9 - LDAR Control Credit from "Leak Detection and Repair Compliance Assistance Guidance —A Best Practices Guide" Table 4-1, w/ Quarterly Monitoring and 500 ppm Leak Definition.

Table 4.1 – Control effectiveness for an LDAR program at a chemical process unit and a refinery.

Equipment Type and Service	Control Effectiveness (% Reduction) Monthly Monitoring 10,000 ppmv Leak Definition	Quarterly Monitoring 10,000 ppmv Leak Definition	500 ppm Leak Definition[a]
Chemical Process Unit			
Valves – Gas Service[b]	87	67	92
Valves – Light Liquid Service[c]	84	61	88
Pumps – Light Liquid Service[c]	69	45	75
Connectors – All Services			93

Source: Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

[a] Control effectiveness attributable to the HON-negotiated equipment leak regulation (40 CFR 63, Subpart H) is estimated based on equipment-specific leak definitions and performance levels. However, pumps subject to the HON at existing process units have a 1,000 to 5,000 ppm leak definition, depending on the type of process.

[b] Gas (vapor) service means the material in contact with the equipment component is in a gaseous state at the process operating conditions.

[c] Light liquid service means the material in contact with the equipment component is in a liquid state in which the sum of the concentration of individual constituents with a vapor pressure above 0.3 kilopascals (kPa) at 20°C is greater than or equal to 20% by weight.

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Francis - Compressor Engine Emissions – 1,380 bhp CAT G3516B (CE-01/22E)

Unit ID (Point ID)	Description	Reference	Pollutant	Pre-Controlled Emissions				Control Efficiency	Controlled Emissions			
				g/bhp-hr	lb/MMBtu	lb/hr	tpy		g/bhp-hr	lb/MMBtu	lb/hr	tpy
CE-01/22E	**Engine 01** **Caterpillar (CAT)** **G3516B** **1,380 bhp** 1,400 rpm 4SLB / AFRC Oxidation Catalyst Manufactured/Modified After July 1, 2010 NSPS JJJJ Affected **8,760 hr/yr** 1,020 Btu/scf (HHV) **8,182 Btu/bhp-hr** 11.29 MMBtu/hr (HHV) 98,911 MMBtu/yr (HHV) 11,070 scf/hr 0.27 MMscfd 1.86 MMscf/wk 96.97 MMscf/yr	Vendor Data	NOx	0.50	0.13	1.52	6.66	---	0.50	0.13	**1.52**	**6.66**
		Vendor Data	CO	2.92	0.79	8.88	38.91	90.0%	0.29	0.08	**0.89**	**3.89**
		Vendor Data	THC	4.53	1.22	13.78	60.37	15.6%	3.82	1.03	**11.63**	**50.94**
		Vendor Data	NMHC	2.14	0.58	6.51	28.52	33.0%	1.43	0.39	**4.36**	**19.10**
		Vendor Data	NMNEHC	1.01	0.27	3.07	13.46	70.0%	0.30	0.08	**0.92**	**4.04**
		NMNEHC+HCHO	VOC	1.41	0.38	4.29	18.79	70.0%	0.42	0.11	**1.29**	**5.64**
		AP-42 Table 3.2-2	SO2	2E-03	6E-04	0.01	0.03	---	2E-03	6E-04	**0.01**	**0.03**
		AP-42 Table 3.2-2	PM10/2.5	0.04	0.01	0.11	0.49	---	0.04	0.01	**0.11**	**0.49**
		AP-42 Table 3.2-2	Acetaldehyde	0.03	0.01	0.09	0.41	70.0%	0.01	3E-03	**0.03**	**0.12**
		AP-42 Table 3.2-2	Acrolein	0.02	0.01	0.06	0.25	70.0%	0.01	2E-03	**0.02**	**0.08**
		AP-42 Table 3.2-2	Benzene	2E-03	4E-04	5E-03	0.02	70.0%	5E-04	1E-04	**1E-03**	**0.01**
		AP-42 Table 3.2-2	Ethylbenzene	1E-04	4E-05	4E-04	2E-03	70.0%	4E-05	1E-05	**1E-04**	**6E-04**
		Vendor Data	Formaldehyde	0.40	0.05	1.22	5.33	70.0%	0.12	0.02	**0.37**	**1.60**
		AP-42 Table 3.2-2	n-Hexane	4E-03	1E-03	0.01	0.05	70.0%	1E-03	3E-04	**4E-03**	**0.02**
		AP-42 Table 3.2-2	Methanol	0.01	2.5E-03	0.03	0.12	70.0%	3E-03	8E-04	**0.01**	**0.04**
		AP-42 Table 3.2-2	Toluene	2E-03	4E-04	5E-03	0.02	70.0%	5E-04	1E-04	**1E-03**	**0.01**
		AP-42 Table 3.2-2	2,2,4-TMP	9E-04	3E-04	3E-03	0.01	70.0%	3E-04	8E-05	**8E-04**	**4E-03**
		AP-42 Table 3.2-2	Xylenes	7E-04	2E-04	2E-03	0.01	70.0%	2E-04	6E-05	**6E-04**	**3E-03**
		AP-42 Table 3.2-2	Other HAP	3E-03	9E-04	0.01	0.05	70.0%	1E-03	3E-04	**3E-03**	**0.01**
		Sum	Total HAP	0.47	0.07	1.44	6.29	70.0%	0.14	0.02	**0.43**	**1.89**
		Vendor Data	CO2	503.00	116.89	1,530	6,703	---	503.00	116.89	**1,530**	**6,703**
		THC-NMHC	CH4	2.39	0.64	7.27	31.85	---	2.39	0.64	**7.27**	**31.85**
		40CFR98 - Table C-2	N2O	8E-04	2E-04	2E-03	0.01	---	8E-04	2E-04	**2E-03**	**0.01**
		40CFR98 - Table A-1	CO2e	562.99	133.05	1,713	7,502	---	562.99	133.05	**1,713**	**7,502**

Notes: 1) Fuel Heating Value may vary; 1,020 MMBtu/scf is at the low end of the range and results in a conserservative fule consumption estimate.

2) VOC is the sum of NMNEHC (non-methane non-ethane hydrocarbons) and formaldehyde (HCHO).

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Francis - Compressor Rod Packing and Engine Crankcase Leaks (RPC-3/23E)

Inlet Gas and Flash Gas

Unit ID	Unit Description	Number of Comp-ressors	Cylind-ers per Comp-ressor	scfh per Cyl	Contin-gency	Total Packing Leak Rate	VOC 16,500 (Inlet) 47,500 (Flash) lb/MMscf		HCHO na na lb/MMscf		n-Hexane 180 (Inlet) 600 (Flash) lb/MMscf		BTEX,TMP (Ea) 20 (Inlet) 20 (Flash) lb/MMscf		Total HAP 280 (Inlet) 700 (Flash) lb/MMscf		CO2 300 (Inlet) 300 (Flash) lb/MMscf		CH4 36,500 (Inlet) 18,900 (Flash) lb/MMscf		CO2e 912,800 (Inlet) 472,800 (Flash) lb/MMscf	
						MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
RPC-3/23E	Rod Packing (I)	1	4	15	15%	0.60	1.14	4.99	na	na	0.01	0.05	1E-03	0.01	0.02	0.08	0.02	0.09	2.52	11.03	62.98	275.87
	Rod Packing (F)	1	3	15	15%	0.03	0.14	0.61	na	na	2E-03	0.01	6E-05	3E-04	2E-03	0.01	9E-04	4E-03	0.06	0.24	1.40	6.12

Combustion Gas

Unit ID	Unit Description	Total BHP	Crankcase Leak Rate 0.50 scf/bhp-hr MMscf/yr	Safety Factor	VOC 21.55 lb/MMscf		HCHO 6.11 lb/MMscf		n-Hexane 0.06 lb/MMscf		BTEX,TMP (Ea) 0.21 lb/MMscf		Total HAP 7.21 lb/MMscf		CO2 7,689 lb/MMscf		CH4 37 lb/MMscf		CO2e 8,603 lb/MMscf	
					lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
RPC-3/23E	Crankcase	1,380	6.04	250%	0.04	0.16	0.01	0.05	1E-04	5E-04	4E-04	2E-03	0.01	0.05	13.26	58.10	0.06	0.28	14.84	65.00

	VOC		HCHO		n-Hexane		BTEX,TMP (Ea)		Total HAP		CO2		CH4		CO2e	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TOTAL RPC-3/23E:	**1.32**	**5.76**	**0.01**	**0.05**	**0.01**	**0.06**	**1.8E-03**	**0.01**	**0.03**	**0.15**	**13.29**	**58.19**	**2.64**	**11.55**	**79.22**	**346.98**

Notes:

1 - RPC is a broad category covering leaks of natural gas from sealed surfaces, such as packing and gaskets, resulting from the wear of mechanical joints, seals, and rotating surfaces over time. It also includes the crankcase emissions from reciprocating engines.

2 - Emission are based upon 40CFR98, Subpart W and manufacturer's data.

3 - To be conservative, and to account for potential future changes, the following "worst-case" gas characteristics were assumed:

Pollutant	Worst-Case Inlet Gas Composition		Worst-Case Flash Gas Composition	
CO2	300	lb/MMscf	300	lb/MMscf
CH4	36,500	lb/MMscf	18,900	lb/MMscf
VOC	16,500	lb/MMscf	47,500	lb/MMscf
n-Hexane	180	lb/MMscf	600	lb/MMscf
BTEX, TMP (ea)	20	lb/MMscf	20	lb/MMscf
Total HAP	280	lb/MMscf	700	lb/MMscf

4 - Total Rod Packing Leak Rate (scf/yr) =
No. of Compresors * Cylinders/Compressor * scfh/Cylinder * hr/yr operation * (1 + Contingency)

5 - Engine crankcase emissions are based on vendor data: "As a general rule, blow-by (i.e., crankcase emissions) on a new engine is approx 0.5 scf/bhp-hr." A "safety factor" is used to account for increasing blow-by as the engines "wear".

6 - Crankcase emissions are estimated as follows:

(Data from CAT G3516B Data Sheet and Emissions Calculation Spreadsheet.)

Total Engine Exhaust (TEEx) (Volume)	9,216	ft3/min (acf/min)	1,743 MMscf/yr TEEx*
Pollutant	G3516B PTE		Crankcase Emission Factor**
Crankcase THC emissions (Mass)	60.37	tpy THC	69.25 lb THC / MMscf TEEx
Crankcase VOC emissions (Mass)	18.79	tpy VOC	21.55 lb VOC / MMscf TEEx
Crankcase HCHO emissions (Mass)	5.33	tpy HCHO	6.11 lb HCHO / MMscf TEEx
Crankcase n-Hexane emissions (Mass)	0.05	tpy BTEX (ea)	0.06 lb BTEX (ea) / MMscf TEEx
Crankcase BTEX, TMP (ea) emissions (Mass	0.18	tpy BTEX (ea)	0.21 lb BTEX (ea) / MMscf TEEx
Crankcase HAP emissions (Mass)	6.29	tpy HAP	7.21 lb HAP / MMscf TEEx
Crankcase CO2 emissions (Mass)	6,703	tpy CO2	7,689 lb CO2 / MMscf TEEx
Crankcase CH4 emissions (Mass)	32	tpy CH4	37 lb CH4 / MMscf TEEx
Crankcase CO2e emissions (Mass)	7,502	tpy CO2e	8,606 lb CO2e /MMscf TEEx

* Conversion from acf/min to scf/yr based on 8,760 hr/yr, 1,007 oF exhaust temp, and 68 oF std temp.

** Crankcase Emission Factor = PTE (tpy) from a G3516B Engine ÷ Total Engine Exhaust (TEEx) (MMsfy/yr).

7 - The reciprocating compressor driven by the Caterpillar G3516B engine is expected to operate 8,760 hrs/yr.

8 - The reciprocating compressor driven by the electric motor is expected to operate a maximum of 500 hrs/yr.

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Francis - Start/Stop/Maintenance (Including Blowdown) (SSM-2/24E)

Unit		No of Units	Total bhp	a. Engine "Cold-Start" Gas Volume scf/Start	b. Blowdown Gas Volume scf/B-D	SSM and Blowdown Events/yr	Total Gas Vented MMscf/yr	VOC 16,500 (Inlet) 47,500 (Flash) lb/MMscf tpy	n-Hex 180 (Inlet) 600 (Flash) lb/MMscf tpy	BTEX,TMP 20 (Inlet) 20 (Flash) lb/MMscf tpy	Total HAP 280 (Inlet) 700 (Flash) lb/MMscf tpy	CH4 36,500 (Inlet) 18,900 (Flash) lb/MMscf tpy	CO2e GWP = 25 tpy
SSM-2/24E	Cold Start (Engine)	1	na	700	---	208	0.15	1.20	0.01	1E-03	0.02	2.66	66.43
	Blowdown (Recip - Inlet)	1	1,380	---	8,577	208	1.78	14.72	0.16	0.02	0.25	32.56	813.96
	Blowdown (Recip - Flash)	1	55	---	342	12	4E-03	0.10	1.2E-03	4E-05	1E-03	0.04	0.97
	TOTAL SSM-2/24E:							**16.02**	**0.17**	**0.02**	**0.27**	**35.25**	**881.36**

Notes: 1 - SSM Emissions are the sum of:

a. Unburned fuel resulting from "cold-start" of idle gas-fired engines; and

b. Natural gas that is purged (aka blowdown) from the compressors and associated piping and equipment.

2 - Starting Gas Quantity and Blowdown (B-D) Gas Quantity as per Engineering Department.
(e.g., 8,577 scf/B-D of a compressor with a 1,380 bhp engine equals 6.22 scf/bhp/B-D.)

Engines	a. Unburned "Cold-Start" Gas is Constant at:	700 scf/start
	b. Blowdown Gas is Related to bhp at:	6.22 scf/bhp/B-D

3 - To be conservative, the following "worst-case" gas characteristics were assumed:

Pollutant	Inlet Gas	Flash Gas
Carbon Dioxide	300.00 lb/MMscf	300.00 lb/MMscf
Methane	36,500.00 lb/MMscf	18,900.00 lb/MMscf
Ethane	4,445.72 lb/MMscf	14,115.38 lb/MMscf
VOC	16,500.00 lb/MMscf	47,500.00 lb/MMscf
Benzene	20.00 lb/MMscf	20.00 lb/MMscf
Ethylbenzene	20.00 lb/MMscf	20.00 lb/MMscf
n-Hexane	180.00 lb/MMscf	600.00 lb/MMscf
Toluene	20.00 lb/MMscf	20.00 lb/MMscf
2,2,4-TMP (i-Octane)	20.00 lb/MMscf	20.00 lb/MMscf
Xylenes	20.00 lb/MMscf	20.00 lb/MMscf
Total HAP	280.00 lb/MMscf	700.00 lb/MMscf

5 - Emission estimates are conservatively based on:

4.0	Starts per week
4.0	Blowdown(s) per week - CAT G3516B Compressor
1.0	Blowdown(s) per month - Motor Driven Compressor

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 03 - Emission Calculations

Francis - Process Piping Fugitive Emissions (FUG/25E) - Page 01 of 02

Unit	Description	Component (Unit) Type (Gas/Vapor)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	THC Emission lb/hr	VOC 28.296 Wgt% lb/hr	VOC 28.296 Wgt% tpy	n-Hexane 0.309 Wgt% lb/hr	n-Hexane 0.309 Wgt% tpy	BTEX,TMP (Ea) 0.034 Wgt% lb/hr	BTEX,TMP (Ea) 0.034 Wgt% tpy	Total HAP 0.480 Wgt% lb/hr	Total HAP 0.480 Wgt% tpy	CO2 0.514 Wgt% lb/hr	CO2 0.514 Wgt% tpy	CH4 62.594 Wgt% lb/hr	CH4 62.594 Wgt% tpy	CO2e GWP = 25 lb/hr	CO2e GWP = 25 tpy
FUG-3-G 25E	Process Piping Fugitives (Gas/Vapor)	Valves	506	0.00992	92%	0.40	0.11	0.50	1E-03	0.01	1E-04	6E-04	2E-03	0.01	2E-03	0.01	0.25	1.10	6.29	27.53
		Pump Seals	---	na	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Pressure Relief	17	0.01940	---	0.33	0.09	0.41	1E-03	4E-03	1E-04	5E-04	2E-03	0.01	2E-03	0.01	0.21	0.90	5.16	22.61
		Connectors	1,701	0.00044	93%	0.05	0.01	0.07	2E-04	7E-04	2E-05	8E-05	3E-04	1E-03	3E-04	1E-03	0.03	0.14	0.82	3.60
		Flanges	335	0.00086	93%	0.02	0.01	0.02	6E-05	3E-04	7E-06	3E-05	1E-04	4E-04	1E-04	5E-04	1E-02	6E-02	3E-01	1.38
		Open-ended lines	3	0.00441	---	0.01	4E-03	0.02	4E-05	2E-04	5E-06	2E-05	6E-05	3E-04	7E-05	3E-04	0.01	0.04	0.21	0.91
		Compressors	2	0.00750	---	0.02	4E-03	0.02	5E-05	2E-04	5E-06	2E-05	7E-05	3E-04	8E-05	3E-04	0.01	0.04	0.23	1.03
		SubTotal:	**2,564**	**SubTotal (Controlled):**			**0.24**	**1.03**	**3E-03**	**0.01**	**3E-04**	**1E-03**	**4E-03**	**0.02**	**4E-03**	**0.02**	**0.52**	**2.28**	**13.03**	**57.06**
				SubTotal (PRE-Controlled):			**1.82**	**7.95**	**0.02**	**0.09**	**2E-03**	**0.01**	**0.03**	**0.13**	**0.03**	**0.14**	**4.02**	**17.59**	**100.43**	**439.90**

Unit	Description	Component (Unit) Type (Light Liquid)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	THC Emission lb/hr	VOC 100.000 Wgt% lb/hr	VOC 100.000 Wgt% tpy	n-Hexane 5.000 Wgt% lb/hr	n-Hexane 5.000 Wgt% tpy	BTEX,TMP (Ea) 1.000 Wgt% lb/hr	BTEX,TMP (Ea) 1.000 Wgt% tpy	Total HAP 10.000 Wgt% lb/hr	Total HAP 10.000 Wgt% tpy	CO2 -- Wgt% lb/hr	CO2 -- Wgt% tpy	CH4 -- Wgt% lb/hr	CH4 -- Wgt% tpy	CO2e GWP = 25 lb/hr	CO2e GWP = 25 tpy
FUG-3-L 25E	Process Piping Fugitives (Light Oil)	Valves	144	0.00551	88%	0.10	0.10	0.42	5E-03	0.02	1E-03	4E-03	0.01	0.04	---	---	---	---	---	---
		Pump Seals	9	0.02866	69%	0.08	0.08	0.35	4E-03	0.02	8E-04	4E-03	0.01	0.04	---	---	---	---	---	---
		Pressure Relief	2	0.01653	---	0.03	0.03	0.14	2E-03	0.01	3E-04	1E-03	3E-03	0.01	---	---	---	---	---	---
		Connectors	287	0.00046	93%	0.01	0.01	0.04	5E-04	2E-03	9E-05	4E-04	9E-04	4E-03	---	---	---	---	---	---
		Flanges	67	0.00024	93%	0.00	1E-03	5E-03	6E-05	2E-04	1E-05	5E-05	1E-04	5E-04	---	---	---	---	---	---
		Open-ended lines	2	0.00309	---	0.01	0.01	0.03	3E-04	1E-03	6E-05	3E-04	6E-04	3E-03	---	---	---	---	---	---
		Compressors	---	0.01653	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		SubTotal:	**511**	**SubTotal (Controlled):**			**0.22**	**0.98**	**0.01**	**0.05**	**2E-03**	**0.01**	**0.02**	**0.10**	**---**	**---**	**---**	**---**	**---**	**---**
				SubTotal (PRE-Controlled):			**1.24**	**5.43**	**0.06**	**0.27**	**0.01**	**0.05**	**0.12**	**0.54**	**---**	**---**	**---**	**---**	**---**	**---**

Notes: 1 - Assumed 8,760 hours per year of fugitive emissions.

2 - Updated component counts from recent LDAR monitoring w/: 15% Contingency

3 - Gas/Vapor emissions calculated using EPA Protocol for Equipment Leak Emission Estimates, 1995, EPA-453/R-95-017

TABLE 2.4 O&G PROD (AVE)	Gas/Vapor kg/hr	Gas/Vapor lb/hr	Light Oil kg/hr	Light Oil lb/hr
Valves	4.50E-03	0.00992	**2.50E-03**	**0.00551**
Pump Seals	na	na	**1.30E-02**	**0.02866**
Other[4]	8.80E-03	0.01940	**7.50E-03**	**0.01653**
Connectors	2.00E-04	0.00044	**2.10E-04**	**0.00046**
Flanges	3.90E-04	0.00086	**1.10E-04**	**0.00024**
Open-ended lines	2.00E-03	0.00441	**1.40E-03**	**0.00309**

4 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.

5 - THC = total hydrocarbons, including methane (CH4) and ethane (C2H6).

6 - VOC = non-methane/non-ethane THC (C3+).

7 - HAP = hazardous air pollutants as designated by EPA, primarily n-hexane/BTEX.

8 - The following gas characteristics were assumed:

Pollutant	Gas/Vapor Estimated	Light Oil Estimated	Pollutant	Gas/Vapor Estimated	Light Oil Estimated
Carbon Dioxide	0.514 Wgt%	-- Wgt%	**Toluene**	0.034 Wgt%	1.000 Wgt%
Methane	62.594 Wgt%	-- Wgt%	**Ethylbenzene**	0.034 Wgt%	1.000 Wgt%
VOC (Propane)	28.296 Wgt%	100.000 Wgt%	**Xylenes**	0.034 Wgt%	1.000 Wgt%
n-Hexane	0.309 Wgt%	5.000 Wgt%	**2,2,4-TMP**	0.034 Wgt%	1.000 Wgt%
Benzene	0.034 Wgt%	1.000 Wgt%	**Total HAP:**	0.480 Wgt%	10.000 Wgt%

9 - LDAR Control Credit from "Leak Detection and Repair Compliance Assistance Guidance —A Best Practices Guide" Table 4-1, w/ Quarterly Monitoring and 500 ppm Leak Definition.

Table 4.1 – Control effectiveness for an LDAR program at a chemical process unit and a refinery.

Equipment Type and Service	Control Effectiveness (% Reduction) Monthly Monitoring 10,000 ppmv Leak Definition	Quarterly Monitoring 10,000 ppmv Leak Definition	500 ppm Leak Definition[a]
Chemical Process Unit			
Valves – Gas Service[b]	87	67	92
Valves – Light Liquid Service[c]	84	61	88
Pumps – Light Liquid Service[c]	69	45	75
Connectors – All Services			93

Francis - Process Piping Fugitive Emissions (FUG/25E) - Page 02 of 02

Unit	Description	Component (Unit) Type (Mixture)	Unit Count	THC Factor lb/hr/Unit	LDAR Control Credit	THC Emission lb/hr	VOC 100.00 Wgt% lb/hr	VOC 100.00 Wgt% tpy	n-Hexane 5.00 Wgt% lb/hr	n-Hexane 5.00 Wgt% tpy	BTEX,TMP (Ea) 1.00 Wgt% lb/hr	BTEX,TMP (Ea) 1.00 Wgt% tpy	Total HAP 10.00 Wgt% lb/hr	Total HAP 10.00 Wgt% tpy	CO2 0.51 Wgt% lb/hr	CO2 0.51 Wgt% tpy	CH4 62.59 Wgt% lb/hr	CH4 62.59 Wgt% tpy	CO2e GWP = 25 lb/hr	CO2e GWP = 25 tpy
FUG-3-M 25E	Process Piping Fugitives (Mixture)	Valves	13	0.00992	88%	0.02	0.02	0.07	8E-04	3E-03	2E-04	7E-04	2E-03	0.01	8E-05	3E-04	0.01	0.04	0.24	1.06
		Pump Seals	1	0.02866	69%	0.01	0.01	0.04	4E-04	2E-03	9E-05	4E-04	9E-04	4E-03	5E-05	2E-04	6E-03	0.02	0.14	0.61
		Pressure Relief	1	0.01940	---	0.02	0.02	0.08	1E-03	4E-03	2E-04	8E-04	2E-03	0.01	1E-04	4E-04	0.01	0.05	0.30	1.33
		Connectors	40	0.00046	93%	1E-03	1E-03	0.01	6E-05	3E-04	1E-05	6E-05	1E-04	6E-04	7E-06	3E-05	8E-04	4E-03	0.02	0.09
		Flanges	9	0.00086	93%	5E-04	5E-04	2E-03	3E-05	1E-04	5E-06	2E-05	5E-05	0.00	3E-06	1E-05	3E-04	1E-03	0.01	0.04
		Open-ended lines	1	0.00441	---	4E-03	4E-03	0.02	2E-04	1E-03	4E-05	2E-04	4E-04	2E-03	2E-05	1E-04	3E-03	0.01	0.07	0.30
		Compressors	1	0.01940	---	0.02	0.02	0.08	1E-03	4E-03	2E-04	8E-04	2E-03	0.01	1E-04	4E-04	0.01	0.1	0.30	1.33
		SubTotal:	**66**	**SubTotal (Controlled):**			**0.07**	**0.30**	**3E-03**	**0.02**	**7E-04**	**3E-03**	**0.01**	**0.03**	**4E-04**	**2E-03**	**0.04**	**0.19**	**1.09**	**4.76**
				SubTotal (PRE-Controlled):			**0.23**	**0.99**	**0.01**	**0.05**	**2E-03**	**0.01**	**0.02**	**0.10**	**1E-03**	**0.01**	**0.14**	**0.62**	**3.55**	**15.57**
		Grand Total:	**3,141**	**TOTAL (Controlled):**			**0.53**	**2.32**	**0.02**	**0.08**	**3E-03**	**0.01**	**0.03**	**0.15**	**5E-03**	**0.02**	**0.56**	**2.47**	**14.11**	**61.82**
				TOTAL (PRE-Controlled):			**3.28**	**14.38**	**0.09**	**0.41**	**0.02**	**0.07**	**0.18**	**0.78**	**0.03**	**0.15**	**4.16**	**18.21**	**103.99**	**455.47**

Notes: 1 - Assumed 8,760 hours per year of fugitive emissions.

2 - Component counts in "Mixed" service estmated at: 2.0% of Gas and Liquid Components

3 - Gas/Vapor emissions calculated using EPA Protocol for Equipment Leak Emission Estimates, 1995, EPA-453/R-95-017

TABLE 2.4 O&G PROD (AVE)	Mixture (Max) kg/hr	Mixture (Max) lb/hr
Valves	4.50E-03	0.00992
Pump Seals	1.30E-02	0.02866
Other[(4)]	8.80E-03	0.01940
Connectors	2.10E-04	0.00046
Flanges	3.90E-04	0.00086
Open-ended lines	2.00E-03	0.00441

4 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.

5 - THC = total hydrocarbons, including methane (CH4) and ethane (C2H6).

6 - VOC = non-methane/non-ethane THC (C3+).

7 - HAP = hazardous air pollutants as designated by EPA, primarily n-hexane/BTEX.

8 - The following gas characteristics were assumed:

Pollutant	Mixture (Max) Estimated	Pollutant	Mixture (Max) Estimated
Carbon Dioxide	0.514 Wgt%	**Toluene**	1.000 Wgt%
Methane	62.594 Wgt%	**Ethylbenzene**	1.000 Wgt%
VOC (Propane)	100.000 Wgt%	**Xylenes**	1.000 Wgt%
n-Hexane	5.000 Wgt%	**2,2,4-TMP**	1.000 Wgt%
Benzene	1.000 Wgt%	**Total HAP:**	10.000 Wgt%

9 - LDAR Control Credit from "Leak Detection and Repair Compliance Assistance Guidance —A Best Practices Guide" Table 4-1, w/ Quarterly Monitoring and 500 ppm Leak Definition.

Table 4.1 – Control effectiveness for an LDAR program at a chemical process unit and a refinery.

Equipment Type and Service	Control Effectiveness (% Reduction) Monthly Monitoring 10,000 ppmv Leak Definition	Quarterly Monitoring 10,000 ppmv Leak Definition	500 ppm Leak Definition[a]
Chemical Process Unit			
Valves – Gas Service[b]	87	67	92
Valves – Light Liquid Service[c]	84	61	88
Pumps – Light Liquid Service[c]	69	45	75
Connectors – All Services			93

Source: Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

[a] Control effectiveness attributable to the HON-negotiated equipment leak regulation (40 CFR 63, Subpart H) is estimated based on equipment-specific leak definitions and performance levels. However, pumps subject to the HON at existing process units have a 1,000 to 5,000 ppm leak definition, depending on the type of process.

[b] Gas (vapor) service means the material in contact with the equipment component is in a gaseous state at the process operating conditions.

[c] Light liquid service means the material in contact with the equipment component is in a liquid state in which the sum of the concentration of individual constituents with a vapor pressure above 0.3 kilopascals (kPa) at 20°C is greater than or equal to 20% by weight.

Potentially Applicable

AP-42 and GHG EMISSION FACTORS

(Preferentially use test data or vendor data where available)

	Pollutant	GAS-FIRED ENGINES			GAS-FIRED TURBINES		
		AP-42 Table 3.2-1; 3.2-2; 3.2-3 07/00			AP-42 Table 3.1-1; 3.1-2a; 3.1-3 04/00		
		2SLB lb/MMBtu	4SLB lb/MMBtu	4SRB lb/MMBtu	Uncontrolled lb/MMBtu	Water Injection lb/MMBtu	Lean Pre-Mix# lb/MMBtu
CRITERIA	NOX (≥ 90% Load)	3.17E+00	4.08E+00	2.21E+00	3.20E-01	1.30E-01	9.90E-02
	CO (≥ 90% Load)	3.86E-01	3.17E-01	3.72E+00	8.20E-02	3.00E-02	1.50E-02
	THC (TOC)	1.64E+00	1.47E+00	3.58E-01	1.10E-02	1.10E-02	1.10E-02
	NMHC (THC-CH4)	1.90E-01	2.20E-01	1.28E-01	2.40E-03	2.40E-03	2.40E-03
	NMNEHC (NMHC-C2H6)	1.19E-01	1.15E-01	5.76E-02	2.10E-03	2.10E-03	2.10E-03
	VOC	1.20E-01	1.18E-01	2.96E-02	2.10E-03	2.10E-03	2.10E-03
	SO2*** (2,000 gr-S/MMscf)	5.88E-04	5.88E-04	5.88E-04	5.88E-04	5.88E-04	5.88E-04
	PM10/2.5 (Filter+Cond)	4.83E-02	9.99E-03	1.94E-02	6.60E-03	6.60E-03	6.60E-03
HAPs	Benzene	1.94E-03	4.40E-04	1.58E-03	1.20E-05	1.20E-05	9.10E-07
	Ethylbenzene	1.08E-04	3.97E-05	2.48E-05	3.20E-05	3.20E-05	3.20E-05
	Formaldehyde (HCHO)	5.52E-02	5.28E-02	2.05E-02	7.10E-04	7.10E-04	2.00E-05
	n-Hexane	4.45E-04	1.11E-03	---	---	---	---
	Toluene	9.63E-04	4.08E-04	5.58E-04	1.30E-04	1.30E-04	1.30E-04
	TMP, 2,2,4- (i-Octane)	8.46E-04	2.50E-04	---	---	---	---
	Xylenes	2.68E-04	1.84E-04	1.95E-04	6.40E-05	6.40E-05	6.40E-05
	Other HAPs	1.96E-02	1.69E-02	9.42E-03	1.06E-04	1.06E-04	1.06E-04
GHG	CO2 (GWP=1)	1.17E+02	1.17E+02	1.17E+02	1.17E+02	1.17E+02	1.17E+02
	CH4 (GWP=25)	1.45E+00	1.25E+00	2.30E-01	8.60E-03	8.60E-03	8.60E-03
	N2O (GWP=298)	*2.20E-04*	*2.20E-04*	*2.20E-04*	3.00E-03	3.00E-03	3.00E-03
	CO2e	*1.53E+02*	*1.48E+02*	*1.23E+02*	*1.18E+02*	*1.18E+02*	*1.18E+02*

(#Lean Pre-Mix - aka: Dry Low Emissions (DLE or DLN) and SoLoNOX)

	Pollutant	GAS-FIRED EXTERNAL COMBUSTION			FLARES	DIESEL ENGINES
		AP-42 Table 1.4-1; 1.4-2; 1.4-3 (<100 MMBtu/hr) 07/98			13.5-1 12/16	3.3-1; 3.3-2 10/96
		Uncontrolled lb/MMBtu	LoNOX Burners lb/MMBtu	Flue Gas Recirc lb/MMBtu	(Combustion) lb/MMBtu	Uncontrolled lb/MMBtu
CRITERIA	NOX	9.80E-02	4.90E-02	3.14E-02	External Combustion	4.41E+00
	CO	8.24E-02	8.24E-02	8.24E-02	3.10E-01	9.50E-01
	THC (TOC)	1.08E-02	1.08E-02	1.08E-02		3.60E-01
	NMHC (THC-CH4)	8.53E-03	8.53E-03	8.53E-03		3.53E-01
	NMNEHC (NMHC-C2H6)	5.49E-03	5.49E-03	5.49E-03		3.50E-01
	VOC	5.56E-03	5.56E-03	5.56E-03		3.60E-01
	SO2 (2,000 gr-S/MMscf)	5.88E-04	5.88E-04	5.88E-04		2.90E-01
	PM10/2.5 (Filter+Condense)	7.45E-03	7.45E-03	7.45E-03		3.10E-01
HAPs	Benzene	2.06E-06	2.06E-06	2.06E-06		9.33E-04
	Ethylbenzene	---	---	---		---
	HCHO (Formaldehyde)	7.35E-05	7.35E-05	7.35E-05		1.18E-03
	n-Hexane	1.76E-03	1.76E-03	1.76E-03		---
	Toluene	3.33E-06	3.33E-06	3.33E-06		4.09E-04
	2,2,4-TMP (i-Octane)	---	---	---		---
	Xylenes	---	---	---		2.85E-04
	Other HAPs	1.86E-06	1.86E-06	1.86E-06		1.05E-03
GHG	CO2 (GWP=1)	1.18E+02	1.18E+02	1.18E+02		1.64E+02
	CH4 (GWP=25)	2.25E-03	2.25E-03	2.25E-03		*6.61E-03*
	N2O (GWP=298)	2.16E-03	6.27E-04	6.27E-04		*1.32E-03*
	CO2e	*1.18E+02*	*1.18E+02*	*1.18E+02*		*1.65E+02*

USE

≥98% DRE

OR

External Combustion

AS APPLICABLE

40 CFR 98 - DEFAULT EMISSION FACTORS				
Fuel Type	Table C-1 to Subpart C of Part 98	Table C-2 to Subpart C of Part 98		
	Default HHV	Carbon Dioxide	Methane	Nitrous Oxide
		lb CO2/MMBtu	lb CH4/MMBtu	lb N2O/MMBtu
Fuel Oil No. 2 (Diesel)	0.138 MMBtu/gal	1.61E+02	6.61E-03	1.32E-03
Propane	91,000 Btu/gal	1.39E+02	6.61E-03	1.32E-03
Natural Gas	1,026 MMBtu/scf	1.17E+02	2.20E-03	2.20E-04

Global Warming Potential (100 Yr) (GWP)		
Table A-1 to Subpart A of Part 98		
CO2	CH4*	N2O#
1	25	298

Conversion Factors

1.0 lb	=	453.592 g
1.0 kg	=	2.2046226 lb
1.0 hp	=	2,544.433 Btu/hr
1.0 hp	=	745.700 Watt
1.0 kW	=	3,412.142 Btu/hr
1.0 kW-hr	=	1.340 hp-hr
1.0 ft3	=	7.481 gal
1.0 gal H2O	=	8.338 lb
1.0 cf H2O	=	62.371 gal
1.0 m	=	3.281 ft
1.0 km	=	0.621 mi
1.0 acre	=	43,560.174 ft2
1.0 °F	=	(°C*9/5)+32
1.0 °R	=	°F+459.67
UGC (stp)	=	379.482 scf/lb-mol

Supplement 04

Insignificant Activities

Misc. Storage Tanks

Emission units which do not have any applicable requirements and which emit criteria pollutants (CO, NOx, SO2, VOC and PM) into the atmosphere at a rate of less than 1 pound per hour and less than 10,000 pounds per year (5 tpy) aggregate total for each criteria pollutant from all emission units.

Emission units which do not have any applicable requirements and which emit hazardous air pollutants (HAP) into the atmosphere at a rate of less than 0.1 pounds per hour and less than 1,000 pounds per year (0.5 tpy) aggregate total for all HAPs from all emission sources.

Please specify all emission units for which this exemption applies along with the quantity of pollutants emitted on an hourly and annual basis:

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 04 - Insignificant Activities

(Include all emission units and air pollution control devices
that will be part of this permit application review, regardless of permitting status.)

Emission Unit ID[1]	Emission Point[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
Insignificant Activities - Misc. Storage Tanks						
---	---	00-V-823 Common Closed Drain Vessel	2014	2,200 gal	Existing	na
---	---	00-V-817 Flare Knockout Vessel	2014	25,000 gal	Existing	na
---	---	21-ST-810 Lube Oil Day Tank	2014	300 gal	Existing	na
---	---	21-V-809 Closed Drain Vessel	2014	4,500 gal	Existing	na
---	---	21-V-701 Hot Oil Surge Tank	2014	2,300 gal	Existing	na
---	---	21-V-828 De-Ethanizer Surge Tank	2014	70,000 gal	Existing	na
---	---	21-ST-801 De-Ionized Water Storage Tank	2014	16,800 gal	Existing	na
---	---	21-ST-802 Amine Storage Tank	2014	4,200 gal	Existing	na
---	---	21-ST-803 Raw Regen Water Storage Tank	2014	16,800 gal	Existing	na
---	---	21-ST-806 Used Amine Storage Tank	2014	25,000 gal	Existing	na
---	---	21-HTR-703 Hot Oil Heater	2014	2,662 gal	Existing	na
---	---	21-HTR-704 Hot Oil Heater	2014	2,662 gal	Existing	na
---	---	31-ST-980 Lube Oil Day Tank	2014	300 gal	Existing	na
---	---	32-ST-980 Lube Oil Day Tank	2014	300 gal	Existing	na
---	---	31-V-801 Feed Separator	2014	1,700 gal	Existing	na
---	---	32-V-801 Feed Separator	2014	1,700 gal	Existing	na
---	---	01-ST-863 Residue Compressor Lube Oil	2014	335 gal	Existing	na
---	---	01-ST-884 Turbo Expander Bullet Tank	2014	60 gal	Existing	na
---	---	01-V-868 Closed Drain Vessel	2014	370 gal	Existing	na
---	---	01-V-403 Cold Drain Tank	2014	3,500 gal	Existing	na
---	---	01-V-860 Inlet Gas Separator	2014	380 gal	Existing	na
---	---	01-V-402 Cold Separator	2014	7,500 gal	Existing	na
---	---	Diesel tank	2014	500 gal	Existing	na
---	---	Gasoline tank	2014	500 gal	Existing	na

[1] For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S, ... or other appropriate designation.
[2] For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal, etc.
[4] For Control Devices use the following numbering system: 1C, 2C, 3C, ... or other appropriate designation.

Supplement 05

Lab Analysis

---

§45-30-4.3.c.8 - The application forms shall include calculations or test data on which the information is based.

- **Inlet Gas Analysis – Design Basis**
- **Inlet Gas Summary – Design Basis**
- **Residue Gas Summary**
- **Ethane Product Summary**
- **Natural Gas Liquids (NGL) Summary**
- **Waste Gas Summary**
- **Waste Gas BTU Analysis**

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 05 - Lab Analysis

Inlet Gas Summary - Design Basis

Inlet Gas - Design Basis - (Ft Beeler Gas Plant)

Component	CAS	Formula	Molecular Weight	Mole % (Vol %)	Mole Fraction	Weighted Sum	Weight %	lb/MMscf
Nitrogen	7727-37-9	N2	32.00	0.4955	0.004955	0.1586	0.738	417.82
Hydrogen Sulfide	2148-87-8	H2S	34.08	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	0.1887	0.001887	0.0830	0.386	218.84
Methane*	75-82-8	CH4	16.04	73.4443	0.734453	11.7824	54.831	31,048.71
Ethane*	74-84-0	C2H6	30.07	17.2512	0.172514	5.1873	24.140	13,669.52
Propane**	74-98-6	C3H8	44.10	6.0946	0.060947	2.6875	12.507	7,081.99
i-Butane**	75-28-5	C4H10	58.12	0.5849	0.005849	0.3400	1.582	895.86
n-Butane**	106-97-8	C4H10	58.12	1.3036	0.013036	0.7577	3.526	1,996.65
Cyclopentane**	287-92-3	C5H10	70.13	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	0.2148	0.002148	0.1550	0.721	408.39
n-Pentane**	109-66-0	C5H12	72.15	0.2357	0.002357	0.1701	0.791	448.13
Cyclohexane**	110-82-7	C6H12	84.16	0.0112	0.000112	0.0094	0.044	24.84
Other Hexanes**	varies	C6H14	86.18	0.0750	0.000750	0.0646	0.301	170.32
Methylcyclohexane**	varies	C7H14	98.19	0.0062	0.000062	0.0061	0.028	16.04
Heptanes**	varies	C7H16	100.20	0.0287	0.000287	0.0288	0.134	75.78
C8+ Heavies**	varies	C8H18	114.5 est	0.0087	0.000087	0.0100	0.046	26.25
Benzene***	71-43-2	C6H6	78.11	0.0008	0.000008	0.0006	0.003	1.65
Ethylbenzene***	100-41-4	C8H10	106.17	0.0001	0.000001	0.0001	0.000	0.14
n-Hexane***	110-54-3	C6H14	86.18	0.0518	0.000518	0.0446	0.208	117.63
Toluene***	108-88-3	C7H8	92.14	0.0013	0.000013	0.0012	0.006	3.16
2,2,4-TMP***	540-84-1	C8H18	114.23	0.0001	0.000001	0.0001	0.000	0.15
Xylenes***	1330-20-7	C8H10	106.17	0.0016	0.000016	0.0017	0.008	4.48
Totals:				**100.00**	**1.00**	**21.49**	**100.00**	**56,626**
Total THC:				**99.31**	**0.99**	**21.25**	**98.88**	**55,990**
Total VOC:				**8.62**	**0.09**	**4.28**	**19.90**	**11,271**
Total HAP:				**0.06**	**0.001**	**0.05**	**0.22**	**127**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (VOC) *** = also Hazardous Air Pollutant (HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 °F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, and to account for potential future changes in the gas quality, the following "worst-case" values were assumed:

Component	CAS	Formula	Representative Gas Analysis			Worst-Case (120% Min)		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	124-38-9	CO2	0.189	0.386	219	0.259	0.530	300
Methane	75-82-8	CH4	73.444	54.831	31,049	88.231	65.870	37,300
Ethane	74-84-0	C2H6	17.251	24.140	13,670	20.823	29.138	16,500
VOC	Various	C3+	8.619	19.905	11,271	10.400	24.017	13,600
Benzene	71-43-2	C6H6	0.001	0.003	2	0.005	0.018	10
Ethylbenzene	110-54-3	C8H10	0.000	0.000	0	0.004	0.018	10
n-Hexane	100-41-4	C6H14	0.052	0.208	118	0.066	0.265	150
Toluene	108-88-3	C7H8	0.001	0.006	3	0.004	0.018	10
2,2,4-TMP	540-84-1	C8H18	0.000	0.000	0	0.003	0.018	10
Xylenes	1330-20-7	C8H10	0.002	0.008	4	0.004	0.018	10
Total HAP	Various	C6+	0.056	0.225	127	0.087	0.353	200

Inlet Gas Composition - Design Basis

Legacy Measurement Solutions
Shreveport, LA
318-226-7237

Gooc

Customer	: 2259 - WILLIAMS	**Date Sampled**	: 11/01/2013
Station ID	: 5001	**Date Analyzed**	: 11/11/2013
Cylinder ID	: 5203	**Effective Date**	: 12/01/2013
Producer	:	**Cyl Pressure**	: 900
Lease	: FORT BEELER 12 INCH	**Temp**	: 60
Area	: 500 - OHIO VALLEY MID	**Cylinder Type**	: Spot
State	: WV	**Sample By**	: JM

COMPONENT	MOL%	GPM@14.73(PSIA)
Oxygen	0.0030	0.000
Nitrogen	0.4955	0.000
Methane	73.4443	0.000
Carbon-Dioxide	0.1887	0.000
Ethane	17.2512	4.630
Propane	6.0946	1.685
Iso-Butane	0.5849	0.192
Normal-Butane	1.3036	0.412
Iso-Pentane	0.2148	0.079
Normal-Pentane	0.2357	0.086
2,2-Dimethylbutane	0.0045	0.002
2,3-Dimethylbutane/CycloC5	0.0087	0.003
2-methylpentane	0.0393	0.016
3-methylpentane	0.0225	0.009
Normal-Hexane	0.0518	0.021
2,2-Dimethylpentane	0.0004	0.000
Methylcyclopentane	0.0062	0.002
BENZENE	0.0008	0.000
3,3-Dimethylpentane	0.0006	0.000
CYCLOHEXANE	0.0050	0.002
2-Methylhexane	0.0075	0.003
2,3-Dimethylpentane	0.0019	0.001
3-Methylhexane	0.0075	0.003
1,t2-DMCYC5 / 2,2,4-TMC5	0.0001	0.000
1,t3-Dimethylcyclopentane	0.0002	0.000
N-Heptane	0.0108	0.005
METHYLCYCLOHEXANE	0.0059	0.003
2,5-Dimethylhexane	0.0005	0.000
2,3-Dimethylhexane	0.0007	0.000
TOLUENE	0.0013	0.000
2-Methylheptane	0.0017	0.001
4-Methylheptane	0.0007	0.000
3-Methylheptane	0.0014	0.001
1,t4-Dimethylcyclohexane	0.0007	0.000
N-OCTANE / 1,T2-DMCYC6	0.0022	0.001
1,t3-DMCYC6/1,C4-DMCYC6/1,C2,C3-TMCYC5	0.0000	0.000
2,4,4 TMC6	0.0000	0.000

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 05 - Lab Analysis

Residue Gas Summary

Residue Gas Composition

Component	CAS	Formula	Molecular Weight	Mole % (Vol %)	Mole Fraction	Weighted Sum	Weight %	lb/MMscf
Nitrogen	7727-37-9	N2	32.00	---	---	---	---	---
Hydrogen Sulfide	2148-87-8	H2S	34.08	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	---	---	---	---	---
Methane*	75-82-8	CH4	16.04	95.3860	0.953822	15.3016	91.571	40,322.46
Ethane*	74-84-0	C2H6	30.07	4.4760	0.044758	1.3458	8.054	3,546.51
Propane**	74-98-6	C3H8	44.10	0.1420	0.001420	0.0626	0.375	165.00
i-Butane**	75-28-5	C4H10	58.12	---	---	---	---	---
n-Butane**	106-97-8	C4H10	58.12	---	---	---	---	---
Cyclopentane**	287-92-3	C5H10	70.13	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	---	---	---	---	---
n-Pentane**	109-66-0	C5H12	72.15	---	---	---	---	---
Cyclohexane**	110-82-7	C6H12	84.16	---	---	---	---	---
Other Hexanes**	varies	C6H14	86.18	---	---	---	---	---
Methylcyclohexane**	varies	C7H14	98.19	---	---	---	---	---
Heptanes**	varies	C7H16	100.20	---	---	---	---	---
C8+ Heavies**	varies	C8H18	114.5 est	---	---	---	---	---
Benzene***	71-43-2	C6H6	78.11	---	---	---	---	---
Ethylbenzene***	100-41-4	C8H10	106.17	---	---	---	---	---
n-Hexane***	110-54-3	C6H14	86.18	---	---	---	---	---
Toluene***	108-88-3	C7H8	92.14	---	---	---	---	---
2,2,4-TMP***	540-84-1	C8H18	114.23	---	---	---	---	---
Xylenes***	1330-20-7	C8H10	106.17	---	---	---	---	---
Totals:				**100.00**	**1.00**	**16.71**	**100.00**	**44,034**
Total THC:				**100.00**	**1.00**	**16.71**	**100.00**	**44,034**
Total VOC:				**0.14**	**0.00**	**0.06**	**0.37**	**165**
Total HAP:				**0.00**	**0.000**	**0.00**	**0.00**	**0**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (VOC) *** = also Hazardous Air Pollutant (HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 °F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, and to account for potential future changes in the gas quality, the following "worst-case" values were assumed:

Component	CAS	Formula	Representative Gas Analysis			Worst-Case (120% Min)		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	124-38-9	CO2	---	---	---	--	--	---
Methane	75-82-8	CH4	95.386	91.571	40,322	100.005	96.005	42,275
Ethane	74-84-0	C2H6	4.476	8.054	3,547	5.427	9.765	4,300
VOC	Various	C3+	0.142	0.375	165	0.172	0.454	200
Benzene	71-43-2	C6H6	---	---	---	--	--	---
Ethylbenzene	110-54-3	C8H10	---	---	---	--	--	---
n-Hexane	100-41-4	C6H14	---	---	---	--	--	---
Toluene	108-88-3	C7H8	---	---	---	--	--	---
2,2,4-TMP	540-84-1	C8H18	---	---	---	--	--	---
Xylenes	1330-20-7	C8H10	---	---	---	--	--	---
Total HAP	Various	C6+	---	---	---	--	--	---

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 05 - Lab Analysis

Ethane Product Summary

Ethane Product

Component	CAS	Formula	Molecular Weight	Mole % (Vol %)	Mole Fraction	Weighted Sum	Weight %	lb/MMscf
Nitrogen	7727-37-9	N2	32.00	---	---	---	---	---
Hydrogen Sulfide	2148-87-8	H2S	34.08	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	0.0697	0.000697	0.0307	0.100	80.84
Methane*	75-82-8	CH4	16.04	3.0000	0.030001	0.4813	1.565	1,268.28
Ethane*	74-84-0	C2H6	30.07	93.3274	0.933301	28.0635	91.228	73,952.04
Propane**	74-98-6	C3H8	44.10	1.0000	0.010000	0.4410	1.433	1,162.03
i-Butane**	75-28-5	C4H10	58.12	1.0000	0.010000	0.5812	1.889	1,531.66
n-Butane**	106-97-8	C4H10	58.12	1.0000	0.010000	0.5812	1.889	1,531.66
Cyclopentane**	287-92-3	C5H10	70.13	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	---	---	---	---	---
n-Pentane**	109-66-0	C5H12	72.15	---	---	---	---	---
Cyclohexane**	110-82-7	C6H12	84.16	---	---	---	---	---
Other Hexanes**	varies	C6H14	86.18	---	---	---	---	---
Methylcyclohexane**	varies	C7H14	98.19	---	---	---	---	---
Heptanes**	varies	C7H16	100.20	---	---	---	---	---
C8+ Heavies**	varies	C8H18	114.5 est	---	---	---	---	---
Benzene***	71-43-2	C6H6	78.11	0.1000	0.001000	0.0781	0.254	205.84
Ethylbenzene***	100-41-4	C8H10	106.17	0.1000	0.001000	0.1062	0.345	279.77
n-Hexane***	110-54-3	C6H14	86.18	0.1000	0.001000	0.0862	0.280	227.09
Toluene***	108-88-3	C7H8	92.14	0.1000	0.001000	0.0921	0.300	242.81
2,2,4-TMP***	540-84-1	C8H18	114.23	0.1000	0.001000	0.1142	0.371	301.02
Xylenes***	1330-20-7	C8H10	106.17	0.1000	0.001000	0.1062	0.345	279.77
Totals:				**100.00**	**1.00**	**30.76**	**100.00**	**81,063**
Total THC:				**99.93**	**1.00**	**30.73**	**99.90**	**80,982**
Total VOC:				**3.60**	**0.04**	**2.19**	**7.11**	**5,762**
Total HAP:				**0.60**	**0.006**	**0.58**	**1.90**	**1,536**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (VOC) *** = also Hazardous Air Pollutant (HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 °F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, and to account for potential future changes in the gas quality, the following "worst-case" values were assumed:

Component	CAS	Formula	Representative Gas Analysis			Worst-Case (120% Min)		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	124-38-9	CO2	0.070	0.100	81	0.086	0.123	100
Methane	75-82-8	CH4	3.000	1.565	1,268	3.785	1.974	1,600
Ethane	74-84-0	C2H6	93.327	91.228	73,952	100.001	97.751	79,240
VOC	Various	C3+	---	---	---	--	--	---
Benzene	71-43-2	C6H6	0.100	0.254	206	0.121	0.308	250
Ethylbenzene	110-54-3	C8H10	0.100	0.345	280	0.122	0.419	340
n-Hexane	100-41-4	C6H14	0.100	0.280	227	0.123	0.345	280
Toluene	108-88-3	C7H8	0.100	0.300	243	0.124	0.370	300
2,2,4-TMP	540-84-1	C8H18	0.100	0.371	301	0.123	0.456	370
Xylenes	1330-20-7	C8H10	0.100	0.345	280	0.122	0.419	340
Total HAP	Various	C6+	0.600	1.895	1,536	0.734	2.319	1,880

Ethane Product Summary

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 05 - Lab Analysis

Natural Gas Liquids (NGL) Summary

Natural Gas Liquids (NGL) Composition (Inlet Gas w/CH4 and C2H6 Removed)

Component	CAS	Formula	Molecular Weight	Mole % (Vol %)	Mole Fraction	Weighted Sum	Weight %	lb/MMscf
Nitrogen	7727-37-9	N2	32.00	---	---	---	---	---
Hydrogen Sulfide	2148-87-8	H2S	34.08	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	---	---	---	---	---
Methane*	75-82-8	CH4	16.04	---	---	---	---	---
Ethane*	74-84-0	C2H6	30.07	--	---	---	---	---
Propane**	74-98-6	C3H8	44.10	70.7112	0.707112	31.1806	62.831	82,166.09
i-Butane**	75-28-5	C4H10	58.12	6.7862	0.067862	3.9443	7.948	10,393.83
n-Butane**	106-97-8	C4H10	58.12	15.1247	0.151247	8.7908	17.714	23,165.32
Cyclopentane**	287-92-3	C5H10	70.13	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	2.4922	0.024922	1.7981	3.623	4,738.22
n-Pentane**	109-66-0	C5H12	72.15	2.7347	0.027347	1.9730	3.976	5,199.25
Cyclohexane**	110-82-7	C6H12	84.16	0.1299	0.001299	0.1094	0.220	288.19
Other Hexanes**	varies	C6H14	86.18	0.8702	0.008702	0.7499	1.511	1,976.04
Methylcyclohexane**	varies	C7H14	98.19	0.0719	0.000719	0.0706	0.142	186.12
Heptanes**	varies	C7H16	100.20	0.3330	0.003330	0.3337	0.672	879.25
C8+ Heavies**	varies	C8H18	114.5 est	0.1009	0.001009	0.1156	0.233	304.56
Benzene***	71-43-2	C6H6	78.11	0.0093	0.000093	0.0073	0.015	19.11
Ethylbenzene***	100-41-4	C8H10	106.17	0.0006	0.000006	0.0006	0.001	1.62
n-Hexane***	110-54-3	C6H14	86.18	0.6010	0.006010	0.5179	1.044	1,364.79
Toluene***	108-88-3	C7H8	92.14	0.0151	0.000151	0.0139	0.028	36.62
2,2,4-TMP***	540-84-1	C8H18	114.23	0.0006	0.000006	0.0007	0.001	1.75
Xylenes***	1330-20-7	C8H10	106.17	0.0186	0.000186	0.0197	0.040	51.93
Totals:				**100.00**	**1.00**	**49.63**	**100.00**	**130,773**
Total THC:				**100.00**	**1.00**	**49.63**	**100.00**	**130,773**
Total VOC:				**100.00**	**1.00**	**49.63**	**100.00**	**130,773**
Total HAP:				**0.65**	**0.006**	**0.56**	**1.13**	**1,476**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (VOC) *** = also Hazardous Air Pollutant (HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 °F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, and to account for potential future changes in the gas quality, the following "worst-case" values were assumed:

Component	CAS	Formula	Representative Gas Analysis			Worst-Case (120% Min)		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	124-38-9	CO2	---	---	---	--	--	---
Methane	75-82-8	CH4	---	---	---	--	--	---
Ethane	74-84-0	C2H6	--	---	---	--	--	---
VOC	Various	C3+	100.000	100.000	130,773	100.000	100.000	130,800
Benzene	71-43-2	C6H6	0.009	0.015	19	0.015	0.023	30
Ethylbenzene	110-54-3	C8H10	0.001	0.001	2	0.004	0.008	10
n-Hexane	100-41-4	C6H14	0.601	1.044	1,365	0.722	1.254	1,640
Toluene	108-88-3	C7H8	0.015	0.028	37	0.021	0.038	50
2,2,4-TMP	540-84-1	C8H18	0.001	0.001	2	0.003	0.008	10
Xylenes	1330-20-7	C8H10	0.019	0.040	52	0.025	0.054	70
Total HAP	Various	C6+	0.645	1.129	1,476	0.791	1.384	1,810

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 05 - Lab Analysis

Waste Gas Summary

Waste Gas (Blended Streams to Flare (FLR-1 (8E))

Component	CAS	Formula	Molecular Weight	Mole % (Vol %)	Mole Fraction	Weighted Sum	Weight %	lb/MMscf
Nitrogen	7727-37-9	N2	32.00	0.0724	0.000724	0.0232	0.081	61.04
Hydrogen Sulfide	2148-87-8	H2S	34.08	---	---	---	---	---
Carbon Dioxide	124-38-9	CO2	44.01	0.0829	0.000829	0.0365	0.127	96.10
Methane*	75-82-8	CH4	16.04	18.7110	0.187114	3.0018	10.490	7,910.18
Ethane*	74-84-0	C2H6	30.07	76.8294	0.768312	23.1024	80.734	60,878.77
Propane**	74-98-6	C3H8	44.10	1.8182	0.018182	0.8018	2.802	2,112.78
i-Butane**	75-28-5	C4H10	58.12	0.8910	0.008910	0.5179	1.810	1,364.63
n-Butane**	106-97-8	C4H10	58.12	1.0108	0.010108	0.5875	2.053	1,548.22
Cyclopentane**	287-92-3	C5H10	70.13	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	0.0358	0.000358	0.0258	0.090	68.11
n-Pentane**	109-66-0	C5H12	72.15	0.0393	0.000393	0.0284	0.099	74.74
Cyclohexane**	110-82-7	C6H12	84.16	0.0019	0.000019	0.0016	0.005	4.14
Other Hexanes**	varies	C6H14	86.18	0.0125	0.000125	0.0108	0.038	28.41
Methylcyclohexane**	varies	C7H14	98.19	0.0010	0.000010	0.0010	0.004	2.68
Heptanes**	varies	C7H16	100.20	0.0048	0.000048	0.0048	0.017	12.64
C8+ Heavies**	varies	C8H18	114.5 est	0.0015	0.000015	0.0017	0.006	4.38
Benzene***	71-43-2	C6H6	78.11	0.0795	0.000795	0.0621	0.217	163.59
Ethylbenzene***	100-41-4	C8H10	106.17	0.0793	0.000794	0.0842	0.294	221.99
n-Hexane***	110-54-3	C6H14	86.18	0.0880	0.000880	0.0758	0.265	199.79
Toluene***	108-88-3	C7H8	92.14	0.0796	0.000796	0.0733	0.256	193.17
2,2,4-TMP***	540-84-1	C8H18	114.23	0.0793	0.000794	0.0906	0.317	238.85
Xylenes***	1330-20-7	C8H10	106.17	0.0796	0.000796	0.0845	0.295	222.72
Totals:				**100.00**	**1.00**	**28.62**	**100.00**	**75,407**
Total THC:				**99.84**	**1.00**	**28.56**	**99.79**	**75,250**
Total VOC:				**4.30**	**0.04**	**2.45**	**8.57**	**6,461**
Total HAP:				**0.49**	**0.005**	**0.47**	**1.64**	**1,240**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (VOC) *** = also Hazardous Air Pollutant (HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 °F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, and to account for potential future changes in the gas quality, the following "worst-case" values were assumed:

Component	CAS	Formula	Representative Gas Analysis			Worst-Case (120% Min)		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Carbon Dioxide	124-38-9	CO2	0.083	0.127	96	0.129	0.199	150
Methane	75-82-8	CH4	18.711	10.490	7,910	22.472	12.598	9,500
Ethane	74-84-0	C2H6	76.829	80.734	60,879	92.253	96.941	73,100
VOC	Various	C3+	4.302	8.568	6,461	5.194	10.344	7,800
Benzene	71-43-2	C6H6	0.079	0.217	164	0.097	0.265	200
Ethylbenzene	110-54-3	C8H10	0.079	0.294	222	0.097	0.358	270
n-Hexane	100-41-4	C6H14	0.088	0.265	200	0.106	0.318	240
Toluene	108-88-3	C7H8	0.080	0.256	193	0.099	0.318	240
2,2,4-TMP	540-84-1	C8H18	0.079	0.317	239	0.096	0.385	290
Xylenes	1330-20-7	C8H10	0.080	0.295	223	0.097	0.358	270
Total HAP	Various	C6+	0.485	1.645	1,240	0.591	2.002	1,510

Williams Ohio Valley Midstream LLC

Oak Grove Gas Plant

Application for 45CSR30 Title V Permit Renewal

Supplement 05 - Lab Analysis

Waste Gas Btu Analysis

Based on Streams Disposed in Flare (FLR-1 (8E))

Component	Formula	Molecular Weight (MW)	Component Btu/scf		Inlet Gas		Residue Gas		Ethane Product		NGLs		Waste Gas	
					Flow: 92.1 MMscf/yr		Flow: 37.0 MMscf/yr		Flow: 500.0 MMscf/yr		Flow: 1.1 MMscf/yr		Flow: 630.2 MMscf/yr	
					Flow: 10,509 scf/hr		Flow: 4,225 scf/hr		Flow: 57,078 scf/hr		Flow: 128 scf/hr		Flow: 71,940 scf/hr	
					14.6%		5.9%		79.3%		0.2%		100.0%	
			LHV	HHV	Mole %	Btu/scf	Mole %	Btu/scf	Mole %	Btu/scf	Mole %	Btu/scf	Mole %	Btu/scf
Nitrogen	N2	28.013	---	---	0.4955	---	---	---	---	---	---	---	0.072	---
Hydrogen Sulfide	H2S	34.086	586.8	637.1	---	---	---	---	---	---	---	---	---	---
Carbon Dioxide	CO2	44.010	---	---	0.1887	---	---	---	0.070	---	---	---	0.083	---
Methane*	CH4	16.042	909.4	1,010.0	73.4443	667.902	95.3860	867.4	3.000	27.3	---	---	18.711	170.2
Ethane*	C2H6	30.069	1,618.7	1,769.7	17.2512	279.245	4.4760	72.5	93.327	1510.7	--	---	76.829	1243.6
Propane**	C3H8	44.096	2,314.9	2,516.2	6.0946	141.084	0.1420	3.3	1.000	23.1	70.711	1636.9	1.818	42.1
i-Butane**	C4H10	58.122	3,000.4	3,252.0	0.5849	17.549	---	---	1.000	30.0	6.786	203.6	0.891	26.7
n-Butane**	C4H10	58.122	3,010.8	3,262.4	1.3036	39.249	---	---	1.000	30.1	15.125	455.4	1.011	30.4
Cyclopentane**	C5H10	70.100	3,512.0	3,763.6	---	---	---	---	---	---	---	---	---	---
i-Pentane**	C5H12	72.149	3,699.0	4,000.9	0.2148	7.945	---	---	---	---	2.492	92.2	0.036	1.3
n-Pentane**	C5H12	72.149	3,706.9	4,008.7	0.2357	8.737	---	---	---	---	2.735	101.4	0.039	1.5
Cyclohexane**	C6H12	84.159	4,179.7	4,481.6	0.0112	0.468	---	---	---	---	0.130	5.4	0.002	0.1
Other Hexanes**	C6H14	86.175	4,394.8	4,746.9	0.0750	3.296	---	---	---	---	0.870	38.2	0.013	0.5
Methylcyclohexane**	C7H14	98.186	4,863.7	5,215.9	0.0062	0.302	---	---	---	---	0.072	3.5	0.001	0.1
Heptanes**	C7H16	100.202	5,100.0	5,502.5	0.0287	1.464	---	---	---	---	0.333	17.0	0.005	0.2
C8+ Heavies**	C8+	114.5 est	5,815 est	6,255 est	0.0087	0.506	---	---	---	---	0.101	5.9	0.001	0.1
Benzene***	C6H6	78.112	3,590.9	3,741.9	0.0008	0.029	---	---	0.100	3.6	0.009	0.3	0.079	2.85
Ethylbenzene***	C8H10	106.165	4,970.4	5,222.0	0.0001	0.002	---	---	0.100	5.0	0.001	0.0	0.079	3.9
n-Hexane***	C6H14	86.175	4,403.8	4,756.0	0.0518	2.281	---	---	0.100	4.4	0.601	26.5	0.088	3.9
Toluene***	C7H8	92.138	4,273.7	4,474.9	0.0013	0.056	---	---	0.100	4.3	0.015	0.6	0.080	3.40
2,2,4-TMP***	C8H18	114.229	5,778.8	6,231.6	0.0001	0.003	---	---	0.100	5.8	0.001	0.0	0.079	4.6
Xylenes***	C8H10	106.165	4,957.2	5,208.9	0.0016	0.079	---	---	0.100	5.0	0.019	0.9	0.080	3.9
					100.00		100.00		100.00		100.00		100.00	
				Btu/scf (LHV):		**1,170**		**943**		**1,649**		**2,588**		**1,539**
				LHV/HHV:		**91.0%**		**90.1%**		**91.5%**		**90.7%**		**91.4%**
				Btu/scf (HHV):		**1,286**		**1,047**		**1,802**		**2,852**		**1,685**
				MMBtu/hr (LHV):		**12.30**		**3.98**		**94.13**		**0.33**		**110.75**
				MMBtu/hr (HHV):		**13.52**		**4.42**		**102.84**		**0.37**		**121.22**

Supplement 06

Vendor Data

---

§45-30-4.3.c.8 - The application forms shall include calculations or test data on which the information is based.

Oak Grove Gas Plant:

Heater Specifications:

- TXP2 and TXP3 Regen Gas Heaters (H-03 (3E) and H-04 (4E))
- DeC2 Hot Oil Heaters (H-05 (5E) and H-06 (6E))

Flare Specification:

- Process Flare – Zeeco Process Flare (FL-01 (8E))

Generator Engine Specifications:

- Olympian GenSet (EPA Certified)

Amine Process Vent:

- DOW ProComp Report – Amine Process Vent (De-Ethanizer) (V-01 (16E))

Francis Compressor Station:

Compressor Engine Specifications:

- CAT G3516B Compressor Engine
- Catalytic Combustion Oxidation Catalyst

Zeeco USA LLC
Tulsa, Ok

Doc. No. 21914-601
Cover Page + 5

Client : Tulsa Heaters, Inc.
Item : Burner Data Sheets

P.O.: 014487
Zeeco S.O.: 21914

GLSF-14 Round Flame Free-Jet Burner with CMS Skid

FOR

Tulsa Heaters, Inc.

AT

Exterran and Marshall County, WV

THI Reference: J12-793

Burner Data Sheets

Rev	By	Date	Description
0	RDR	20-Dec-12	First Issue
1	RDR	25-Feb-13	Revised per Customer Comments

Burner Design Criteria

Customer:	**Tulsa Heaters Inc.**
End User:	**Exterran**
Jobsite:	**Marshall County, WV**
Heater Tag Number:	**H-711**
Type of Heater:	**SHO**
Burner Designation:	**GLSF**
Burner Description:	**Round Flame, "Free-Jet"**
Patent Info:	***US Patent # 6,499,990***

Revision Table

Rev #	Issue	Description of Revision		Rev Date	Name
1	3	Revised per Customer Comments		25-Feb-13	Ryan Roberts
0	2	Revised to Project S.O. 21914		20-Dec-12	Ryan Roberts
A	1	Original Issue.	6-Nov-12	Matt Roush	

ZEECO BURNER DATA SHEETS

Rev. Rev.

GENERAL INFORMATION

Customer Name	Tulsa Heaters Inc.
End User Name	Exterran
Jobsite	Marshall County, WV

FURNACE DATA / SITE CONDITIONS

Furnace Tag Number	H-711	Plant Site Elevation Above Sea Level, ft	1215
Type of Furnace	SHO	Ambient Air Temperature (°F)	100
Refractory Thickness, in	5	Minimum Relative Humidity	0%
Heater Steel Thickness, in	0.25	Normal Relative Humidity	70%
Type of Draft	Forced	Maximum Relative Humidity	100%
Direction of Firing	Horizontal	Heater Height (to convective sec.), ft	21.1
Mounting Direction	Horizontal	Tube Circle Diameter (ft)	9.0
		Heater Length, ft	0.0

PROCESS DATA

	Gas		
Maximum Heat Release (MM BTU/hr)	18.200	Available Combustion Air dP (in H2O)	4.000
Normal Heat Release (MM BTU/hr)	14.560	Combustion Air Temperature (°F)	100
Minimum Heat Release (MM BTU/hr)	3.640	Furnace Temperature (°F)	1508
Turndown	5.00	Combustion Test	Required
Required Fuel Pressure for Burner (psig)	30		
Design Excess Air	15%		

GENERAL BURNER DESCRIPTION

Burner Model / Size	GLSF 14	Flame Shape	Round Flame
Burner Description	Round Flame, "Free-Jet"	Maximum Predicted Flame Length (ft)	17.0
Number Required	1	Maximum Predicted Flame Width (ft)	4.50
Oil Gun Model / Size		Pilot Model	JM-1S-E
Atomizing Media		Pilot Ignition Method	Electric Ignition
Atomizing Type		Pilot Heat release (Btu/hr)	90,000.00
Available Atomizing Pressure (psig)		Pilot Operating Pressure (psig)	10
Atomizing Media Rate (# / # fuel)		Pilot Fuel	Natural Gas
		Flame / Ionization Rod Provided	None

NOISE DATA (SINGLE BURNER BASIS)

Predicted @ 63 Hz (dB)	85	Predicted @ 2000 Hz (dB)	72
Predicted @ 125 Hz (dB)	89	Predicted @ 4000 Hz (dB)	74
Predicted @ 250 Hz (dB)	82	Predicted @ 8000 Hz (dB)	72
Predicted @ 500 Hz (dB)	86	Guar. Noise Level @ 3 ft from burner, dBa	85
Predicted @ 1000 Hz (dB)	76		

GENERAL BURNER COMMENTS

2-1. The above noise emissions are "Sound Pressure Level".
2-2. The above heat releases are based on the lower heating value 'LHV' of the fuel(s).
2-3. The burners are sized based on the maximum relative humidity case, as listed above.

FUEL GAS CHARACTERISTICS | **OFF GAS CHARACTERISTICS**

	1								
Composition	Design % vol	Rich Rjctn % vol							
CH4 (methane)	98.15%	83.28%							
C2H6 (ethane)	1.36%	15.67%							
C3H8 (propane)	0.02%	0.37%							
C4H10 (butane)									
C5H12 (pentane)									
C6H14 (hexane)									
C5H10 (cyclopen)									
C6H12 (cyclohex)									
C2H4 (ethene)									
C3H6 (propene)									
C4H8 (butene)									
C5H10 (pentene)									
C6H6 (benzene)									
C5H8 (isoprene)									
CO2		0.42%							
H2O									
O2									
N2	0.47%	0.26%							
SO2									
H2S									
CO									
NH3									
H2									
AR									
Total (vol%)	100%	100%							
Excess O2 (vol%)	3.00%	2.99%							
LHV (Btu/scf)	915	1020							
S.G.	0.57	0.64							
TEMP (°F)	70.00	70.00							
M.W.	16.47	18.65							

FUEL OIL CHARACTERISTICS

LHV (BTU/lb)
S.G. @ 60°F
TEMP (°F)
API GRAVITY @ 60°F
NITROGEN (wt%)
VANADIUM (PPM)
SULFUR (wt%)
CATALYST PRESENT
GENERAL OIL TYPE

BASIS OF EMISSIONS INFORMATION

Rev.

Furnace Temperature (°F)	1,508				
Excess Combustion Air (%)	15% Gas				
Combustion Air Temperature (°F)	100				
Relative Humidity (%)	70%				
Heat Release for Guarantee (MM Btu/hr)	18.200	to	9.100 LHV		1

EMISSIONS INFORMATION

	PREDICTED		GUARANTEED	
	(ppmv)	(#/MMBtu)	(ppmv)	(#/MMBtu)
NOx Design	9	0.011	30	0.036
NOx Rich Rjctn	9	0.011	30	0.036
CO - Gas	0	0.000	50	0.040
UHC - Gas	1	0.001	15	0.007
Particulate - Gas	2	0.002	15	0.013
VOC - Gas	0	0.000	15	0.019

EMISSIONS COMMENTS

4-1 The above listed UHC emissions are based upon UHC being defined as free "methane" as the result of incomplete combustion due to the supplied combustion equipment as stated in these data sheets.

4-2 The above listed VOC emissions are based upon VOC being defined as free "propane" as the result of incomplete combustion due to the supplied combustion equipment as stated in these data sheets.

4-3 The above listed Particulate emissions are based upon Particulate being defined as free "ethane" as the result of incomplete combustion due to the supplied combustion equipment as stated in these data sheets. This excludes ash, sand and heavy metals in the fuel oil.

4-4 NOx guarantees are based on the furnace temperature, combustion air temperature, excess combustion air and the fuel gas compositions as specified the Zeeco Burner Data Sheets.

4-5 The emissions guarantees above are for operation between maximum and normal heat release.

4-6 The emissions guarantees as stated above are based upon operation with the % excess air, temperature, furnace temperature, and fuel temperatures as stated in these data sheets.

4-7 See Notes & Clarifications section for more information concerning noise emissions.

4-8 See Notes & Clarifications section for more information concerning the above emissions guarantees.

4-9 Zeeco takes exception to any SOx guarantees since SOx production is based upon the amount of Sulfur in the fuel stream and the equilibrium conditions in the furnace.

4-10 The above listed predictions & guarantees are based on the higher heating value 'HHV' of the fuel(s).

4-11 All ppmv and/or mg/Nm3 guarantees are corrected to 3% O2 dry basis.

4-12 All CO, UHC, Particulate and VOC emissions guarantees are based on the furnace local temperature at the burner being above 1100°F (593°C).

BASIS OF SCOPE OF SUPPLY

		Rev.
Burner Plenum	Burners are supplied with individual, manufactured plenums (windboxes).	
Plenum General Description	Integral, round-shaped air plenum, fabricated construction	
Material	A-1011 Gr 30 Carbon Steel	
Thickness	10 gauge (3.58 mm) material	
Internal Insulation / thickness	Not Required 0.00 (in)	
Method of Construction	Seal-Welded Construction	
Inlet Air Control	Burners are supplied with air control.	
Mode of Operation	Damper assembly, complete with self-locking handle & position indicator	
Tight Shutoff for Damper Blades	Seal strips not required, 10% air leakage with damper in closed position	
Mechanism Description	Opposed motion, dual carbon steel blades & 304 SS shafts, linked with a quarter gear system	
Bearing construction	Supplied with bearings c/w grease fittings for damper shafts	
Burner Tile	Burner is supplied with a refractory tile assembly.	
Regen Tile Composition	Not Applicable	
Secondary Tile Composition	60% Al2O3	
Needle Construction Required	Not Required	
Rated Service Temperature (°F)	3000	
Temperature of Pre-firing (°F)	500	
Noise Attenuation Method	Not Required	
Fuel Delivery System	Burners are supplied with a gas tip and manifold assembly, with a single point connection	
Gas manifold description	Manufactured pipe manifold, constructed from schedule 40 carbon steel pipe	
Gas Tip Material	310 or HK (ASTM A-297) stainless steel	
Gas Riser Material	1/4" (6.35 mm), schedule 40, 304 stainless steel pipe	
Separate Off Gas Manifold	Not Required	
Off Gas Tip Material	Not Required	
Off Gas Riser Material	Not Required	
Pilot Material	Carbon Steel and / or Cast Equivalent - 310 SS or Cast equivalent tip	
Fuel Gas / Off Gas / Pilot Gas Connections	150#, Carbon Steel Flange, RFWN, A-105	
Oil Tip / Atomizer Material	Not Applicable	
Oil & Steam Connections	Not Applicable	
Painting Requirements	Zeeco Standard	
Carbon Steel Surface Preparation	SSPC-SP-6 // NACE 3 // SA 2 - Commercial Blast	
Primer	Dimetcote 9, Inorganic Zinc Primer	
Primer Thickness	2-3 mils dft or 55-75 microns dft	
1st Paint Coat	Amercoat 385, Multi-purpose epoxy	
1st Paint Coat Thk.	4-6 mils dft or 100-150 microns dft	
Top Coat	Not required	
Top Coat Thickness	Not required	
Tile Case Assembly / Mounting Plate	Burners are supplied with a tile case assembly	
Mounting Template - heater floor cutout	Not Required	
Lifting Lugs	Not Required	
Pressure Taps Required for Windbox	Not Required	
Scanner Connection	1" NPT fixed connection, one (1) per burner	1
Ignition / Sight Ports	Two (2) ports provided, 2" (50.8 mm), c/w threaded cap & glass	
Electrical Information	Pilot Fittings and Ship Loose Items	
Pilot Conduit Fittings	Class I, Div. II, Group C & D	1
UV Scanners	By Zeeco	1

FIRED THERMAL FLUID HEATER SYSTEM PARAMETERS:

The recommendations in this proposal are based on the following parameters:

Heater capacity Normal (Duty):	**55,059,388 Btu/hr**
Thermal fluid circulation rate:	**1,870GPM (742,603 lbs/hr)**
Fluid temperature (Heater outlet):	**400 ºF**
Fluid temperature (Heater inlet):	**275 ºF**
Plant location:	Unknown
Plant elevation:	2000 fasl Maximum
Heater location:	Outdoor
Burner turndown:	10:1
Burner input required (HHV):	**68,327,472 Btu/hr**
Stack temperature with Economizer	476 ºF
Heater orientation:	Horizontal
Heater efficiency:	**89% (LHV)**
Fuel:	Gas
Electrical:	**460 V / 3 PH / 60 Hz**
Controls:	**NEMA 4**
Insurance / code requirements:	NFPA Latest Edition / FM / ASME
Thermal fluid:	**Therminol 55**
Heater volume:	2,725 Gallons
Design of heater coil and expansion tank:	600 ºF @ 150 PSIG w/ CA = .0626”

EQUIPMENT RECOMMENDATIONS:

Heater:

The heater will be a model HCI-25010-50(Q)-G two pass design for a duty of **55,059,388 Btu/hr to meet your process design conditions. The heater will include:**

- Quad circuit 5" SA106 Gr. B seamless, 40 helical coil
- ASME section VIII stamp for 150 PSIG @ 600 ºF with a CA = .0625"
- 10" - 300 # RFWN coil flanges on inlet and outlet.
- Coil hydrostatically tested per the ASME code
- **Economizer to reduce stack temperature for the Low NOx Re-circulation Burner**
- **CompactLogix Profiler**
- **Low NOx Burner Duct Work**
- National Board for pressure vessels registration
- A36 Carbon steel shell
- 3 - 5" thick high temperature ceramic fiber blanket insulation on heater shell and covers to provide an average skin temperature of 140-160 ºF with an ambient temperature of 70 ºF and 5 MPH wind.
- Rear cover peep sight
- Structural steel skid mounting
- 4 skid lifting lugs, 2 on top and 2 near the bottom of the heater shell
- Shell and structural steel will receive surface preparation to SSPC-SP10 and a surface coat of primer and one top coat.
- Stack, 8 ft. above top of heater

Burner

A forced draft Faber Low NOx burner is provided for natural gas combustion. The burner will be the modulation type for a 10:1 turndown. The pilot will be natural gas with the standard ignition procedures. Burner will require natural gas to the inlet of the fuel train. Estimated emissions: (Corrected to 3% O2) are as follows:

NOx - <30 PPMVD
CO – <50 PPMVD

Burner includes:

- Direct spark ignited natural gas pilot (Interruptible type)
- UV Flame detection scanner
- Ignition transformer
- Nameplate on burner stating the burner rated maximum input (HHV)

DESIGN NORMAL

HCI	IP UNITS	SI UNITS
Heater Capacity (Btu/hr) (MW)	55,059,388	16.14
Heater Circulation Rate (Lb/hr) (kg/hr)	742,603	336,751
Heater Circulation Rate (Gal/min) (m^3/hr)	1,870	425
Heater Inlet Temperature (°F) (°C)	275	135
Heater Outlet Temperature (°F) (°C)	400	204
Minimum Allowable Circulation Rate (Gal/min) (m^3/hr)	1,496	340
Input (HHV) (Btu/hr) (MW)	68,327,472	20.03
Stack Temperature (°F) (°C)	476	247
Calculated Heater Efficiency % LHV	89	89
Heater Calculated ΔP (psid) (kPa) (Clean)	10	68
Heater Volume (Gallons) (m^3)	2,725	10
Total Surface Area (ft^2) (m^2)	7,996	743
Overall Flux Rate (Btu/hr-ft^2) (kW/m^2)	6,886	22
Radiant Surface Area (ft^2) (m^2)	1,717	160
Average Radiant Flux Rate (Btu/hr-ft^2) (kW/m^2) AICHE	18,017	57
Maximum Radiant Flux Rate (Btu/hr-ft^2) (kW/m^2) AICHE	24,324	77
Maximum Metal Temperature (°F) (°C) AICHE	532	278
Maximum Film Temperature (°F) (°C) AICHE	511	266
Combustion Loading (Btu/hr-ft^3) (kW/m^3)	26,078	270
Average Flue Gas Velocity Across Insulation (ft/s) (m/s)	76	23
Average Therminol 55 Velocity (ft/s) (m/s)	8	2

% Output	Duty (Btu/Hr)	% Eff (LHV)	Stack Temp (F)
25.00	13,764,847	95	176
50.00	27,529,694	93	276
75.00	41,294,541	91	376
100.00	55,059,388	89	476

FABER BURNER COMPANY
#13011
BURNER DATA
Page 3 of 4

F. Gas Pilot Data:
Natural Gas at 1000 BTU/SCF & 0.6 S.G., 630 SCFH required at 1 PSIG at the pilot.

G. Turndown Data:
10:1 on Natural Gas
4:1 on Natural Gas (with emissions guarantee)

H. Excess Air Design Data:
15% on Natural Gas @ MCR

I. EMISSION GUARANTEES

Not to Exceed:	Natural Gas	
	Lbs/MMBTU	PPM
NOx	0.036	30
CO	0.037	50

Parts Per Million (PPM) @ 3% O2 Dry

EMISSION TEST CONDITIONS:

For a valid guarantee test, the following conditions must be met:

1. Emission guarantees are based upon the data in the design conditions above and are for the firing of natural gas only.
2. Guarantees are from 25% to 100% heater MCR (maximum continuous rating) only.
3. Heater meets (min.) construction requirements for furnace sidewall integrity and seals at the drums and front wall. CO emission stated above is provided furnace leakage (bypassing of flue gas) does not contribute more than .015 lb/MMBTU to the total CO emissions.
4. Fuel Quality:

   The fuel must not contain fuel bound nitrogen. The emission guarantee above is based upon fuel that doesn't contain fuel bound nitrogen.
5. FABER field service must do the initial burner adjustments and must be present during testing for optimization of the equipment supplied.
6. Emission testing must be conducted within the warranty period. Upon obtaining the guaranteed emissions, as described above, the equipment shall be considered accepted.

Oak Grove Gas Plant

URS

Flare

Project No.: 30788-01

Data Sheet No.: OGGP-ME20-0001

ITEM No. : 00-FS-016

Rev. No.: 1

QUANTITY REQUIRED : 1

PROCESS DESIGN CONDITIONS - PURCHASER

		Note	CASE 1	Rev	CASE 2	Rev	CASE 3	Rev
1	Design Flare Capacity, lb/hr		439,174		288,060		349,400	
2	Smokeless Capacity, lb/hr capacity	2	164,000		96,000		87,350	
3	Gas Temperature, deg F		-20		200		150	
4	Static Pressure at Flare Inlet, psig	3	15		~ 8 psig		~ 8 psig	
5	Flare Inlet Diameter, inches		By Vendor		By Vendor		By Vendor	
6	Veq, SCFH air equivalent							
7	Heat Release, MMBTU/hr							
8	Duration @ Max. Rate, min.							
9	Relief Source		200 MMSCFD Blowdown		Fire Scenario - TXP 1		Fire Scenario - 1 Deethanizer	
10	Controlling Case For . . .							
11	GAS COMPOSITION (Mole%)							
12	H2S		0.00		0.00		0.00	
13	CO2		0.00		0.00		0.00	
14	Nitrogen		0.00		0.00		0.00	
15	Methane		0.72		0.30		0.00	
16	Ethane		0.28		0.70		0.46	
17	Propane		0.00		0.00		0.36	
18	i-Butane		0.00		0.00		0.04	
19	n-Butane		0.00		0.00		0.08	
20	i-Pentane		0.00		0.00		0.02	
21	n-Pentane		0.00		0.00		0.02	
22	n-Hexane		0.00		0.00		0.02,	
23	n-Octane		0.00		0.00		0.00	
24	n-Nonane		0.00		0.00		0.00	
25	H2O		0.00		0.00		0.00	
47								
48	TOTAL (should be 100%)		1.00		1.00		1.00	
49	Molecular Weight		20		25.9		41.3	
50	Lower Heating Value, BTU/lb							
51	Ratio of Specific Heats, Cp/Cv							
52	Viscosity, cP							
53	UEL, % in air							
54	LEL, % in air							

$$\left(\frac{87,350\ lb}{hr}\right)\left(\frac{379.3\ scf}{lb\text{-}mol}\right)\left(\frac{lb\text{-}mol}{41.3\ lb}\right)\left(\frac{2406\ Btu,\ HHV}{scf}\right) = 1,930,15\ \frac{MMBtu}{hr}\ (HHV)$$

Air Assisted Flare Tip Specification Sheet

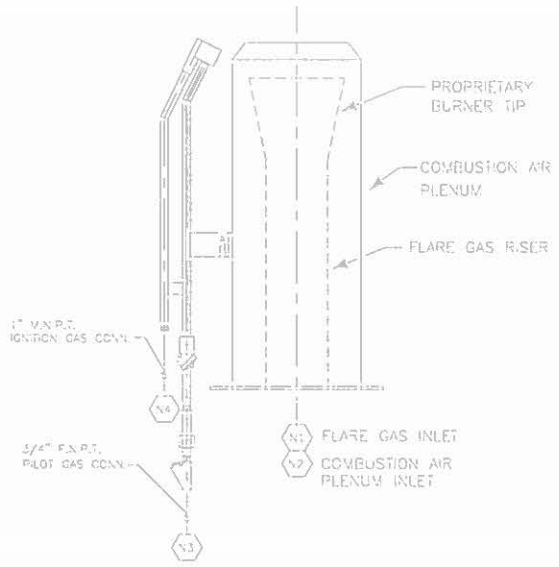
Client:	URS Energy	Zeeco Ref.:	SO21986	Date:	11-Apr-13
Location:	West Virginia	Client Ref.:	3078801-15-001	Rev.	1

General Information:

Tag No.:	Tip	
Model:	AFTA - 24/80	Type: Air Assisted
Length:	10'-0"	
Weight:	4000 lbs	
No. of Pilots:	3	

Design Case:

Governing Case:	Case 1
Molecular weight:	20.0
L. H. V. :	1,108 BTU/SCF
Temperature:	-20 Deg. F
Available Static Pressure:	15.0 psig
Design Flow Rate:	439,174 lbs/hr
Governing Smokeless Case:	Case 3
Design Smokeless Rate:	87,350 lbs/hr
Approximate Exit Velocity:	1196 ft/s
Mach No.:	1.00
Approx. Tip Press. Drop:	11.00 psig



See Drawing SC-8522 for Details

Construction:

Upper Section:	310 SS	Windshield:	NO
Lower Section:	Carbon Steel	Flame retention Ring:	310 SS
Refractory:	None	Lifting Lugs:	0
Refractory Thk:	N/A		

Surface Finish (Carbon Steel Surfaces):

Surface Preparation:	SSPC-SP6	Primer:	Inorganic Zinc
Paint (c. s. surfaces):	High Heat Aluminum		

Connections:

	Qty.	Size	Type	Material
N1 - Flare Gas Inlet:	1	24"	Beveled ; Weld	LTCS
N2 - Combustion Air Inlet:	1	80"	Fab. Plate Flange	A36
N3 - Pilot Gas Manifold:	1	1"	150# RFSW	A105
N4 - Ignition Line:	3	1"	SW Union	304 SS

Miscellaneous Notes:

1. Includes Integral Purge Reducing Velocity Seal.
2. Required Fuel Gas Purge Rate = 870 SCFH.
3. Flare system is designed for 99% destruction efficiency or better.
4. Air Plenum - 310SS top section, A36 lower section
5. Gas Riser - A516-70N or equal

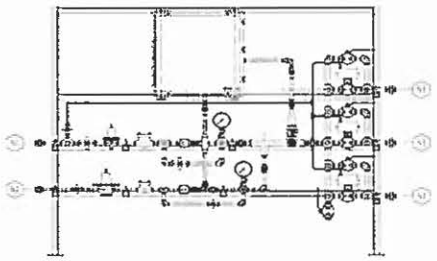
Flame Front Generator Specification Sheet

Client:	URS Energy	Zeeco Ref.:	SO21986	Date:	11-Apr-13
Location:	West Virginia	Client Ref.:	3078801-15-001	Rev.	1

General Information:	
Tag No.:	FFG-1
Model No.:	LMC-3-T/S
Operation:	Manual/Automatic
No. of Pilots Ignited:	3
Area Classification:	Class 1, Div 2, Gr D

Fuel Gas Data:	
Molecular Weight:	18.0
L. H. V.:	1,000 BTU/SCF
Temperature:	100 deg. F
Pressure:	15 psig

Utility Consumption:	
Pilot Gas (Per Pilot):	65 SCFH
Pilot Gas (Total):	195 SCFH
Ignition Gas (Intermittent):	110 SCFH
Ignition Air (Intermittent):	1,100 SCFH
Power Available:	120 V, 1 Phase, 60 Hz (<600 VA)



See Drawing WC-5090 for Details

Construction:			
Ignition Line Piping:	Carbon Steel	Ignition Chamber:	Cast Iron
Fuel Gas Piping:	Carbon Steel	No. Thermocouples/Pilot:	1
Mounting Rack:	Carbon Steel	Thermocouple Type:	K
Enclosure:	NEMA 4X w/ Z-Purge	Propane Backup:	No
Sun / Rain Shield:	Yes	Ignition Air PCV:	Yes
Pilot Gas PCV:	Yes		

Surface Finish (Carbon Steel Surfaces):			
Surface Preparation:	SSPC-SP1	Primer:	Red Oxide
Paint (c. s. surfaces):	Grey Enamel		

Connections:	Qty.	Size	Type	Material
N1 - Instrument Air Inlet:	1	1/2"	3000# Thrd. Union	Galvanized C.S.
N2 - Pilot Gas Inlet:	1	1/2"	3000# Thrd. Union	Carbon Steel
N3 - Ignition Gas Outlet:	3	1"	3000# Thrd. Union	Carbon Steel
Pilot Gas Out. (Not Shown):	1	1"	3000# Thrd. Union	Carbon Steel

Miscellaneous Notes:

1. FFG lines downstream of the FFG rack will be 304 SS.
2. Ignition panel includes AB Controllogix with Ethernet communication.
3. Several PLC inputs / outputs will be handled (passed through) the Zeeco PLC (Programs provided by URS)

OLYMPIAN™

G150LG2

6.8L

Industrial Spark-Ignited Generator Set

EPA Certified Stationary Emergency

Standby Power Rating
150 kW 188 kVA 60 Hz

Prime Power Rating*
135 kW 169 kVA 60 Hz

ISO 9001:2008

USA ENGINEERED

*Built in the USA using domestic and foreign parts

*EPA Certified Prime ratings are not available in the U.S. or its Territories

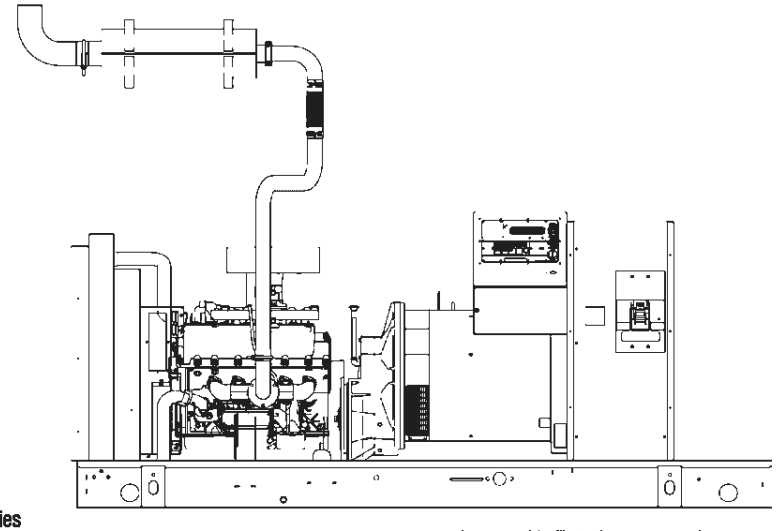


Image used for illustration purposes only

Codes and Standards

Olympian products are designed to the following standards:

cULus	UL2200, UL508, UL142, UL498
NFPA	NFPA70, 99, 110, 37
nec	NEC700, 701, 702, 708
ISO 9001:2008	ISO9001, 8528, 3046, 7637, Pluses #2b, 4
NEMA	NEMA ICS10, MG1, 250, ICS6, AB1
ANSI American National Standards Institute	ANSI C62.41
ICC oshpd	IBC 2009, CBC 2010, IBC 2012, ASCE 7-05, ASCE 7-10, ICC-ES AC-156 (2012)

Prime power or standby service, Olympian Natural gas or Propane fuel generator sets deliver dependable, clean, economical power – even in the most demanding conditions – and Olympian gensets are available in a wide range of configurations with optional equipment.

Olympian generator sets are designed, engineered and manufactured for optimal performance. All major components are tested individually; once assembled, the entire unit is tested at and above 100% of rated load for safety and operation.

These complete, ready-to-run packages have another distinct advantage. They all come with the comprehensive service and support of Cat® dealers – beginning with prompt delivery and ongoing support throughout the life of the generator set.

OLYMPIAN™

LG Series

Standard Features

ENGINE SYSTEM

General

- Oil Drain Extension
- Air Cleaner
- Fan Guard
- Stainless Steel flexible exhaust connection
- Critical Exhaust Silencer
- Factory Filled Oil
- Radiator duct adapter (open set only)

Fuel System

- Primary and Secondary Fuel Shutoff
- Flexible Fuel Line - NPT Connection

Cooling System

- Closed Coolant Recovery System
- UV/Ozone resistant hoses
- Factory-installed Radiator
- Radiator drain extension
- 50/50 Ethylene glycol antifreeze

Engine Electrical System

- Battery charging alternator
- Battery Cables
- Battery Tray
- Solenoid activated starter motor
- Rubber-booted engine electrical connections

ALTERNATOR SYSTEM

- Class H insulation material
- 2/3 Pitch
- Skewed Stator
- Brushless Excitation
- Sealed Bearings
- Amortisseur winding
- Full load capacity alternator

GENERATOR SET

- Internal Genset Vibration Isolation
- Separation of circuits - high/low voltage
- Separation of circuits - multiple breakers
- Wrapped Exhaust Piping
- Standard Factory Testing
- 2 Year Limited Warranty (Standby rated Units)
- 1 Year Warranty (Prime rated units)
- Silencer mounted in the discharge hood (enclosed only)

ENCLOSURE (If selected)

- Rust-proof fasteners with nylon washers to protect finish
- High performance sound-absorbing material
- Gasketed doors
- Stamped air-intake louvers
- Air discharge hoods for radiator-upward pointing
- Stainless steel lift off door hinges
- Stainless steel lockable handles

CONTROL SYSTEM

Control Panel

- Digital H Control Panel - Dual 4x20 Display
- Programmable Crank Limiter
- 7-Day Programmable Exerciser
- Special Applications Programmable PLC
- RS-232/485
- All-Phase Sensing DVR
- Full System Status
- Utility Monitoring
- Low Fuel Pressure Indication
- 2-Wire Start Compatible
- Power Output (kW)
- Power Factor
- kW Hours, Total & Last Run
- Real/Reactive/Apparent Power
- All Phase AC Voltage
- All Phase Currents
- Oil Pressure
- Coolant Temperature
- Coolant Level
- Engine Speed
- Battery Voltage
- Frequency
- Date/Time Fault History (Event Log)
- Isochronous Governor Control
- Waterproof/sealed Connectors
- Audible Alarms and Shutdowns
- Not in Auto (Flashing Light)
- Auto/Off/Manual Switch
- E-Stop (Red Mushroom-Type)
- NFPA110 Level I and II (Programmable)
- Customizable Alarms, Warnings, and Events
- Modbus protocol
- Predictive Maintenance algorithm
- Sealed Boards
- Password parameter adjustment protection
- Single point ground
- 15 channel data logging
- 0.2 msec high speed data logging
- Alarm information automatically comes up on the display

Alarms

- Oil Pressure (Pre-programmable Low Pressure Shutdown)
- Coolant Temperature (Pre-programmed High Temp Shutdown)
- Coolant Level (Pre-programmed Low Level Shutdown)
- Low Fuel Pressure Alarm
- Engine Speed (Pre-programmed Over speed Shutdown)
- Battery Voltage Warning
- Alarms & warnings time and date stamped
- Alarms & warnings for transient and steady state conditions
- Snap shots of key operation parameters during alarms & warnings
- Alarms and warnings spelled out (no alarm codes)

LG Series

Configurable Options

ENGINE SYSTEM

General

- ○ Engine Block Heater
- ○ Oil Heater
- ○ Air Filter Restriction Indicator
- ○ Stone Guard (Open Set Only)
- ○ Critical Exhaust Silencer (Open Set Only / Standard on Ultra Low Emissions Option)

Engine Electrical System

- ○ 10A UL battery charger
- ○ 2.5A UL battery charger
- ○ Battery Warmer

ALTERNATOR SYSTEM

- ○ Alternator Upsizing
- ○ Anti-Condensation Heater
- ○ Tropical coating
- ○ Permanent Magnet Excitation

GENERATOR SET

- ○ Extended Factory Testing (3 Phase Only)
- ○ IBC Seismic Certification
- ○ 8 Position Load Center
- ○ 2 Year Extended Warranty
- ○ 5 Year Warranty
- ○ 5 Year Extended Warranty

CIRCUIT BREAKER OPTIONS

- ○ Main Line Circuit Breaker
- ○ 2nd Main Line Circuit Breaker
- ○ Shunt Trip and Auxiliary Contact
- ○ Electronic Trip Breakers

ENCLOSURE

- ○ Standard Enclosure
- ○ Level 1 Sound Attenuation
- ○ Level 2 Sound Attenuation
- ○ Steel Enclosure
- ○ Aluminum Enclosure
- ○ 150 MPH Wind Kit
- ○ 12 VDC Enclosure Lighting Kit
- ○ 120 VAC Enclosure Lighting Kit
- ○ AC/DC Enclosure Lighting Kit
- ○ Door Alarm Switch

CONTROL SYSTEM

- ○ 21-Light Remote Annunciator
- ○ Remote Relay Panel (8 or 16)
- ○ Oil Temperature Sender with Indication Alarm
- ○ Remote E-Stop (Break Glass-Type, Surface Mount)
- ○ Remote E-Stop (Red Mushroom-Type, Surface Mount)
- ○ Remote E-Stop (Red Mushroom-Type, Flush Mount)
- ○ Remote Communication - Modem
- ○ Remote Communication - Ethernet
- ○ 10A Run Relay
- ○ Ground fault indication and protection functions

Engineered Options

ENGINE SYSTEM

- ○ Coolant heater ball valves
- ○ Fluid containment pans

ALTERNATOR SYSTEM

- ○ 3rd Breaker Systems

GENERATOR SET

- ○ Special Testing
- ○ Battery Box

ENCLOSURE

- ○ Motorized Dampers
- ○ Enclosure Ambient Heaters

CONTROL SYSTEM

- ○ Spare inputs (x4) / outputs (x4) - H Panel Only
- ○ Battery Disconnect Switch

Rating Definitions

Standby – Applicable for a varying emergency load for the duration of a utility power outage with no overload capability.
Prime – Applicable for supplying power to a varying load in lieu of utility for an unlimited amount of running time. A 10% overload capacity is available for 1 out of every 12 hours. The Prime Power option is only available on International applications.

Power ratings in accordance with ISO 8528-1, Second Edition dated 2005-06-01, definitions for Prime Power (PRP) and Emergency Standby Power (ESP).

OLYMPIAN™

LG Series application and engineering data

ENGINE SPECIFICATIONS

General

Cylinder #	10
Type	V
Displacement - L (Cu In)	6.8 (414.96)
Bore - mm (in)	90.17 (3.55)
Stroke - mm (in)	105.992 (4.17)
Compression Ratio	9:01
Intake Air Method	Naturally Aspirated
Number of Main Bearings	7
Connecting Rods	Forged
Cylinder Head	Aluminum
Cylinder Liners	No
Ignition	High Energy
Pistons	Aluminum Alloy
Crankshaft	Steel
Lifter Type	Overhead Cam
Intake Valve Material	Steel Alloy
Exhaust Valve Material	Steel Alloy
Hardened Valve Seats	Yes

Engine Governing

Governor	Electronic
Frequency Regulation (Steady State)	+/- 0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full-flow spin-on cartridge
Crankcase Capacity - L (qts)	5.7 (6)

Cooling System

Cooling System Type	Pressurized Closed Recovery
Water Pump Flow - gpm (lpm)	38 (144)
Fan Type	Pusher
Fan Speed (rpm)	3600
Fan Diameter mm (in)	558 (22)
Coolant Heater Wattage	1500
Coolant Heater Standard Voltage	120 V

Fuel System

Fuel Type	Natural Gas, Propane Vapor
Carburetor	Down Draft
Secondary Fuel Regulator	Standard
Fuel Shut Off Solenoid	Standard
Operating Fuel Pressure (Standard)	11" - 14" H_2O
Operating Fuel Pressure (Optional)	7" - 14" H_2O

Engine Electrical System

System Voltage	12 VDC
Battery Charging Alternator	Standard
Battery Size	See Battery Index 0161970SBY
Battery Voltage	12 VDC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	390
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	<5%
Telephone Interference Factor (TIF)	<50
Standard Excitation	Brushless
Bearings	Sealed Ball
Coupling	Direct via Flexible Disc
Prototype Short Circuit Test	Yes

Voltage Regulator Type	Full Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	+/- 0.25%

OLYMPIAN™

G150LG2 150 kW

LG Series operating data

POWER RATINGS

	Natural Gas		Propane Vapor	
Single-Phase 120/240 VAC @1.0pf	136 kW	Amps: 567	144 kW	Amps: 600
Three-Phase 120/208 VAC @0.8pf	142 kW	Amps: 493	150 kW	Amps: 520
Three-Phase 120/240 VAC @0.8pf	142 kW	Amps: 427	150 kW	Amps: 451
Three-Phase 277/480 VAC @0.8pf	142 kW	Amps: 214	150 kW	Amps: 226
Three-Phase 346/600 VAC @0.8pf	142 kW	Amps: 171	150 kW	Amps: 180

STARTING CAPABILITIES (sKVA)

sKVA vs. Voltage Dip

		480 VAC						208/240 VAC					
Alternator	kW	10%	15%	20%	25%	30%	35%	10%	15%	20%	25%	30%	35%
Standard	150	133	199	265	332	398	464	100	149	199	249	299	348
Upsize 1	200	187	280	373	467	560	653	140	210	280	350	420	490

FUEL CONSUMPTION RATES*

Natural Gas – ft³/hr (m³/hr)	
Percent Load	Standby
25%	700 (19.8)
50%	1154 (32.7)
75%	1525 (43.2)
100%	2061 (58.4)

Propane Vapor – ft³/hr (m³/hr)	
Percent Load	Standby
25%	290 (8.2)
50%	478 (13.5)
75%	631 (17.9)
100%	853 (24.2)

*Fuel supply installation must accommodate fuel consumption rates at 100% load.

COOLING

		Standby
Air Flow (inlet air combustion and radiator)	ft³/min (m³/min)	6447 (182.6)
Coolant Flow per Minute	gpm (lpm)	57 (215.8)
Coolant System Capacity	gal (L)	6.3 (23.9)
Heat Rejection to Coolant	BTU/hr	577,080
Max. Operating Air Temp on Radiator	°F (°C)	122 (50)
Maximum Radiator Backpressure	in H_2O	0.5

COMBUSTION AIR REQUIREMENTS

		Standby
Flow at Rated Power	cfm (m3/min)	447 (12.7)

ENGINE

		Standby
Rated Engine Speed	rpm	3600
Horsepower at Rated kW**	hp	224
Piston Speed	ft/min (m/min)	2502 (762)
BMEP	psi	127

** Refer to "Emissions Data Sheet" for maximum bHP for EPA and SCAQMD permitting purposes.

EXHAUST

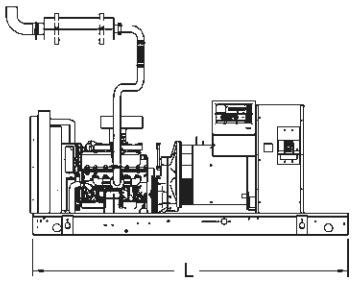
		Standby
Exhaust Flow (Rated Output)	cfm (m³/min)	1507 (42.7)
Maximum Recommended Back Pressure	inHg	1.5
Exhaust Temp (Rated Output)	°F (°C)	1550 (843)
Exhaust Outlet Size (Open Set)	in	2.5" I.D. Flex (No muffler)

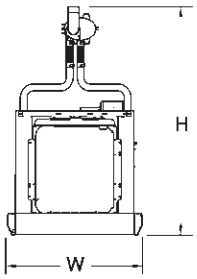
Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions. Please consult a CAT® Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528 and DIN6271 standards.

G150LG2 150 kW

OLYMPIAN™

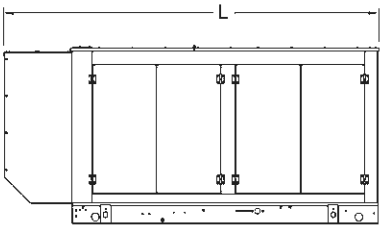
LG Series dimensions, weights, and sound levels

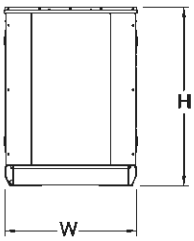




OPEN SET (Includes Exhaust Flex)

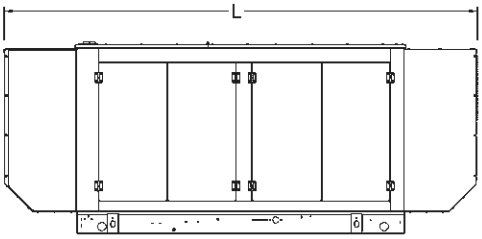
L x W x H in (mm)	128.1 (3252.8) x 49.2 (1248.6) x 84.3 (2141.6)
Weight lbs (kg)	2940 (1333)
Sound Level (dBA*)	89

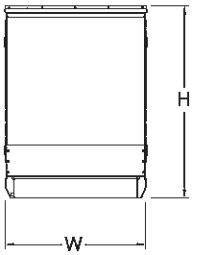




STANDARD ENCLOSURE

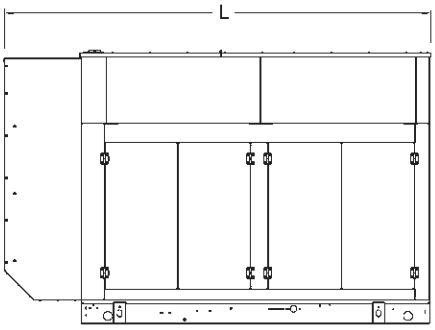
L x W x H in (mm)	143 (3632.9) x 50.4 (1280.1) x 68.2 (1731.5)
Weight lbs (kg)	Steel: 3970 (1719) Aluminum: 3220 (1460)
Sound Level (dBA*)	88

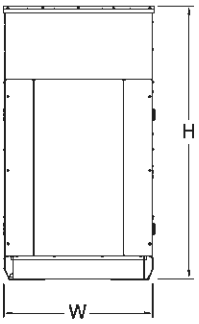




LEVEL 1 ACOUSTIC ENCLOSURE

L x W x H in (mm)	168.5 (4279.3) x 50.4 (1280.1) x 68.2 (1731.5)
Weight lbs (kg)	Steel: 3990 (1809) Aluminum: 3287 (1490)
Sound Level (dBA*)	85





LEVEL 2 ACOUSTIC ENCLOSURE

L x W x H in (mm)	143 (3632.9) x 50.4 (1280.1) x 91.77 (2329.8)
Weight lbs (kg)	Steel: 4190 (1900) Aluminum: 3353 (1520)
Sound Level (dBA*)	78

*All measurements are approximate and for estimation purposes only. Sound levels measured at 23 ft (7 m) and does not account for ambient site conditions.

www.OlympianPower.com
0K4289Y09-E 04/22/14

ProComp Report

Williams Oak Grove Deethanizer

Tracking Number:	263EUS1113
Customer:	Williams
Plant/Project:	Oak Grove Deethanizer
Location:	Pittsburgh, PA
Technical Contact:	Nick Shurgott
Sales Contact:	Eddy Garcia-Reameau
Customer Contact:	Russ Green
Customer Phone No.:	304-845-5028
Customer E-mail Address:	russ.green@williams.com
Project Number:	

Notes:
UCARSOL AP-814 for deep CO2 removal - ethane stream
Circ rate: 65 gpm to absorber
Reboiler duty: 2.7 MMBtu/hr
Absorber: 20 trays

Contents

Williams Oak Grove Deethanizer

Simulation Summary

Williams Oak Grove Deethanizer

Inlet Streams

STREAM-ID		1
Stream Name		Feed Gas
Inlet Block		Feed Gas
Temperature	deg F	81.0000
Pressure	Psi (g)	372.0000
Vapor Fraction (mol/mol)	-	1.0000
Flowrate	lb/hr	2.1684E+05
Volume Flow (Liquid)	USgal/min	
Volume Flow (Vapor)	MMSCFD @60F	65.4600
Water	mass %	8.2257E-04
Carbon Dioxide	mass %	0.2440
Hydrogen Sulfide	mass %	5.0000E-04
Nitrogen	mass %	3.5000E-03
Methane	mass %	7.9999E-02
Ethane	mass %	98.6632
Propane	mass %	1.0080
TOTAL	mass %	100.0000

Outlet Streams

STREAM-ID		2	5	9
Stream Name		Treated Gas	Flash Gas	
Outlet Block		Treated Gas	Flash Gas	Acid Gas
Temperature	deg F	96.9713	81.1599	120.0000
Pressure	Psi (g)	369.3963	70.0000	5.0000
Vapor Fraction (mol/mol)	-	1.0000	1.0000	1.0000
Flowrate	lb/hr	2.1660E+05	33.4835	560.1532
Volume Flow (Liquid)	USgal/min			
Volume Flow (Vapor)	MMSCFD @60F	65.5058	1.0134E-02	0.1237
Water	mass %	0.1545	0.3361	3.9103
Carbon Dioxide	mass %	1.9127E-03	1.7943E-02	93.7392
Hydrogen Sulfide	mass %	3.9114E-05	8.9418E-04	0.1784
Nitrogen	mass %	3.5036E-03	1.2731E-03	5.6793E-06
Methane	mass %	8.0073E-02	7.1365E-02	1.0165E-03
Ethane	mass %	98.7505	98.4694	2.1371
Propane	mass %	1.0088	1.1029	3.3805E-02
TOTAL	mass %	100.0000	100.0000	100.0000

Global Data

Atmospheric Pressure: 14.0700 Psi

Pumps, Compressors, Turbines, Expanders

P-1 (PUMP) Power: 2.6690 HP
P-2 (PUMP) Power: 18.4373 HP

Heat Exchangers

Lean Cooler (HEATER) Duty:	-0.3375 MMBtu/hr
HXLR (HTXR) Duty:	3.1508 MMBtu/hr
Flash Drum (FLASH) Duty:	0.0000 MMBtu/hr
Regenerator (CONDENSER) Duty:	-0.3366 MMBtu/hr
Regenerator (REBOILER) Duty:	2.9000 MMBtu/hr

Absorber (COLUMN)

Lean Solvent Stream ID:	3 (Cool Lean 2)
Temperature:	134.9255 deg F
Flowrate:	3.3960E+04 lb/hr
Solvent Strength:	40.0004 %-mass/mass
Acid Gas Loading:	1.8831E-02 mol/mol
Rich Solvent Stream ID:	4 (Cold Rich)
Acid Gas Loading:	0.1174 mol/mol

Regenerator (COLUMN)

Rich Solvent Stream ID:	8
Temperature:	177.9885 deg F
Flowrate:	3.4164E+04 lb/hr
Solvent Strength:	40.3951 %-mass/mass
Acid Gas Loading:	0.1174 mol/mol
Lean Solvent Stream ID:	10 (Hot Lean 1)
Acid Gas Loading:	1.8830E-02 mol/mol
Reboiler Pressure:	11.2906 Psi (g)
Reflux Flowrate:	305.3208 lb/hr

Stream Table - Williams Oak Grove Deethanizer

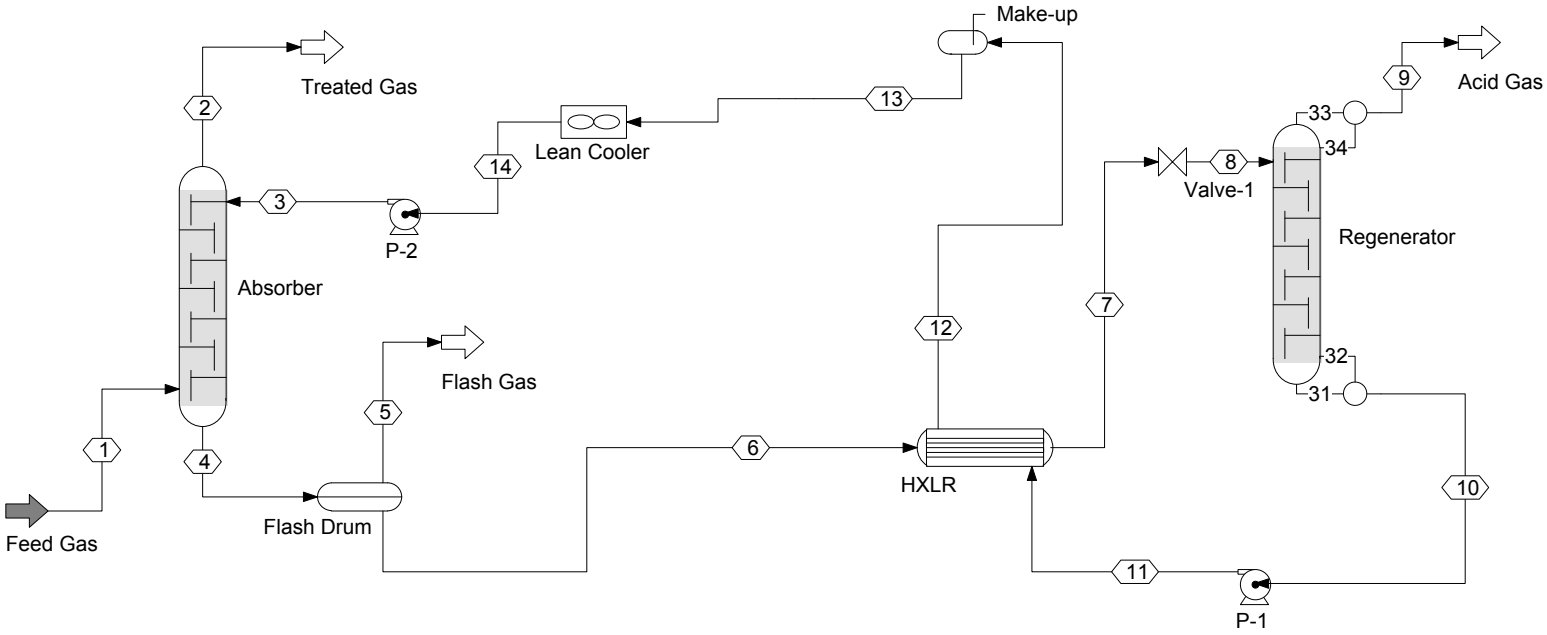
STREAM-ID		1	2	3	4	5	6	7	8	9	10	11
Stream Name		Feed Gas	Treated Gas	Cool Lean 2	Cold Rich	Flash Gas	Flashed Rich				Hot Lean 1	Hot Lean 2
Inlet/Outlet Block		Feed Gas	Treated Gas			Flash Gas				Acid Gas		
Temperature	deg F	81.0000	96.9713	134.9255	80.9674	81.1599	81.1599	178.0000	177.9885	120.0000	246.2285	246.3812
Pressure	Psi (g)	372.0000	369.3963	400.0000	372.0000	70.0000	70.0000	65.0000	10.0000	5.0000	11.2906	60.0000
Vapor Fraction (mol/mol)	-	1.0000	1.0000	0.0000	0.0000	1.0000	0.0000	1.3456E-04	3.8669E-04	1.0000	0.0000	0.0000
Flowrate	lb/hr	2.1684E+05	2.1660E+05	3.3960E+04	3.4197E+04	33.4835	3.4164E+04	3.4164E+04	3.4164E+04	560.1532	3.3603E+04	3.3603E+04
Volume Flow (Liquid)	USgal/min			67.7076	66.8430		66.7179				70.4509	70.4490
Volume Flow (Vapor)	MMSCFD @60F	65.4600	65.5058			1.0134E-02				0.1237		
Enthalpy	Btu/lb	-1228.4371	-1220.2059	-4647.1417	-4675.5546	-1216.1127	-4678.9452	-4586.7022	-4586.7022	-3847.4043	-4522.7153	-4522.5132
Heat Capacity	Btu/lb-R	0.5500	0.5327	0.9247	0.9526	0.4350	0.9615			0.2235	0.9274	0.9273
Density	lb/ft3	2.6160	2.4664	62.5323	63.7837	0.4558	63.8408	60.4682	49.7609	0.1272	59.4665	59.4680
Viscosity	cP	9.4441E-03	9.6378E-03	2.4275	6.5349	9.4491E-03	6.5103			1.5737E-02	0.6851	0.6842
UCARSOL™ AP-814 (dry)	mass %			39.8820	39.6012		39.6400				40.3010	40.3010
Carbon Dioxide	loading			1.8822E-02	0.1172		0.1172				1.8821E-02	1.8821E-02
Hydrogen Sulfide	loading			9.0818E-06	2.5097E-04		2.5090E-04				9.0899E-06	9.0899E-06
Water	lbmol/hr	9.9009E-02	18.5736	1127.6847	1109.2115	6.2459E-03	1109.2053	1109.2053	1109.2053	1.2158	1107.9730	1107.9730
Carbon Dioxide	lbmol/hr	12.0221	9.4136E-02	2.2828	14.2109	1.3651E-04	14.2107	14.2107	14.2107	11.9311	2.2824	2.2824
Hydrogen Sulfide	lbmol/hr	3.1817E-02	2.4863E-03	1.1015E-03	3.0435E-02	8.7864E-06	3.0426E-02	3.0426E-02	3.0426E-02	2.9329E-02	1.1023E-03	1.1023E-03
Nitrogen	lbmol/hr	0.2709	0.2709	0.0000	1.6352E-05	1.5217E-05	1.1356E-06	1.1356E-06	1.1356E-06	1.1356E-06	0.0000	0.0000
Methane	lbmol/hr	10.8131	10.8112	0.0000	1.8444E-03	1.4895E-03	3.5492E-04	3.5492E-04	3.5492E-04	3.5492E-04	0.0000	0.0000
Ethane	lbmol/hr	7114.9355	7113.4408	0.0000	1.4946	1.0965	0.3981	0.3981	0.3981	0.3981	0.0000	0.0000
Propane	lbmol/hr	49.5674	49.5548	1.6440E-14	1.2669E-02	8.3743E-03	4.2942E-03	4.2942E-03	4.2942E-03	4.2942E-03	1.6451E-14	1.6451E-14
TOTAL	lbmol/hr	7187.7398	7192.7638	1251.2541	1246.2316	1.1128	1245.1188	1245.1188	1245.1188	13.5790	1231.5260	1231.5260
Water	mass %	8.2257E-04	0.1545	59.8220	58.4338	0.3361	58.4907	58.4907	58.4907	3.9103	59.4000	59.4000
Carbon Dioxide	mass %	0.2440	1.9127E-03	0.2958	1.8288	1.7943E-02	1.8306	1.8306	1.8306	93.7392	0.2989	0.2989
Hydrogen Sulfide	mass %	5.0000E-04	3.9114E-05	1.1053E-04	3.0327E-03	8.9418E-04	3.0348E-03	3.0348E-03	3.0348E-03	0.1784	1.1178E-04	1.1178E-04
Nitrogen	mass %	3.5000E-03	3.5036E-03	0.0000	1.3395E-06	1.2731E-03	9.3118E-08	9.3118E-08	9.3118E-08	5.6793E-06	0.0000	0.0000
Methane	mass %	7.9999E-02	8.0073E-02	0.0000	8.6526E-05	7.1365E-02	1.6666E-05	1.6666E-05	1.6666E-05	1.0165E-03	0.0000	0.0000
Ethane	mass %	98.6632	98.7505	0.0000	0.1314	98.4694	3.5040E-02	3.5040E-02	3.5040E-02	2.1371	0.0000	0.0000
Propane	mass %	1.0080	1.0088	2.1347E-15	1.6336E-03	1.1029	5.5427E-04	5.5427E-04	5.5427E-04	3.3805E-02	2.1588E-15	2.1588E-15
TOTAL	mass %	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000

Stream Table - Williams Oak Grove Deethanizer

STREAM-ID		12	13	14	31	32	33	34
Stream Name			Warm Lean 2	Cool Lean 1	Lean	Steam	OHD	Reflux
Inlet/Outlet Block								
Temperature	deg F	144.7514	144.7514	134.0000	243.0119	246.2285	209.4487	120.0000
Pressure	Psi (g)	55.0000	55.0000	50.0000	10.2906	11.2906	8.0000	5.0000
Vapor Fraction (mol/mol)	-	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	0.0000
Flowrate	lb/hr	3.3603E+04	3.3960E+04	3.3960E+04	3.6549E+04	2945.0870	865.4740	305.3208
Volume Flow (Liquid)	USgal/min	67.2762	67.9994	67.7287	76.4282			0.6168
Volume Flow (Vapor)	MMSCFD @60F					1.4583	0.2773	
Enthalpy	Btu/lb	-4616.2944	-4638.5730	-4648.5234	-4688.7023	-5597.7436	-4483.4495	-6752.9479
Heat Capacity	Btu/lb-R	0.9228	0.9241	0.9256	0.9360	0.4554	0.3129	0.9981
Density	lb/ft3	62.2726	62.2637	62.5129	59.6199	6.2366E-02	8.8028E-02	61.7147
Viscosity	cP	2.1399	2.0985	2.4621	0.6388	1.2999E-02	1.5995E-02	0.5610
UCARSOL™ AP-814 (dry)	mass %	40.3010	39.8820	39.8820	37.1496			0.4746
Carbon Dioxide	loading	1.8821E-02	1.8818E-02	1.8822E-02	2.8914E-02			0.4633
Hydrogen Sulfide	loading	9.0899E-06	9.0888E-06	9.0818E-06	1.5028E-05			3.1235E-03
Water	lbmol/hr	1107.9730	1127.6801	1127.6847	1266.4819	158.5089	18.0663	16.8504
Carbon Dioxide	lbmol/hr	2.2824	2.2824	2.2828	3.5175	1.2351	11.9380	6.9047E-03
Hydrogen Sulfide	lbmol/hr	1.1023E-03	1.1023E-03	1.1015E-03	1.8282E-03	7.2579E-04	2.9376E-02	4.6549E-05
Nitrogen	lbmol/hr	0.0000	0.0000	0.0000	0.0000	0.0000	1.1356E-06	1.7342E-11
Methane	lbmol/hr	0.0000	0.0000	0.0000	0.0000	0.0000	3.5493E-04	1.0346E-08
Ethane	lbmol/hr	0.0000	0.0000	0.0000	0.0000	0.0000	0.3981	1.3290E-05
Propane	lbmol/hr	1.6451E-14	1.6451E-14	1.6440E-14	1.6697E-11	1.6681E-11	4.2943E-03	1.2679E-07
TOTAL	lbmol/hr	1231.5260	1251.2485	1251.2541	1391.6536	160.1276	30.4513	16.8723
Water	mass %	59.4000	59.8221	59.8220	62.4267	96.9610	37.6059	99.4252
Carbon Dioxide	mass %	0.2989	0.2958	0.2958	0.4236	1.8457	60.7051	9.9526E-02
Hydrogen Sulfide	mass %	1.1178E-04	1.1061E-04	1.1053E-04	1.7045E-04	8.3977E-04	0.1157	5.1952E-04
Nitrogen	mass %	0.0000	0.0000	0.0000	0.0000	0.0000	3.6758E-06	1.5911E-10
Methane	mass %	0.0000	0.0000	0.0000	0.0000	0.0000	6.5791E-04	5.4361E-08
Ethane	mass %	0.0000	0.0000	0.0000	0.0000	0.0000	1.3832	1.3089E-04
Propane	mass %	2.1588E-15	2.1361E-15	2.1347E-15	2.0146E-12	2.4976E-11	2.1880E-02	1.8312E-06
TOTAL	mass %	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000

Make-up Stream(s)

Total losses (vaporization plus operating) of formulated solvent species from a well operated plant are approximately 0.6 lb/MMSCF of gas processed.
Based on 65.46 MMSCFD of treated gas, the total solvent species losses are estimated to be 1.6365 lb/hr.
Water loss from this design is expected to be 355.0293 lb/hr.



Oil & Gas

Process Flow Diagram
Williams Oak Grove Deethanizer

The Dow Chemical Company
Gas Treating Products & Services

ProComp10 (10.5.0.3_#6 / U591313)

Major Equipment Summary

Williams Oak Grove Deethanizer

P-1 (PUMP)

Inlet Pressure:	11.2906 Psi (g)
Outlet Pressure:	60.0000 Psi (g)
Pressure Rise:	48.7094 Psi
Flowrate:	3.3603E+04 lb/hr
Efficiency:	75 %
Power:	2.6690 HP

P-2 (PUMP)

Inlet Pressure:	50.0000 Psi (g)
Outlet Pressure:	400.0000 Psi (g)
Pressure Rise:	350.0000 Psi
Flowrate:	3.3960E+04 lb/hr
Efficiency:	75 %
Power:	18.4373 HP

Lean Cooler (HEATER)

Inlet Temperature:	144.7397 deg F
Outlet Temperature:	134.0000 deg F
Pressure Drop:	5.0000 Psi
Heat Duty:	-0.3375 MMBtu/hr

HXLR (HTXR)

Performance Stream Number:	7
Inlet Temperature:	81.1599 deg F
Outlet Temperature:	178.0000 deg F
Pressure Drop:	5.0000 Psi
Free Stream Number:	12
Inlet Temperature:	246.3812 deg F
Outlet Temperature:	144.7514 deg F
Pressure Drop:	5.0000 Psi
Flowtype:	Counter-Current
Heat Duty:	3.1508 MMBtu/hr
LMTD:	65.9574 deg F
Area:	434.2621 ft2
Heat Transfer Coefficient:	110.0000 Btu/hr-ft2-F

Flash Drum (FLASH)

Flash Type:	QP
Inlet Temperature:	80.9674 deg F
Outlet Temperature:	81.1599 deg F
Outlet Pressure:	70.0000 Psi (g)
Heat Duty:	0.0000 Btu/hr
Vapor fraction (mol/mol):	8.9290E-04 -
Residence Time:	10.0000 minutes
Drum Diameter:	4.0185 ft
Drum Length:	14.0647 ft

Absorber (COLUMN)

Column

Total Pressure Drop:	2.6037 Psi
Internals:	Koch-Glitsch Trays (Vendor)
Number of Trays:	20
Tray Spacing:	2.0000 ft
Number Of Passes:	1
Weir Height:	3.0000 inch
Foam Derating Factor:	0.8
Valve Type:	Type A (V-1) (7/16-AC)
Valve Material:	Stainless Steel
Light Valve:	12 Gauge
Percent Open Area:	12.50 %
Tray Thickness:	10 Gauge
Downcomer Clearance:	1.5000 inch
Downcomer Top Width:	0.2964 ft
Diameter:	4.7554 ft
Active Tray Area:	16.8394 ft2
Percent Vapor Flood:	80.0000
Percent DownComer Flood:	70.0000
Outlet Stream 4 Connects:	At Bottom of Column
Outlet Stream 2 Connects:	At Top of Column
Inlet Stream 1 Connects:	At Bottom of Section
Inlet Stream 3 Connects:	At Top of Section

Vapor Phase

Sec:Seg	Temperature deg F	Pressure Psi (g)	Density lb/ft3	Viscosity cP	Total Flow lb/hr
1:1	96.9713	369.3963	2.4664	9.6378E-03	2.1660E+05
1:2	89.3621	369.5283	2.5186	9.5516E-03	2.1654E+05
1:3	86.4859	369.6592	2.5399	9.5188E-03	2.1652E+05
1:4	85.3722	369.7896	2.5491	9.5061E-03	2.1651E+05
1:5	84.9368	369.9200	2.5534	9.5012E-03	2.1651E+05
1:6	84.7627	370.0502	2.5559	9.4992E-03	2.1651E+05
1:7	84.6859	370.1804	2.5577	9.4982E-03	2.1651E+05
1:8	84.6403	370.3105	2.5594	9.4976E-03	2.1652E+05
1:9	84.5978	370.4407	2.5610	9.4969E-03	2.1652E+05
1:10	84.5446	370.5708	2.5629	9.4961E-03	2.1653E+05
1:11	84.4717	370.7009	2.5650	9.4949E-03	2.1654E+05
1:12	84.3710	370.8309	2.5674	9.4932E-03	2.1656E+05
1:13	84.2337	370.9610	2.5703	9.4909E-03	2.1657E+05
1:14	84.0489	371.0910	2.5738	9.4878E-03	2.1660E+05
1:15	83.8029	371.2210	2.5780	9.4837E-03	2.1662E+05

Sec:Seg	Temperature deg F	Pressure Psi (g)	Density lb/ft3	Viscosity cP	Total Flow lb/hr
1:16	83.4791	371.3510	2.5832	9.4783E-03	2.1666E+05
1:17	83.0567	371.4809	2.5896	9.4713E-03	2.1670E+05
1:18	82.5114	371.6108	2.5975	9.4622E-03	2.1676E+05
1:19	81.8167	371.7406	2.6071	9.4509E-03	2.1683E+05
1:20	80.9777	371.8704	2.6138	9.4436E-03	2.1690E+05

Liquid Phase

Sec:Seg	Temperature deg F	Pressure Psi (g)	Density lb/ft3	Viscosity cP	Surface Tension dyne/cm	Total Flow lb/hr
1:1	103.8283	369.5283	63.0899	4.0893	48.0393	3.3898E+04
1:2	92.0978	369.6592	63.3112	5.0982	48.9999	3.3871E+04
1:3	87.5753	369.7896	63.3938	5.5720	49.3723	3.3862E+04
1:4	85.8131	369.9200	63.4267	5.7721	49.5196	3.3861E+04
1:5	85.1255	370.0502	63.4413	5.8530	49.5796	3.3863E+04
1:6	84.8571	370.1804	63.4494	5.8855	49.6064	3.3866E+04
1:7	84.7500	370.3105	63.4556	5.8992	49.6214	3.3871E+04
1:8	84.7015	370.4407	63.4620	5.9062	49.6334	3.3877E+04
1:9	84.6694	370.5708	63.4695	5.9115	49.6464	3.3886E+04
1:10	84.6354	370.7009	63.4786	5.9176	49.6625	3.3896E+04
1:11	84.5895	370.8309	63.4899	5.9256	49.6832	3.3910E+04
1:12	84.5246	370.9610	63.5038	5.9366	49.7103	3.3928E+04
1:13	84.4338	371.0910	63.5206	5.9516	49.7454	3.3951E+04
1:14	84.3088	371.2210	63.5407	5.9718	49.7906	3.3979E+04
1:15	84.1394	371.3510	63.5644	5.9986	49.8485	3.4015E+04
1:16	83.9125	371.4809	63.5923	6.0341	49.9217	3.4060E+04
1:17	83.6117	371.6108	63.6247	6.0807	50.0136	3.4116E+04
1:18	83.2151	371.7406	63.6628	6.1416	50.1273	3.4183E+04
1:19	82.6657	371.8704	63.7092	6.2268	50.2668	3.4259E+04
1:20	80.9674	372.0000	63.7837	6.5349	50.4588	3.4197E+04

Regenerator (COLUMN)

Condenser

Temperature:	120.0000 deg F
Pressure:	5.0000 Psi (g)
Pressure Drop:	3.0000 Psi
Heat Duty:	-0.3366 MMBtu/hr
Reflux Flowrate:	305.3208 lb/hr

Reboiler

Temperature:	246.2285 deg F
Pressure:	11.2906 Psi (g)
Pressure Drop:	1.0000 Psi
Heat Duty:	2.9000 MMBtu/hr
Stripping Ratio:	1.5096

Column

Total Pressure Drop:	2.2906 Psi
Internals:	Koch-Glitsch Trays (Vendor)
Number of Trays:	20
Tray Spacing:	2.0000 ft
Number Of Passes:	1
Weir Height:	3.0000 inch
Foam Derating Factor:	0.75
Valve Type:	Type A (V-1) (7/16-AC)
Valve Material:	Stainless Steel
Light Valve:	12 Gauge
Percent Open Area:	12.50 %
Tray Thickness:	10 Gauge

Downcomer Clearance:	1.5000 inch
Downcomer Top Width:	0.4460 ft
Diameter:	2.0009 ft
Active Tray Area:	2.0993 ft2
Percent Vapor Flood:	80.0000
Percent DownComer Flood:	75.0000
Inlet Stream 8 Connects:	At Top of Section

Vapor Phase

Sec:Seg	Temperature deg F	Pressure Psi (g)	Density lb/ft3	Viscosity cP	Total Flow lb/hr
1:1	210.2489	8.0000	8.7366E-02	1.5538E-02	851.7060
1:2	224.9361	8.1230	7.2443E-02	1.4652E-02	1764.4719
1:3	230.5857	8.2418	6.6804E-02	1.4210E-02	2389.1717
1:4	233.1060	8.3581	6.4493E-02	1.3967E-02	2630.3163
1:5	234.5825	8.4734	6.3175E-02	1.3795E-02	2714.0722
1:6	235.6761	8.5881	6.2264E-02	1.3659E-02	2751.9731
1:7	236.5774	8.7025	6.1591E-02	1.3548E-02	2776.3042
1:8	237.3539	8.8167	6.1090E-02	1.3455E-02	2795.4544
1:9	238.0393	8.9306	6.0716E-02	1.3377E-02	2811.8664
1:10	238.6552	9.0445	6.0443E-02	1.3311E-02	2826.4987
1:11	239.2172	9.1582	6.0247E-02	1.3255E-02	2839.8636
1:12	239.7368	9.2717	6.0112E-02	1.3206E-02	2852.2883
1:13	240.2230	9.3852	6.0025E-02	1.3164E-02	2863.9972
1:14	240.6826	9.4986	5.9976E-02	1.3126E-02	2875.1489
1:15	241.1217	9.6119	5.9957E-02	1.3092E-02	2885.8567
1:16	241.5460	9.7251	5.9960E-02	1.3061E-02	2896.2017
1:17	241.9645	9.8382	5.9979E-02	1.3033E-02	2906.2365
1:18	242.3991	9.9513	6.0004E-02	1.3007E-02	2915.9685
1:19	242.9232	10.0643	6.0019E-02	1.2987E-02	2925.4115
1:20	243.8022	10.1774	6.0044E-02	1.2961E-02	2933.5829

Liquid Phase

Sec:Seg	Temperature deg F	Pressure Psi (g)	Density lb/ft3	Viscosity cP	Surface Tension dyne/cm	Total Flow lb/hr
1:1	203.9231	8.1230	61.6530	0.9999	40.9760	3.5368E+04
1:2	222.0832	8.2418	61.1487	0.8147	39.6596	3.5993E+04
1:3	229.5199	8.3581	60.8282	0.7509	39.0463	3.6234E+04
1:4	232.5276	8.4734	60.6308	0.7255	38.7459	3.6318E+04
1:5	234.1672	8.5881	60.4888	0.7112	38.5522	3.6355E+04
1:6	235.3385	8.7025	60.3756	0.7008	38.4020	3.6380E+04
1:7	236.2891	8.8167	60.2810	0.6925	38.2765	3.6399E+04
1:8	237.1013	8.9306	60.1997	0.6855	38.1684	3.6415E+04
1:9	237.8139	9.0445	60.1288	0.6794	38.0739	3.6430E+04
1:10	238.4509	9.1582	60.0658	0.6741	37.9899	3.6443E+04
1:11	239.0294	9.2717	60.0091	0.6693	37.9144	3.6456E+04
1:12	239.5621	9.3852	59.9574	0.6650	37.8457	3.6467E+04
1:13	240.0586	9.4986	59.9096	0.6610	37.7825	3.6479E+04
1:14	240.5263	9.6119	59.8649	0.6574	37.7235	3.6489E+04
1:15	240.9712	9.7251	59.8224	0.6539	37.6679	3.6500E+04
1:16	241.3981	9.8382	59.7816	0.6506	37.6149	3.6510E+04
1:17	241.8110	9.9513	59.7418	0.6475	37.5638	3.6519E+04
1:18	242.2136	10.0643	59.7022	0.6444	37.5137	3.6529E+04
1:19	242.6102	10.1774	59.6622	0.6414	37.4646	3.6537E+04
1:20	243.0119	10.2906	59.6199	0.6388	37.4083	3.6549E+04

G3516B

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Francis 1

CATERPILLAR®

ENGINE SPEED (rpm):	1400	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	CAT WIDE RANGE WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 2 INLET (°F):	130		
AFTERCOOLER - STAGE 1 INLET (°F):	201	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	210	FUEL:	Gas Analysis
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig):	7.0-40.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	57.3
CONTROL SYSTEM:	ADEM3	FUEL LHV (Btu/scf):	1181
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	1500
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	100
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5	STANDARD RATED POWER:	1380 bhp@1400rpm
SET POINT TIMING:	28		

RATING		NOTES	LOAD	MAXIMUM RATING 100%	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE 100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(1)	bhp	1380	1380	1035	690
INLET AIR TEMPERATURE			°F	100	100	100	100
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(2)	Btu/bhp-hr	7425	7425	7953	8542
FUEL CONSUMPTION (HHV)		(2)	Btu/bhp-hr	8182	8182	8763	9412
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(3)(4)	ft3/min	3284	3284	2576	1801
AIR FLOW	(WET)	(3)(4)	lb/hr	13962	13962	10953	7657
FUEL FLOW (60ºF, 14.7 psia)			scfm	145	145	116	83
INLET MANIFOLD PRESSURE		(5)	in Hg(abs)	93.3	93.3	75.7	53.2
EXHAUST TEMPERATURE - ENGINE OUTLET		(6)	°F	1007	1007	1000	1020
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(7)(4)	ft3/min	9216	9216	7207	5113
EXHAUST GAS MASS FLOW	(WET)	(7)(4)	lb/hr	14454	14454	11348	7940
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(8)(9)	g/bhp-hr	0.50	0.50	0.50	0.50
CO		(8)(9)	g/bhp-hr	2.92	2.92	3.13	3.08
THC (mol. wt. of 15.84)		(8)(9)	g/bhp-hr	4.53	4.53	4.86	4.93
NMHC (mol. wt. of 15.84)		(8)(9)	g/bhp-hr	2.14	2.14	2.29	2.32
NMNEHC (VOCs) (mol. wt. of 15.84)		(8)(9)(10)	g/bhp-hr	1.01	1.01	1.08	1.10
HCHO (Formaldehyde)		(8)(9)	g/bhp-hr	0.40	0.40	0.39	0.39
CO2		(8)(9)	g/bhp-hr	503	503	537	584
EXHAUST OXYGEN		(8)(11)	% DRY	9.1	9.1	8.8	8.4
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(12)	Btu/min	22309	22309	20744	19351
HEAT REJ. TO ATMOSPHERE		(12)	Btu/min	6110	6110	5092	4074
HEAT REJ. TO LUBE OIL (OC)		(12)	Btu/min	4475	4475	3978	3363
HEAT REJ. TO A/C - STAGE 1 (1AC)		(12)(13)	Btu/min	12348	12348	10260	3630
HEAT REJ. TO A/C - STAGE 2 (2AC)		(12)(13)	Btu/min	5637	5637	5297	3438

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC+1AC)	(13)(14)	Btu/min	42875
TOTAL AFTERCOOLER CIRCUIT (2AC)	(13)(14)	Btu/min	5919
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

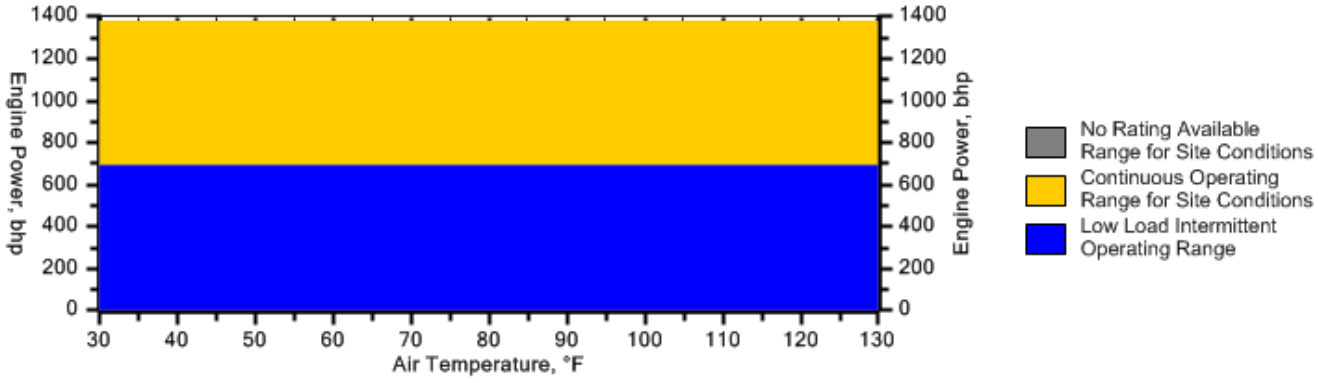
G3516B
GAS COMPRESSION APPLICATION

CATERPILLAR®

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Francis 1

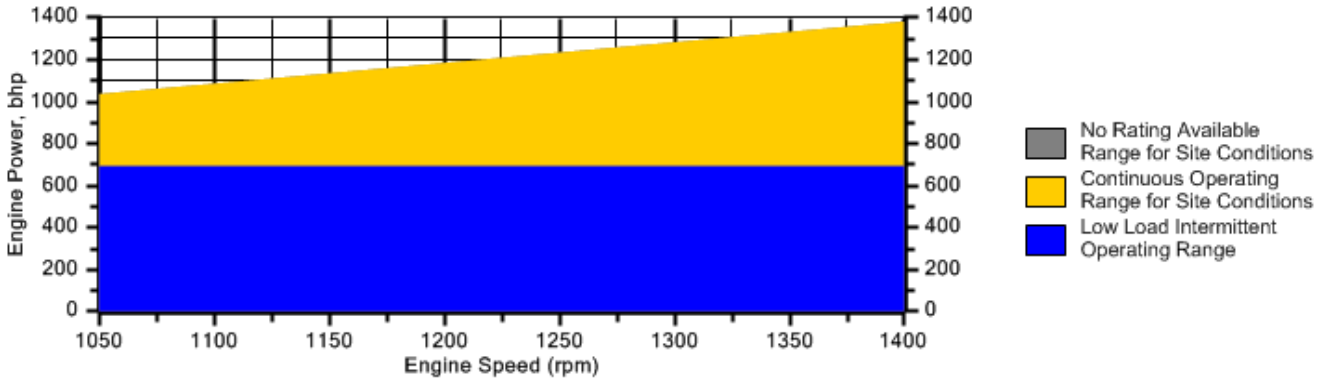
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 1500 ft and 1400 rpm



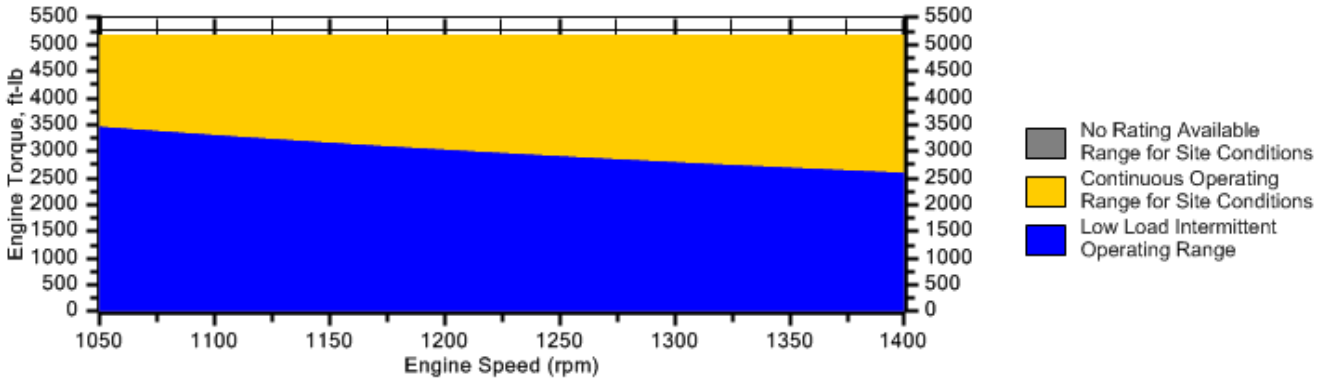
Engine Power vs. Engine Speed

Data represents speed sweep at 1500 ft and 100 °F



Engine Torque vs. Engine Speed

Data represents speed sweep at 1500 ft and 100 °F



Note: At site conditions of 1500 ft and 100°F inlet air temp., constant torque can be maintained down to 1050 rpm. The minimum speed for loading at these conditions is 1050 rpm.

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Francis 1

NOTES

1. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

2. Fuel consumption tolerance is ± 3.0% of full load data.

3. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

4. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

5. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

6. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

7. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

8. Emissions data is at engine exhaust flange prior to any after treatment.

9. Emission values are based on engine operating at steady state conditions. Fuel methane number cannot vary more than ± 3. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate "Not to Exceed" values. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

10. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

11. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

12. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

13. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

14. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.1010	0.1011
Methane	CH4	72.9370	73.0283
Ethane	C2H6	17.1740	17.1955
Propane	C3H8	6.2900	6.2979
Isobutane	iso-C4H1O	0.6170	0.6178
Norbutane	nor-C4H1O	1.4920	1.4939
Isopentane	iso-C5H12	0.2500	0.2503
Norpentane	nor-C5H12	0.3110	0.3114
Hexane	C6H14	0.0610	0.0611
Heptane	C7H16	0.0170	0.0170
Nitrogen	N2	0.4630	0.4636
Carbon Dioxide	CO2	0.1570	0.1572
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0040	0.0040
Nonane	C9H20	0.0010	0.0010
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		99.8750	100.0000

Fuel Makeup:	Gas Analysis
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	57.3
Lower Heating Value (Btu/scf):	1181
Higher Heating Value (Btu/scf):	1301
WOBBE Index (Btu/scf):	1367
THC: Free Inert Ratio:	159.92
Total % Inerts (% N2, CO2, He):	0.62%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.996
Stoich A/F Ratio (Vol/Vol):	12.23
Stoich A/F Ratio (Mass/Mass):	16.41
Specific Gravity (Relative to Air):	0.745
Specific Heat Constant (K):	1.275

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

Catalyst Group
709 21st Ave, Bloomer, WI 54724
Tel: (715) 568-2882 • Fax: (715)568-2884
E-mail : bweninger@catalyticcombustion.com

CATALYTIC COMBUSTION
EMISSION TECHNOLOGIES

To Williams
Attn
Via E-mail

Our Ref. QT-115-2264-1
Date : 12/7/2015
Page: 1 of 1

PERFORMANCE EXPECTATION

For: Location: Francis 1,2,3

Engine Operating Parameters and Catalyst Descpription

Engine Manufacturer	Caterpillar		Substrate Type	Folded Metal Foil
Engine Model	G3516B		Cell Pattern	320 cpsi Herringbone
Horsepower	1380	bhp	Banding	CCC C-Channel Design
Speed	1400	rpm	Catalyst Dimensions	23.875 x 14.875 x 3.50"
Exhaust Flowrate	9,216	acfm	Quantity Required	3 per Unit
Exhaust Temperature	1007	°F	Formulation	HFX4
Fuel	Field Gas			

Engine Output, Fresh Catalyst Performance Expectation and Warranted Emissions

	Raw Exhuast		Performance		Performance	
NOx	0.5	g/bhp-hr				
CO	2.92	g/bhp-hr	90	% Conversion	0.29	g/bhp-hr
THC	4.53	g/bhp-hr				
NMNEHC	1.01	g/bhp-hr	70	% Conversion	0.30	g/bhp-hr
HCHO	0.4	g/bhp-hr	70	% Conversion	0.12	g/bhp-hr
Oxygen	9.1	%				

* Per user supplied information

Notes and Cautions

Note: Catalyst performance is dependent upon the engine being run in accordance with the manufacturer's specifications for new engines.

Issued by

Name : Brian Weninger

Date : 12/7/15

**** End of Application for 45CSR30 Title V Operating Permit Renewal ****