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August 22, 2017
(Via Federal Express)

Beverly McKeone
New Source Review Program Manager
Division of Air Quality
West Virginia Department of Environmental Protection
601 57th Street SE
Charleston, WV 25304-2345

Subject: **Application for G35-D General Permit Registration**
Appalachia Midstream Services, LLC
Blake Ridge Compression Facility
Wetzel County, West Virginia

Dear Ms. McKeone:

Appalachia Midstream Services, LLC is submitting an Application for G35-D General Permit Registration for the proposed Blake Ridge Compression Facility to be located approximately 7.9 miles East-Southeast of Proctor in Wetzel County, West Virginia.

This application for G35-D General Permit Registration has been prepared and submitted to provide for the construction and operation of the following equipment at the subject facility:

• Four (4) 5,000 bhp CAT G3616LE Compressor Engines	CE-01 thru -04
• One (1) 1,000 kWe Capstone Microturbine Generator	MT-01
• One (1) 1,818 hp Caterpillar G3516B Emergency Generator Engine	GE-01
• Compressor Rod Packing	CRP
• Startup/Shutdown/Maintenance (including Blowdown)	SSM
• Two (2) 125 MMscfd TEG Dehydrator Flash Tanks	DFT-01 thru -02
• Two (2) 125 MMscfd TEG Dehydrator Still Vents	DSV-01 thru -02
• One (1) Thermal Oxidizer (Control for Dehys/Tanks/TLO)	TO-01
• Two (2) 2.0 MMBtu/hr Reboilers	RBV-01 thru -02
• One (1) Process Flare (Control for SSM)	FLR-01
• Six (6) Stabilized Condensate Storage Tanks (2,400 bbl Total)	T-01 thru T-06
• Two (2) Produced Water Storage Tanks (800 bbl Total)	T-07 thru T-08
• Stabilized Condensate/Produced Water Truck Load-Out	TLO
• Piping and Equipment Fugitives (Gas and Light Oil)	FUG-G and FUG-L
• Engine Crankcase Emissions	ECC

The facility qualifies as a Minor Source under Non-Attainment New Source Review (NNSR), Prevention of Significant Deterioration (PSD), and Title V Operating Permits. The facility is also an Area Source for Hazardous Air Pollutants (HAP) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations.

If you have any questions concerning this submittal or need additional information, please contact me at (412) 787-4197 or joe.mccay@williams.com.

Sincerely,

Joseph R. McCay
Environmental Specialist

Enclosures:

- Application for G35-D General Permit Registration
- Attachments A through W
- Check for Application Fee

APPLICATION FOR
G35-D GENERAL PERMIT REGISTRATION

For the:

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

New Martinsville, Wetzel County, West Virginia

Submitted to:

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY

Submitted by:

Appalachia Midstream Services, LLC
Park Place Corporate Center 2
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August 2017

APPLICATION FOR
G35-D GENERAL PERMIT REGISTRATION

Appalachia Midstream Services, LLC
BLAKE RIDGE COMPRESSION FACILITY

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Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

APPLICATION SUPPLEMENT

A. Introduction

A new station called the Blake Ridge Compression Facility is being constructed to support the gas gathering system in Wetzel County, West Virginia. The design will include inlet liquid handling capabilities, compression and dehydration capacity, supporting piping and electrical infrastructure and instrument air systems. This application for G35-D General Permit Registration has been prepared and submitted to provide for the following equipment and operations at the subject facility:

• Four (4) 5,000 bhp CAT G3616LE Compressor Engines	CE-01 thru -04
• One (1) 1,000 kWe Capstone Microturbine Generator	MT-01
• One (1) 1,818 hp Caterpillar G3516B Emergency Generator Engine	GE-01
• Compressor Rod Packing	CRP
• Startup/Shutdown/Maintenance (including Blowdown)	SSM
• Two (2) 125 MMscfd TEG Dehydrator Flash Tanks	DFT-01 thru -02
• Two (2) 125 MMscfd TEG Dehydrator Still Vents	DSV-01 thru -02
• One (1) Thermal Oxidizer (Control for Dehys/Tanks/TLO)	TO-01
• Two (2) 2.0 MMBtu/hr Reboilers	RBV-01 thru -02
• One (1) Process Flare (Control for SSM)	FLR-01
• Six (6) Stabilized Condensate Storage Tanks (2,400 bbl Total)	T-01 thru T-06
• Two (2) Produced Water Storage Tanks (800 bbl Total)	T-07 thru T-08
• Stabilized Condensate/Produced Water Truck Load-Out	TLO
• Piping and Equipment Fugitives (Gas and Light Oil)	FUG-G and FUG-L
• Engine Crankcase Emissions	ECC

B. Potential to Emit (PTE)

The facility qualifies as a synthetic minor source for criteria pollutants and as an area source of HAPs, as summarized below:

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Controlled PTE in TPY[1]

Unit ID	Description	Criteria Pollutants			HAP		GHG
		NOX	CO	VOC[2]	HCHO[3]	Tot HAP[4]	CO2e[5]
CE-01	Compressor Engine - CAT G3616 A4	19.31	10.70	5.85	1.22	1.69	23,693
CE-02	Compressor Engine - CAT G3616 A4	19.31	10.70	5.85	1.22	1.69	23,693
CE-03	Compressor Engine - CAT G3616 A4	19.31	10.70	5.85	1.22	1.69	23,693
CE-04	Compressor Engine - CAT G3616 A4	19.31	10.70	5.85	1.22	1.69	23,693
MT-01	Generator Turbine - Capstone C1000	3.50	9.64	0.44	0.04	0.05	5,896
GE-01	Emergency Generator Engine - CAT G3516B	0.50	2.81	1.19	0.35	0.42	600
CRP	Compressor Rod Packing	---	---	18.24	---	0.97	1,992
SSM	Startup/Shutdown/Maintenance (Blowdown)	---	---	2.44	---	0.13	13,327
DFT-01	TEG Dehydrator - Flash Tank	---	---	2.56	---	0.06	79
DSV-01	TEG Dehydrator - Still Vent	---	---	4.70	---	1.27	5
DFT-02	TEG Dehydrator - Flash Tank	---	---	2.56	---	0.06	79
DSV-02	TEG Dehydrator - Still Vent	---	---	4.70	---	1.27	5
TO-01	Dehys/Tanks/TLO Thermal Oxidizer	3.37	10.65	[A]	2.5E-03	2.6E-03	4,063
RBV-01	TEG Dehydrator - Reboiler Vent	0.86	0.72	0.05	6.4E-04	0.02	1,037
RBV-02	TEG Dehydrator - Reboiler Vent	0.86	0.72	0.05	6.4E-04	0.02	1,037
FLR-01	SSM Flare	2.24	7.08	[A]	1.7E-03	1.7E-03	2,700
T-01	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-02	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-03	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-04	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-05	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-06	Storage Tank - Stabilized Condensate	---	---	0.06	---	0.01	---
T-07	Storage Tank - Produced Water	---	---	0.06	---	0.01	---
T-08	Storage Tank - Produced Water	---	---	0.06	---	0.01	---
TLO	Truck Load-Out - Stabilized Condensate	---	---	5.62	---	1.69	---
	Truck Load-Out - Produced Water	---	---	0.42	---	0.12	---
TOTAL POINT SOURCE PTE:		**88.58**	**74.41**	**66.87**	**5.26**	**12.90**	**125,592**
Title V Operating Permit Thresholds:		100	100	100	10	25	na
FUG-G	Process Piping Fugitives - Gas	---	---	2.40	---	0.13	262
FUG-L	Process Piping Fugitives - Light Oil	---	---	6.13	---	0.92	---
ECC	Engine Crankcase Emissions	0.21	1.43	0.40	0.07	0.11	254
TOTAL FUGITIVE SOURCE PTE:		0.21	1.43	8.93	0.07	1.15	516
TOTAL PTE:		**88.79**	**75.84**	**75.80**	**5.33**	**14.05**	**126,108**

Notes: [A] - Refer to sources being controlled.

1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr, except SSM and TLO which are intermittent

2 - VOC is volatile organic compounds, as defined by EPA, and includes HCHO (formaldehyde).

3 - HCHO is formaldehyde and is the individual HAP with the highest PTE.

4 - Total HAP includes, but not limited to, HCHO (formaldehyde), n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), 2,2,4-TMP (i-octane), acetaldehyde, acrolein, and MeOH.

5 - CO2e is aggregated Greenhouse Gas (GHG), comprised of carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), as adjusted for Global Warming Potential (GWP).

C. Applicability of New Source Review (NSR) Regulations

The following New Source Review (NSR) regulations are potentially applicable to natural gas production facilities. 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 Synthetic Minor Source" for each regulated pollutant, as follows:

- NOx: PSD Natural Minor Source with Pre-Controlled PTE < 250 tpy
- CO: PSD Synthetic Minor Source with 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

2. Nonattainment New Source Review (NNSR) [Not Applicable]

This rule does not apply. The facility location is designated as either "Maintenance" or "Attainment/Unclassified" for all criteria pollutants.

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

This rule does not apply. The facility is a "HAP Area Source" as follows:

- Each HAP: HAP Area Source with Controlled Each 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) [Not Applicable]

This rule does not apply. The facility is a "Title V Synthetic Minor Source" as follows:

- NOx: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- CO: Title V Synthetic Minor Source with Controlled PTE < 100 tpy
- VOC: Title V Synthetic Minor Source with Controlled PTE < 100 tpy
- SO2: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- PM10/2.5: Title V Natural Minor Source with Pre-Controlled PTE < 100 tpy
- Each HAP: Title V Synthetic Minor Source with Controlled PTE < 10 tpy
- Total HAPs: Title V Synthetic Minor Source with Controlled PTE < 25 tpy

D. Applicability of Federal Regulations

The following federal regulations are potentially applicable to natural gas production facilities. 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 (§60.7)
b. Recordkeeping and Reporting (§60.7)
c. Source Testing (§60.8, §60.11)

2. NSPS Dc, Steam Generating Units

40CFR§60.40c-§60.48c [Not Applicable]

This rule does not apply because there is no steam generating unit at the facility with a maximum design heat input capacity ≥ 10 MMBtu/hr (§60.40c(a)).

3. NSPS Kb, Volatile Organic Liquid (VOL) Storage Vessels

40CFR§60.110b-§60.117b [Not Applicable]

This rule does not apply because each tank that is used to store volatile organic liquids (VOL) has a design capacity < 75 m3 (19,800 gals, 471 bbl) (§60.110b(a)).

4. 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 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). The proposed microturbine generator (Capstone Turbine C1000) is actually comprised of five (5) individual C200 microturbines, each having a peak load of 200 kW (2.05 MMBtu/hr LHV) and as such, are not subject to this subpart.

5. NSPS KKK, Leaks from Natural Gas Processing Plants

40CFR§60.630-§60.636 [Not Applicable]

This rule does not apply because the facility is not located at a natural gas processing plant that is engaged in the extraction of natural gas liquids from field gas (§60.630(e)).

6. 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 unit at the facility (§60.640(a)).

7. NSPS IIII, Compression Ignition Reciprocating Internal Combustion Engines
CFR§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)).

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

This rule does apply to the four new 5,000 bhp CAT G3616LE Compressor Engines (CE-01 thru -04) and the 1,818 bhp CAT G3516B emergency generator engine (GE-01) because they were each constructed ("ordered"), modified or reconstructed after 06/12/06 (§60.4230(a)(5)), are lean burn with ≥ 1,350 bhp, and were 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 requirements (§60.4245).

9. NSPS KKKK, Stationary Combustion Turbines
40CFR§60.4300-§60.4420 [Not Applicable]

This rule does not apply because there is no stationary combustion turbine with a heat input at peak load equal to or greater than 10.7 gigajoules (10 MMBtu) per hour, based on the higher heating value of the fuel (§60.4300). The proposed microturbine generator (Capstone Turbine C1000) is actually comprised of five (5) individual C200 microturbines, each having a peak load of 200 kW (2.28 MMBtu/hr HHV) and as such, are not subject to this subpart.

10. NSPS OOOO, Crude Oil and Natural Gas Production
40CFR§60.5360-§60.5430 [Not Applicable]

This rule does not apply to the new reciprocating compressors because they were constructed after 09/18/15 (§60.5365).

This rule does not apply to the new storage vessels (tanks) because they were constructed after 09/18/15 (§60.5365).

This rule does not apply as instrument air is used in lieu of natural gas pneumatic controllers (§60.5365).

11. NSPS OOOOa, Crude Oil and Natural Gas Production
40CFR§60.5360a-§60.5499a [Applicable]

This rule does apply to the new reciprocating compressors (driven by CE-01 thru -04) and the electrically driven reciprocating compressors because they were constructed after September 18, 2015 (§60.5360a and §60.5365a(c)). Requirements include replacing rod-packing systems on a specified schedule (§60.5385a(a)); also monitoring, recordkeeping and reporting requirements.

This rule does not apply to the new 400 bbl stabilized condensate and produced water storage vessels (tanks) because they do not have the potential to emit > 6 tpy of VOC (§60.5365a(e)(3)). However, there is a requirement to maintain documentation that the VOC emission rate is < 6 tpy per tank (§60.5420(c)(5)(ii)).

This rule does not apply as instrument air is used in lieu of natural gas pneumatic controllers (§60.5365a).

This rule does apply to the collection of fugitive emissions components at a compressor station (§60.5365a(j)). The new process piping components installed as part of the project will be subject to the equipment leak standards specified in §60.5397a.

12. NESHAP A, General Provisions (aka MACT)

40CFR§63.1-§63.16 [Applicable]

This rule does apply to all sources subject to a NESHAP, including the dehydrators (DEHY-01 thru DEHY-02), compressor engines (CE-01 thru CE-04) and emergency generator engine (GE-01). Requirements include notification, monitoring and recordkeeping.

13. NESHAP HH, Oil and Natural Gas Production Facilities

40CFR§63.760-§63.779 [Applicable]

This rule does apply to the TEG dehydrators. However, because each dehydrator has an actual average benzene emission rate < 0.90 megagram (1.00 ton) per year they are exempt from all requirements except to maintain records of actual benzene emissions to demonstrate continuing exemption status (§63.764(e)(1)).

14. 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)).

15. NESHAP YYYY, Stationary Combustion Turbines

40CFR§63.6080-§63.6175 [Not Applicable]

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

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

40CFR§63.6580-§63.6675 [Applicable]

This rule does apply to the compressor engines and emergency generator engine. However, because each new compressor and generator engine is “new”; i.e., commenced construction or reconstruction on or after 06/12/06 (§63.6590(a)(2)(iii)), the only requirement is compliance with 40CFR§60.4230 thru §60.4248 (NSPS JJJJ) for Spark Ignition Internal Combustion Engines.

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

40CFR§63.7480 – §63.7575 [Not Applicable]

This rule does not apply to the gas-fired reboilers (RBV-01 thru RBV-02) because the facility is not a major source of HAP (§63.7485).

18. NESHAP JJJJJJ, Industrial, Commercial, and Institutional Boilers – Area Sources

40CFR§63.11193 – §63.11237 [Not Applicable]

This rule does not apply because the gas-fired reboilers (RBV-01 thru RBV-02) do not meet the definition of “boiler” in §63.11237. Specifically, “boiler” is defined as an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of

steam and/or hot water. Furthermore, waste heat boilers, process heaters, and autoclaves are excluded from the definition of "boiler".

19. Compliance Assurance Monitoring (CAM)

40CFR§64.1-§64.10 [Not Applicable]

This rule does not apply because the subject facility is not a major source required to obtain a Title V Operating Permit (§64.2(a)).

20. Mandatory Greenhouse Gases (GHG) Reporting

40CFR§98.1-§98.9 (See Attachment D-4) [Potentially Applicable]

This rule potentially applies. The facility is not subject to a listed source category; however, this rule potentially applies because the aggregate maximum heat input capacity of the stationary fuel combustion units is ≥ 30 MMBtu/hr and the facility has the potential to emit ≥ 25,000 metric ton/yr (27,558 tpy) of Carbon Dioxide Equivalent (CO_2e) emissions from all stationary fuel combustion sources combined (§98.2(a)).

Records must be kept of actual CO_2, CH_4, and N_2O emissions to determine the actual CO_2e emissions. If the actual CO_2e emissions exceed the 25,000 metric ton/yr threshold then an annual report must be submitted no later than March 31 of each calendar year thereafter.

E. Applicability of State Regulations

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

1. Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

45CSR2 [Applicable]

This rule does apply, however, because each dehydrator reboiler (RBV-01 and RBV-02) has a maximum design heat input (MDHI) rating < 10 MMBtu/hr, the only requirement is to limit visible emissions to < 10% opacity during normal operations (§45-02-3.1). The dehydrator reboilers combust only natural gas which inherently conforms to the visible emission standards.

2. Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or 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]

The rule does apply as 45CSR6 establishes emission standards for particulate matter and requirements for activities involving incineration of refuse. As the flare (FLR-01) and thermal oxidizer (TO-01) are required to be smokeless except for periods not to exceed a total of 5 minutes during any 2 consecutive hours, particulate matter emissions should be negligible and the equipment will comply with the applicable emission standard. The facility will monitor the

flare and thermal oxidizer pilot flame and record any malfunctions that may cause no flame to be present during facility operation.

4. **Prevent and Control Air Pollution from the Emission of Sulfur Oxides**
   45CSR10 [Not Applicable]

   This rule does not apply because each "fuel burning unit" at the facility has a Maximum Design Heat Input (MDHI) rating < 10 MMBtu/hr.

5. **Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation**
   45CSR13 [Applicable]

   This rule does apply. Appalachia Midstream Services, LLC is applying for a G35-D Class II General Permit and has published the required Class I legal advertisement notifying the public of this application to construct and operate the facility.

6. **Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants**
   45CSR14 [Not Applicable]

   The rule does not apply because the facility is not a major source of air pollutants.

7. **Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60**
   45CSR16 [Applicable]

   The rule does apply to this source by reference of §40CFR60, Subparts JJJJ and OOOOa. Appalachia Midstream Services, LLC is subject to the monitoring and recordkeeping 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 because the facility is a minor (or "deferred") source of all regulated pollutants.

9. **Requirements for Operating Permits**
   45CSR30 [Not Applicable]

   This rule does not apply because the facility is a minor (or "deferred") source of all regulated pollutants.

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 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 the subject facility is not located in Putnam, Kanawha, Cabell, Wayne, Wood, or Greenbrier Counties (§45-29-1).

14. Requirements for Operating Permits

45CSR30 [Not Applicable]

This rule does not apply because the subject facility is a non-major "deferred" source of all regulated pollutants.

Pursuant to the authority granted in West Virginia 45CSR§30-3.2 and 45CSR§30A-3.1, the DAQ is extending the deferral, which was set to expire December 15, 2000, of non-major sources subject to West Virginia 45CSR30 (Title V Program) from the obligation to submit an operating permit application.

15. Emission Standards for Hazardous Air Pollutants (HAP)

45CSR34 [Not Applicable]

This rule does not apply because the provisions under Subpart HH of 40 CFR Part 63 which apply to non-major area sources of hazardous air pollutants are excluded.

APPLICATION FOR PERMIT

G35-D General Permit Registration

west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone (304) 926-0475
Fax (304) 926-0479
www.dep.wv.gov

G35-D GENERAL PERMIT REGISTRATION APPLICATION

PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS COMPRESSOR AND/OR DEHYDRATION FACILITIES

☒CONSTRUCTION
☐MODIFICATION
☐RELOCATION
☐CLASS I ADMINISTRATIVE UPDATE
☐CLASS II ADMINISTRATIVE UPDATE

SECTION 1. GENERAL INFORMATION

Name of Applicant (as registered with the WV Secretary of State's Office): **Appalachia Midstream Services, LLC**

Federal Employer ID No. (FEIN): **26-3678972**

Applicant's Mailing Address: **Park Place Corporate Center 2, 2000 Commerce Drive**

City: **Pittsburgh**	State: **PA**	ZIP Code: **15275**

Facility Name: **Blake Ridge Compression Facility**

Operating Site Physical Address: **Co. Rd 1/14, New Martinsville, WV 26155**
If none available, list road, city or town and zip of facility.

City: **New Martinsville**	Zip Code: **WV**	County: **Wetzel**

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: **39.67678°N**
Longitude: **80.68181°W**

SIC Code: **1389** NAICS Code: **213112**	DAQ Facility ID No. (For existing facilities) **NA**

CERTIFICATION OF INFORMATION

This G35-D General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of the Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. **Any administratively incomplete or improperly signed or unsigned G35-D Registration Application will be returned to the applicant. Furthermore, if the G35-D forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

I hereby certify that **Paul Hunter** is an Authorized Representative and in that capacity shall represent the interest of the business (e.g., Corporation, Partnership, Limited Liability Company, Association Joint Venture or Sole Proprietorship) and may obligate and legally bind the business. If the business changes its Authorized Representative, a Responsible Official shall notify the Director of the Division of Air Quality immediately.

I hereby certify that all information contained in this G35-D General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible.

Responsible Official Signature: Paul Hunter August 21, 2017
Name and Title: **Paul Hunter - Vice President, Northeast Operating Area** Phone: **(412) 787-5561** Fax: **(412) 787-6002**
Email: **paulv.hunter@williams.com** Date:

If applicable: NA
Authorized Representative Signature: _____
Name and Title: Phone: Fax:
Email: Date:

If applicable:
Environmental Contact
Name and Title: **Joseph R. McCay, Environmental Specialist** Phone: **(412) 787-7300** Fax: **(412) 787-6002**
Email: **joe.mccay@williams.com** Date:

OPERATING SITE INFORMATION

Briefly describe the proposed new operation and/or any change(s) to the facility: The Blake Ridge Compression Facility will be constructed and operated to compress and dehydrate natural gas.

Directions to the facility: Directions from Proctor:
a. Head southeast on Plum St toward WV-2 S ~ 0.1 mi;
b. Turn right at the 1st cross street onto WV-2 S ~ 0.1 mi;
c. Turn left onto Proctor Creek Rd ~ 9.3 mi;
d. Sharp left to stay on Proctor Creek Rd ~ 2.0 mi;
e. Turn left and destination is on the left ~ 0.4 mi.

ATTACHMENTS AND SUPPORTING DOCUMENTS

I have enclosed the following required documents:

Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22).

☒ Check attached to front of application.
☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address):
☐ I wish to pay by credit card. Contact for payment (incl. name and email address):

☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update)
☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ and/or OOOO and/or OOOOa [1]
☒$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2]

[1] Only one NSPS fee will apply.
[2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ.
NSPS and NESHAP fees apply to new construction or if the source is being modified.

☒ Responsible Official or Authorized Representative Signature (if applicable)	
☒ Single Source Determination Form **(must be completed in its entirety)** – Attachment A	
☒ Siting Criteria Waiver (if applicable) – Attachment B	☒ Current Business Certificate – Attachment C
☒ Process Flow Diagram – Attachment D	☒ Process Description – Attachment E
☒ Plot Plan – Attachment F	☒ Area Map – Attachment G
☒ G35-D Section Applicability Form – Attachment H	☒ Emission Units/ERD Table – Attachment I
☒ Fugitive Emissions Summary Sheet – Attachment J	
☒ Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment K	
☒ Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment L	
☒ Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment M	
☒ Tanker Truck Loading Data Sheet (if applicable) – Attachment N	
☒ Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment O	
☒ Pneumatic Controllers Data Sheet – Attachment P	
☒ Centrifugal Compressor Data Sheet – Attachment Q	
☒ Reciprocating Compressor Data Sheet – Attachment R	
☒ Blowdown and Pigging Operations Data Sheet – Attachment S	
☒ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment T	
☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment U	
☒ Facility-wide Emission Summary Sheet(s) – Attachment V	
☒ Class I Legal Advertisement – Attachment W	
☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments	

All attachments must be identified by name, divided into sections, and submitted in order.

ATTACHMENT A

Single Source Determination Form

G35-D General Permit Registration

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

Classifying multiple facilities as one "stationary source" under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of Building, structure, facility, or installation as given in §45-14-2.13 and §45-19-2.12. The definition states:

"Building, Structure, Facility, or Installation" means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).

The Source Determination Rule for the oil and gas industry was published in the Federal Register on June 3, 2016 and will become effective on August 2, 2016. EPA defined the term "adjacent" and stated that equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.

Is there equipment and activities in the same industrial grouping (defined by SIC code)?
Yes ☒ No ☐

(The upstream well(s) and subject facility share the same two-digit major SIC code of 13.)

Is there equipment and activities under the control of the same person/people?
Yes ☐ No ☒

(Facility receives natural gas from wells owned by other companies)

Is there equipment and activities located on the same site or on sites that share equipment and are within ¼ mile of each other?
Yes ☐ No ☒

(The closest Appalachia Midstream Services, LLC owned facility to the subject facility is the Pleasants Compressor Station located approximately 3.8 miles away.)

ATTACHMENT B

Siting Criteria Waiver (If Applicable)

G35-D General Permit Registration

ATTACHMENT B - SITING CRITERIA WAIVER – *NOT APPLICABLE*
If applicable, please complete this form and it must be notarized.

G35-D General Permit
Siting Criteria Waiver

WV Division of Air Quality 300' Waiver

I _____ hereby
Print Name

acknowledge and agree that _____ will
General Permit Applicant's Name

construct an emission unit(s) at a natural gas compressor and/or dehydration facility that will be located within 300' of my dwelling and/or business.

.

I hereby offer this waiver of siting criteria to the West Virginia Department of Environmental Protection Division of Air Quality as permission to construct, install and operate in such location.

Signed:

_____
Signature Date

_____
Signature Date

Taken, subscribed and sworn before me this _____ day of

_____, 20_____.

My commission expires: _____

SEAL_____
Notary Public

ATTACHMENT C

Current Business Certificate

G35-D General Permit Registration

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
APPALACHIA MIDSTREAM SERVICES, L.L.C.
900 PENNSYLVANIA AVE
CHARLESTON, WV 25302-3548

BUSINESS REGISTRATION ACCOUNT NUMBER: **2222-3681**

This certificate is issued on: **06/30/2010**

This certificate is issued by
the West Virginia State Tax Commissioner
in accordance with W.Va. Code § 11-12.

The person or organization identified on this certificate is registered to conduct business in the State of West Virginia at the location above.

This certificate is not transferrable and must be displayed at the location for which issued.

This certificate shall be permanent until cessation of the business for which the certificate of registration was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

Change in name or change of location shall be considered a cessation of the business and a new certificate shall be required.

TRAVELING/STREET VENDORS: Must carry a copy of this certificate in every vehicle operated by them. CONTRACTORS, DRILLING OPERATORS, TIMBER/LOGGING OPERATIONS: Must have a copy of this certificate displayed at every job site within West Virginia.

atL006 v.1
L0250854144

ATTACHMENT D

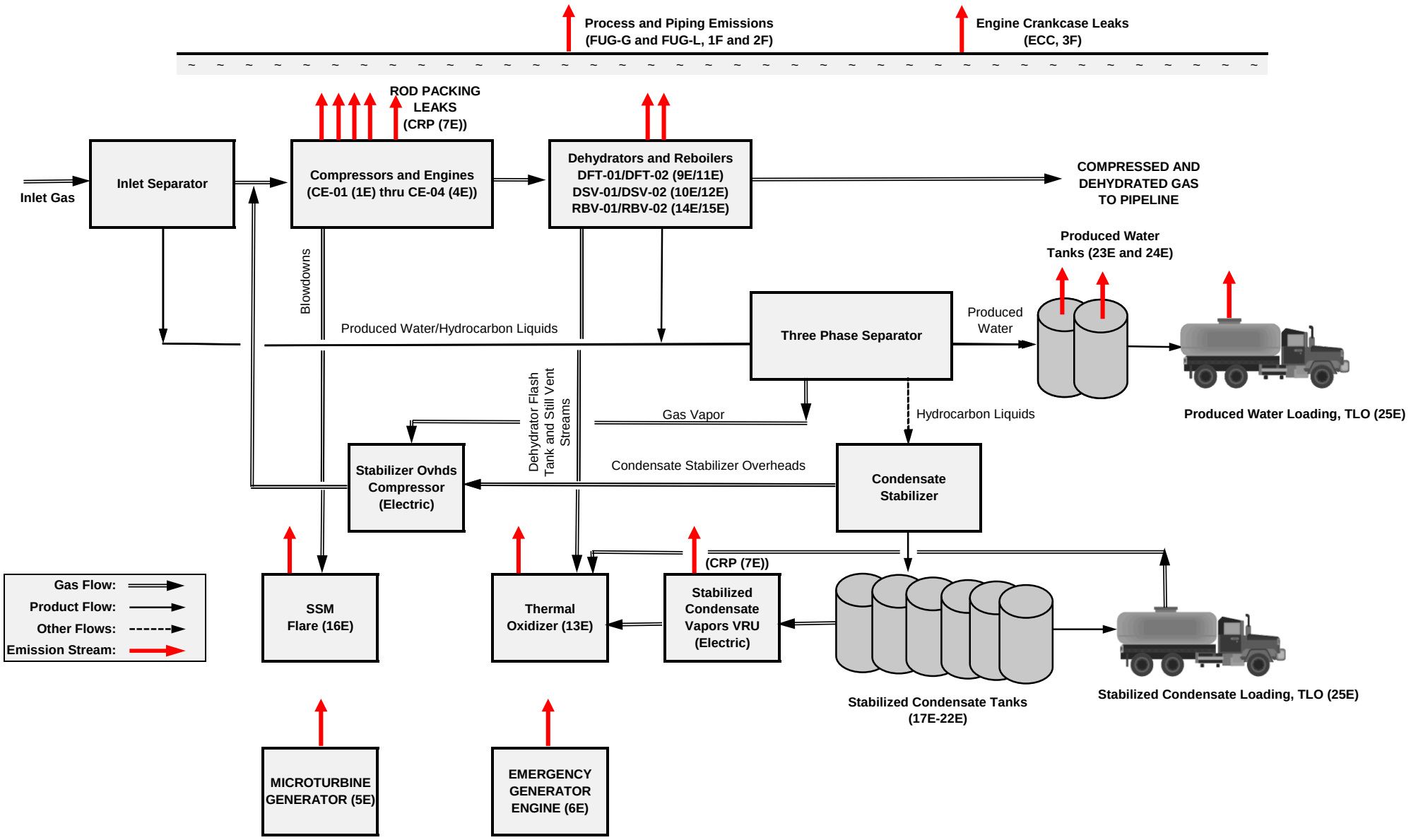
Process Flow Diagram

G35-D General Permit Registration

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

PROCESS FLOW DIAGRAM (PFD)



ATTACHMENT E

Process Description

G35-D General Permit Registration

A. Project Overview

Appalachia Midstream Services, LLC owns and operates the Blake Ridge Compression Facility located approximately 7.9 Miles East-Southeast of Proctor in Wetzel County, West Virginia (See Attachment G – Site Location Map). The facility receives natural gas from local production wells then compresses and dehydrates the gas for delivery to a gathering pipeline. Additionally, raw field condensate is received at the site, stabilized and then sent offsite via tanker trucks.

B. Reciprocating Engines

Five (5) natural gas-fueled reciprocating engines are utilized at the facility. Four of these engines drive a natural gas compressor to increase the pressure of the natural gas. One of the engines drives an electrical generator when electric power from the local utility is interrupted. Emissions result from the combustion of natural gas fuel.

C. Microturbine

One microturbine is utilized at the facility to drive an electrical generator to produce power for onsite needs. Emissions result from the combustion of natural gas fuel.

D. Compressor Rod Packing Leaks

The reciprocating compressor operations result in emissions from the wear of mechanical seals around the piston rods over time.

E. Startup/Shutdown/Maintenance

As part of facility operation, the compressor engines will undergo periods of startup and shutdown. When an engine is shutdown, the natural gas contained within the compressor and associated piping must be evacuated and the blowdown gas is routed to a flare for destruction. Additionally, there will be other infrequent emissions from various maintenance activities at the facility that are not associated with compressor blowdowns such as pigging activities.

F. Tri-Ethylene Glycol (TEG) Dehydrators

Two (2) Triethylene Glycol (TEG) Dehydrators are utilized at the facility. Each dehydrator is comprised of a Contactor/Absorber Tower (no vented emissions), a Flash Tank, and a Regenerator/Still Vent.

The TEG Dehydrators are used to remove water vapor from the inlet wet gas stream to meet pipeline specifications. In the dehydration process, the wet inlet gas stream flows through a contactor tower where the gas is contacted with lean glycol. The lean glycol absorbs the

water in the gas stream and becomes rich glycol laden with water and trace amounts of hydrocarbons.

The rich glycol is then routed to a flash tank where the glycol pressure is reduced to liberate the lighter end hydrocarbons (predominantly methane). The lighter end hydrocarbons are routed from the flash tank to the Reboiler for use as fuel with the excess hydrocarbons vented to a thermal oxidizer.

The rich glycol is then sent from the flash tank to the regenerator/still where the TEG is heated to drive off the water vapor and any remaining hydrocarbons. The off-gases from the regenerator/still are vented to a thermal oxidizer.

After regeneration, the glycol is returned to a lean state and used again in the process

G. Tri-Ethylene Glycol (TEG) Reboilers

Tri-Ethylene Glycol (TEG) Reboilers are utilized to supply heat for the Triethylene Glycol (TEG) Regenerator/Stills.

H. Thermal Oxidizer

One thermal oxidizer with 98% VOC/HAPs destruction efficiency is used to control the dehydrator's flash gas and still vent vapor streams, stabilized condensate tank emissions and stabilized condensate truck loading losses.

I. Process Flare

One process flare with 98% VOC/HAPs destruction efficiency is used to control emissions from startup/shutdown/maintenance activities (including blowdowns, pigging events and station ESD events).

J. Condensate Stabilizer

A heated 3-phase separator will separate gas vapor, water, and condensate. Water will go to the produced water tanks. Raw condensate from the 3-phase separator will be sent to a stabilizer tower skid to stabilize the condensate to a RVP 12 product. An electric immersion heater will be used to provide the heat necessary to stabilize the condensate. Gas vapor and stabilizer overheads will be gathered by an electric motor driven vapor recovery unit (VRU). The VRU will discharge into the compressor facility suction line. A backup VRU will be installed and used only when the primary condensate stabilizer overheads VRU is inoperable.

K. Storage Tanks

There are tanks at the facility used to store various materials, including produced water, lube oil, fresh and spent TEG, etc. All of these tanks, except for the stabilized condensate and produced water storage tanks, generate de-minimis (insignificant) emissions.

Six 400 bbl storage tanks will be used to hold the stabilized condensate product. Each of these tanks will be connected to the thermal oxidizer for emissions control. Two 400 bbl storage tanks will be used to hold produced water from the dehydrators and inlet separator.

The stabilized condensate tank vapors will be gathered by an electric motor driven VRU. The VRU will send the vapors to the thermal oxidizer for destruction.

L. Truck Load-Out

Produced water will be loaded into tanker trucks and produce small quantities of VOC emissions. Additionally, stabilized condensate will be loaded into tanker trucks and emissions will be controlled by the thermal oxidizer.

M. Piping and Equipment Fugitive Emissions

Piping and process equipment generate from leaks from different component types (connectors, valves, pumps, etc.) in gas-vapor service and light-liquid (condensate) service.

N. Engine Crankcase Emissions

Internal combustion results in a small but continual amount of blow-by, which occurs when some of the gases from combustion leak past the piston rings (that is, blow by them) to end up inside the crankcase, causing pressure to build up in the crank case. These blow-by gases are vented to the atmosphere.

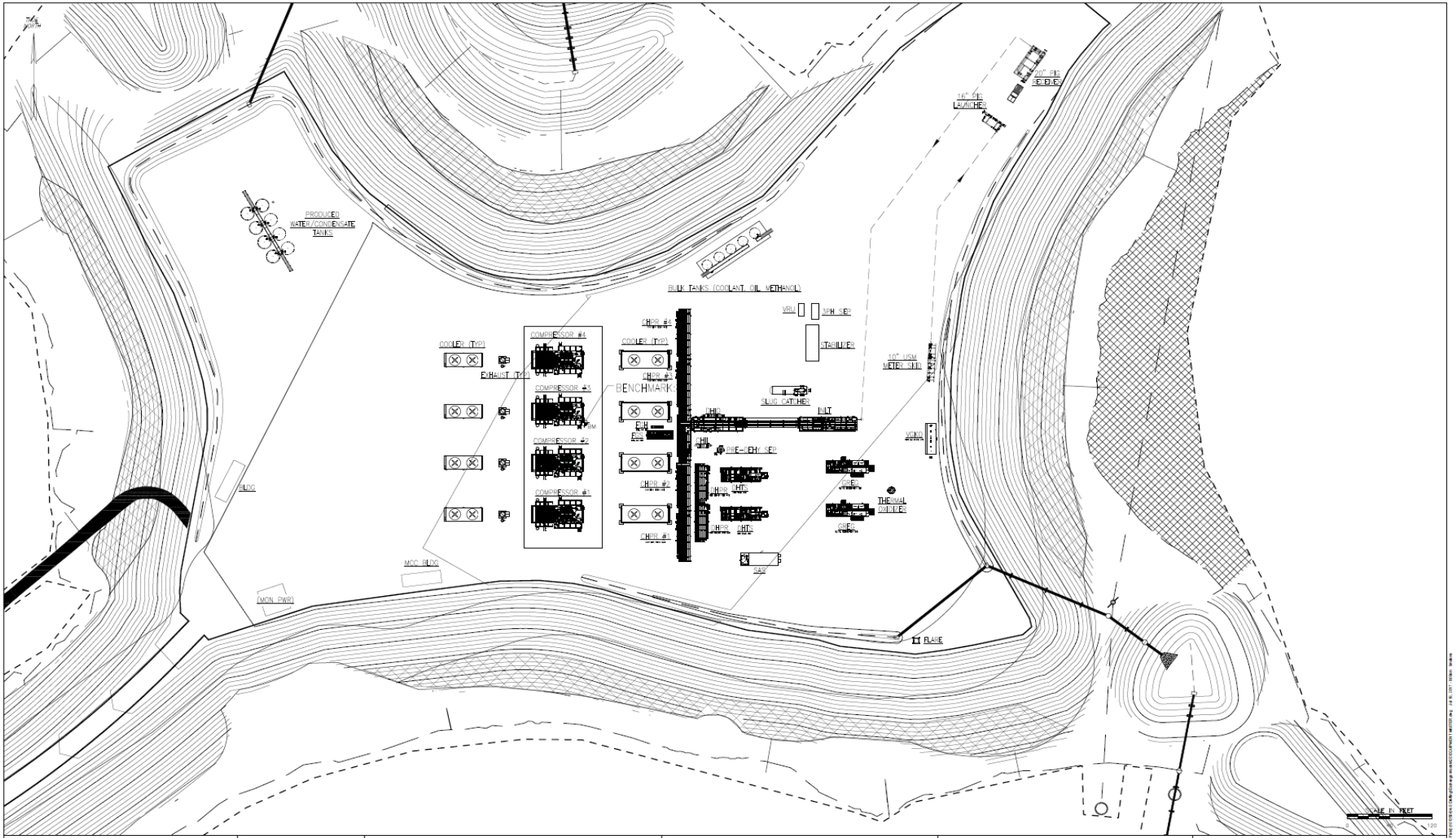
A process flow diagram is included as Attachment D.

ATTACHMENT F

Plot Plan

G35-D General Permit Registration

Attachment F - Plot Plan



NOTES	DRAWING STATUS	REFERENCE DRAWINGS		REVISIONS					
	REVISED DATE: XX-XX-XXXX DESTROY ALL PREVIOUS REV'S	DRAWING NUMBER	DRAWING TITLE	REV:	DRAWN BY:	DATE REVISED:	CHECKED BY:	APPROVED BY:	
				C	ISSUED FOR REVIEW B. MALONE	07/19/2017	A. DAY	A. DAY	
				B	RELOCATED VGKO, FLARE AND SAS B. MALONE	05/15/2017	A. DAY	A. DAY	
				A	ISSUED FOR PRELIMINARY REVIEW B. MALONE	05/11/2017	A. DAY	A. DAY	

Williams.

COUNTY/PARISH: WETZEL — STATE: WV
TOWNSHIP: — RANGE: — SECTION: — LAT/LONG: 00.000000° 000.000000°
DRAWN BY: B. MALONE — DATE: 05/11/2017
CHECKED BY: A. DAY — DATE: 05/11/2017
APPROVED BY: A. DAY — DATE: 05/11/2017
ENGINEER: A. DAY
WORK ORDER NUMBER/PROJECT NUMBER:
LEGACY DRAWING NUMBER:

OHIO RIVER SUPPLY HUB
BLAKE RIDGE CF
GENERAL ARRANGEMENT (PRELIMINARY)

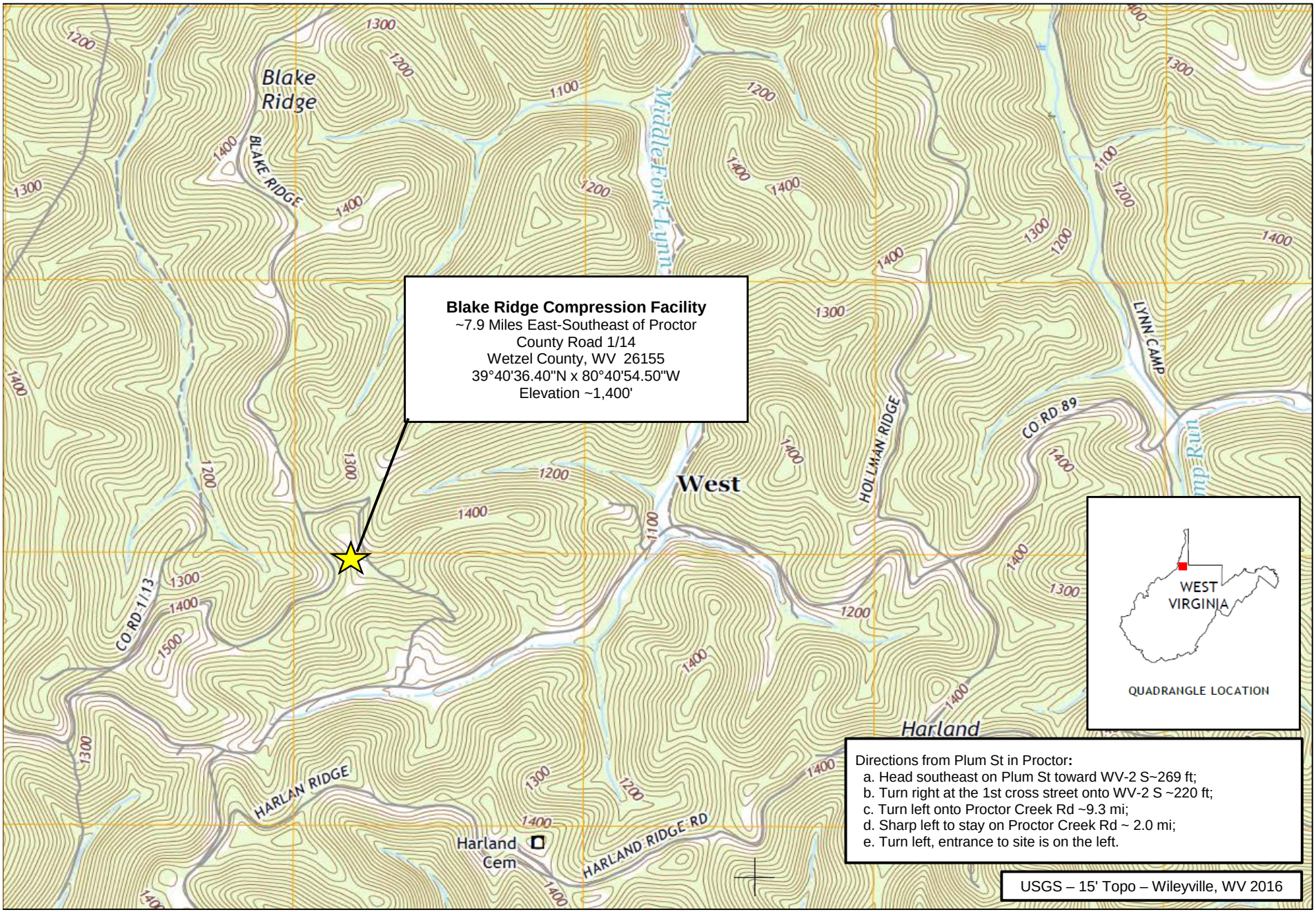
DRAWING NUMBER: MCNW-P20-200 — REVISION: C
DRAWING SCALE: 1"=40'-0" — SHEET NUMBER: 1 OF 1
DATE ISSUED: 05/11/2017

ATTACHMENT G

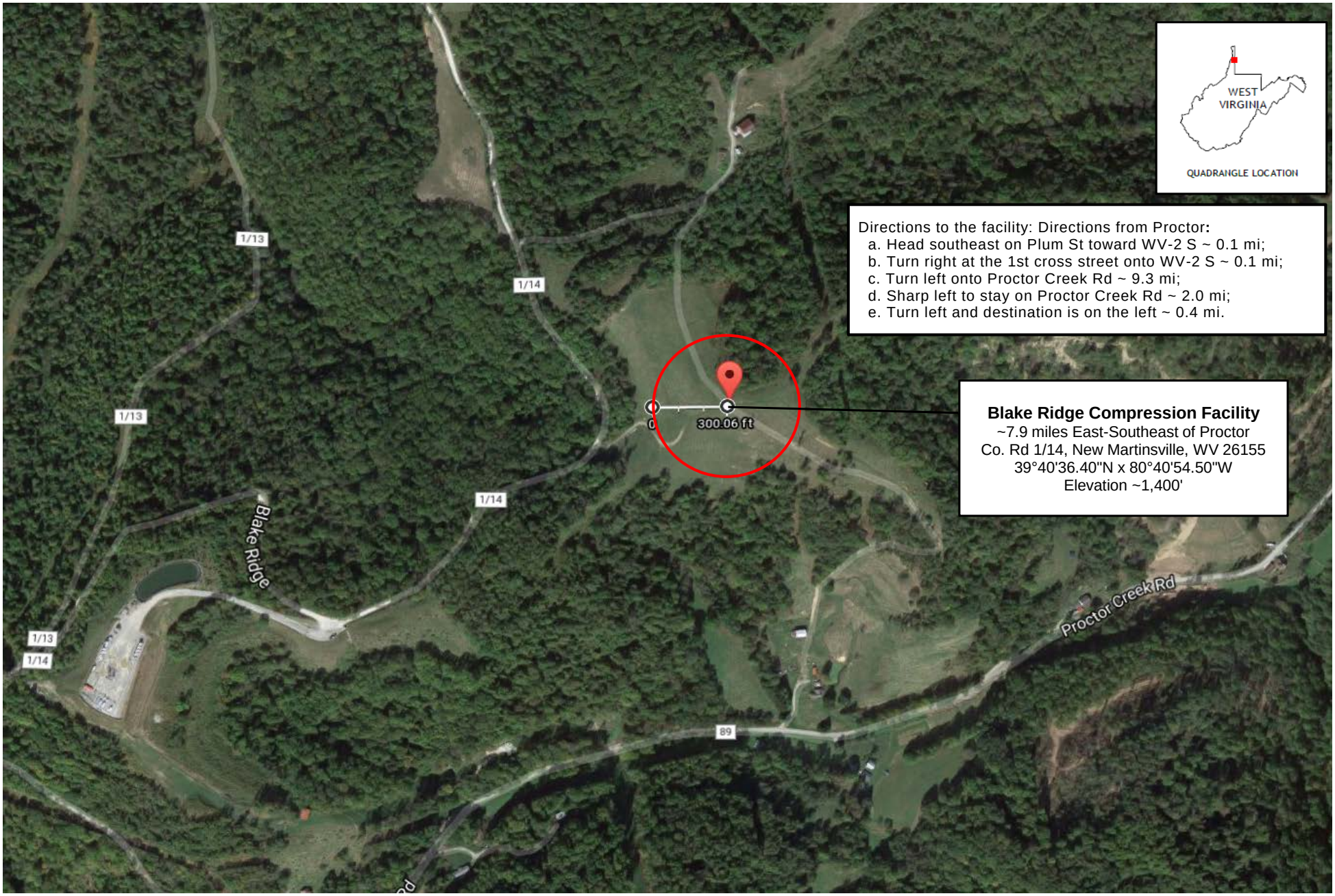
Area Map

G35-D General Permit Registration

Attachment G - Location/Topographic Map



Attachment G' - Area Map



ATTACHMENT H

G35-D Section Applicability Form

G35-D General Permit Registration

General Permit G35-D Registration
Section Applicability Form

General Permit G35-D was developed to allow qualified applicants to seek registration for a variety of sources. These sources include storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, centrifugal compressors, reciprocating compressors, reciprocating internal combustion engines (RICEs), tank truck loading, fugitive emissions, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G35-D allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

GENERAL PERMIT G35-D APPLICABLE SECTIONS	
☒ Section 5.0	Storage Vessels Containing Condensate and/or Produced Water[1]
☐ Section 6.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO/OOOOa)
☒ Section 7.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO/OOOOa and/or NESHAP Subpart HH
☒ Section 8.0	Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc
☐ Section 9.0	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO/OOOOa)
☐ Section 10.0	Centrifugal Compressor Affected Facility (NSPS, Subpart OOOO/OOOOa)[2]
☒ Section 11.0	Reciprocating Compressor Affected Facility (NSPS, Subpart OOOO/OOOOa)[2]
☒ Section 12.0	Reciprocating Internal Combustion Engines, Generator Engines. Microturbine Generators
☒ Section 13.0	Tanker Truck Loading[3]
☒ Section 14.0	Glycol Dehydration Units[4]
☒ Section 15.0	Blowdown and Pigging Operations
☒ Section 16.0	Fugitive Emission Components (NSPS, Subpart OOOOa)

1 Applicants that are subject to Section 5 may also be subject to Section 6 if the applicant is subject to the NSPS, Subpart OOOO/OOOOa control requirements or the applicable control device requirements of Section 7.

2 Applicants that are subject to Section 10 and 11 may also be subject to the applicable RICE requirements of Section 12.

3 Applicants that are subject to Section 13 may also be subject to control device and emission reduction device requirements of Section 7.

4 Applicants that are subject to Section 14 may also be subject to the requirements of Section 8 (reboilers). Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 7.

ATTACHMENT I

Emission Units/ERD Table

G35-D General Permit Registration

ATTACHMENT I – EMISSION UNITS / EMISSION REDUCTION DEVICES (ERD) TABLE

Include ALL emission units and air pollution control devices/ERDs that will be part of this permit application review. Do not include fugitive emission sources in this table. Deminimis storage tanks shall be listed in the Attachment K table. This information is required for all sources regardless of whether it is a construction, modification, or administrative update.

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed	Manufac. Date[3]	Design Capacity	Type[4] and Date of Change	Control Device(s)[5]	ERD(s)[6]
CE-01	1E	Compressor Engine - CAT G3616 A4	2017	After 2012	5,000 bhp	NEW	01-OxCat	---
CE-02	2E	Compressor Engine - CAT G3616 A4	2017	After 2012	5,000 bhp	NEW	02-OxCat	---
CE-03	3E	Compressor Engine - CAT G3616 A4	2017	After 2012	5,000 bhp	NEW	03-OxCat	---
CE-04	4E	Compressor Engine - CAT G3616 A4	2017	After 2012	5,000 bhp	NEW	04-OxCat	---
MT-01	5E	Generator Turbine - Capstone C1000	2017	---	1,000 kWe	NEW	---	---
GE-01	6E	Emergency Generator Engine - CAT G3516B	2017	After 2012	1,818 bhp	NEW	---	---
CRP	7E	Compressor Rod Packing	2017	---	20,100 bhp	NEW	---	---
SSM	8E	Startup/Shutdown/Maintenance (Blowdown)	2017	---	20,100 bhp	NEW	FLR-01	---
DFT-01	9E	TEG Dehydrator - Flash Tank	2017	---	125.0 MMscfd	NEW	TO-01	---
DSV-01	10E	TEG Dehydrator - Still Vent	2017	---	125.0 MMscfd	NEW	TO-01	---
DFT-02	11E	TEG Dehydrator - Flash Tank	2017	---	125.0 MMscfd	NEW	TO-01	---
DSV-02	12E	TEG Dehydrator - Still Vent	2017	---	125.0 MMscfd	NEW	TO-01	---
TO-01	13E	Dehys/Tanks/TLO Thermal Oxidizer	2017	---	7.84 MMBtu/hr	NEW	---	---
RBV-01	14E	TEG Dehydrator - Reboiler Vent	2017	---	2.0 MMBtu/hr	NEW	---	---
RBV-02	15E	TEG Dehydrator - Reboiler Vent	2017	---	2.0 MMBtu/hr	NEW	---	---
FLR-01	16E	SSM Flare	2017	---	8,030 MMBtu/hr	NEW	---	---
T-01	17E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-02	18E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-03	19E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-04	20E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-05	21E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-06	22E	Storage Tank - Stabilized Condensate	2017	> 09/18/15	400 bbl	NEW	TO-01	---
T-07	23E	Storage Tank - Produced Water	2017	> 09/18/15	400 bbl	NEW	---	---
T-08	24E	Storage Tank - Produced Water	2017	> 09/18/15	400 bbl	NEW	---	---
TLO	25E	Truck Load-Out - Stabilized Condensate	2017	---	188,000 bbl/yr	NEW	TO-01	---
		Truck Loadout – Produced Water	2017	---	30,000 bbl/yr	NEW	---	---

[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] When required by rule
[4] New, modification, removal, existing
[5] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.
[6] For ERDs use the following numbering system: 1D, 2D, 3D,... or other appropriate designation.

ATTACHMENT J

Fugitive Emissions Summary

G35-D General Permit Registration

ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

Sources of fugitive emissions may include loading operations, equipment leaks, blowdown emissions, etc.
Use extra pages for each associated source or equipment if necessary.

Source/Equipment: Fugitive Emissions (FUG-G/FUG-L)

Leak Detection Method Used	☐ Audible, visual, and olfactory (AVO) inspections	☐ Infrared (FLIR) cameras	☐ Other (please describe)	☐ None required

Is the facility subject to quarterly LDAR monitoring under 40CFR60 Subpart OOOOa? ☒ Yes ☐ No. If no, why?

Component Type	Closed Vent System	Count	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)		
					VOC	HAP	GHG (CO_2e)
Pumps	☐ Yes ☒ No	17	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☒ Liquid ☐ Both	0.53	0.08	0
Valves	☐ Yes ☒ No	1536	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	2.26	0.28	65
Safety Relief Valves	☐ Yes ☒ No			☐ Gas ☐ Liquid ☐ Both			
Open Ended Lines	☐ Yes ☒ No	54	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	0.39	0.05	13
Sampling Connections	☐ Yes ☒ No			☐ Gas ☐ Liquid ☐ Both			
Connections (Not sampling)	☐ Yes ☒ No	4428	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	0.26	0.03	8
Compressors	☐ Yes ☒ No			☐ Gas ☐ Liquid ☐ Both			
Flanges	☐ Yes ☒ No	1107	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	0.87	0.08	57
Other[1]	☐ Yes ☒ No	115	EPA Protocol for Equipment Leak Emission Estimates. Table 2-4. (EPA-453/R-95-017, 1995).	☐ Gas ☐ Liquid ☒ Both	4.22	0.53	119

[1] Other equipment types may include compressor seals, relief valves, diaphragms, drains, meters, etc.

Please indicate if there are any closed vent bypasses (include component):

Specify all equipment used in the closed vent system (e.g. VRU, ERD, thief hatches, tanker truck loading, etc.)

ATTACHMENT K

Storage Vessel(s) Data Sheet

G35-D General Permit Registration

ATTACHMENT K – STORAGE VESSEL DATA SHEET

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for ***each*** new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

□ Composition of the representative sample used for the simulation
□ For each stream that contributes to flashing emissions:
- □ Temperature and pressure (inlet and outlet from separator(s))
- □ Simulation-predicted composition
- □ Molecular weight
- □ Flow rate

□ Resulting flash emission factor or flashing emissions from simulation
☒ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION

1. Bulk Storage Area Name Blake Ridge Compression Facility	2. Tank Name 400 bbl stabilized condensate tank
3. Emission Unit ID number T-01 thru T-06	4. Emission Point ID number 17E – 22E
5. Date Installed , Modified or Relocated *(for existing tanks)* Was the tank manufactured after August 23, 2011? ☒ Yes ☐ No	6. Type of change: ☒ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification *(if applicable)* NA	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☒ Yes ☐ No (The tanks will normally store stabilized condensate; however, they may also store produced water. Emissions for each of the six tanks are based on storage of stabilized condensate as this produces the highest emissions).	
7C. Was USEPA Tanks simulation software utilized? ☒ Yes ☐ No ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft.)	9B. Tank Internal Height (ft.)
10A. Maximum Liquid Height (ft.)	10B. Average Liquid Height (ft.)
11A. Maximum Vapor Space Height (ft.)	11B. Average Vapor Space Height (ft.)
12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume".	
13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of tank turnovers per year	15. Maximum tank fill rate (gal/min)
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☐ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☐ Fixed Roof ☐ vertical ☐ horizontal ☐ flat roof ☐ cone roof ☐ dome roof ☐ other (describe) ☐ External Floating Roof ☐ pontoon roof ☐ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting ☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm ☐ Pressurized ☐ spherical ☐ cylindrical ☐ Other (describe)	

PRESSURE/VACUUM CONTROL DATA – See EPA TANKS 4.0.9d Output in Attachment U

19. Check as many as apply: NA

☐ Does Not Apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket of _____ ☐ Carbon Adsorption[1]

☐ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig) ☐ Condenser[1]

Vacuum Setting Pressure Setting

☐ Emergency Relief Valve (psig)

Vacuum Setting Pressure Setting

☐ Thief Hatch Weighted ☐ Yes ☐ No

[1] Complete appropriate Air Pollution Control Device Sheet

20. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name	**Flashing Loss**		**Breathing Loss**		**Working Loss**		**Total Emissions Loss**		**Estimation Method[1]**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	

See Attached Emission Calculations for All Values

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

TANK CONSTRUCTION AND OPERATION INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
21. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)			
21A. Shell Color:	21B. Roof Color:	21C. Year Last Painted:	
22. Shell Condition (if metal and unlined): ☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable			
22A. Is the tank heated? ☐ Yes ☐ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?	
23. Operating Pressure Range (psig): TBD **Must be listed for tanks using VRUs with closed vent system.**			
24. Is the tank a **Vertical Fixed Roof Tank**? ☐ Yes ☐ No	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft):	
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☐			
25A. Year Internal Floaters Installed:			
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):			
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No			
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):			
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No			
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks** ☐ Does not apply			
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:		
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No			
28. Closed Vent System with Enclosed Combustor? ☐ Yes ☐ No			
SITE INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
29. Provide the city and state on which the data in this section are based:			
30. Daily Avg. Ambient Temperature (°F):	31. Annual Avg. Maximum Temperature (°F):		
32. Annual Avg. Minimum Temperature (°F):	33. Avg. Wind Speed (mph):		
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day):	35. Atmospheric Pressure (psia):		
LIQUID INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
36. Avg. daily temperature range of bulk liquid (°F):	36A. Minimum (°F):	36B. Maximum (°F):	
37. Avg. operating pressure range of tank (psig):	37A. Minimum (psig):	37B. Maximum (psig):	
38A. Minimum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):		
39A. Avg. liquid surface temperature (°F):	39B. Corresponding vapor pressure (psia):		
40A. Maximum liquid surface temperature (°F):	40B. Corresponding vapor pressure (psia):		
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
41A. Material name and composition:			
41B. CAS number:			
41C. Liquid density (lb/gal):			
41D. Liquid molecular weight (lb/lb-mole):			
41E. Vapor molecular weight (lb/lb-mole):			
41F. Maximum true vapor pressure (psia):			
41G. Maximum Reid vapor pressure (psia):			
41H. Months Storage per year. From: To:			
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.			

ATTACHMENT K – STORAGE VESSEL DATA SHEET (CONTINUED)

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for ***each*** new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

☐ Composition of the representative sample used for the simulation
☐ For each stream that contributes to flashing emissions:
- ☐ Temperature and pressure (inlet and outlet from separator(s))
- ☐ Simulation-predicted composition
- ☐ Molecular weight
- ☐ Flow rate

☐ Resulting flash emission factor or flashing emissions from simulation
☒ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION

1. Bulk Storage Area Name Blake Ridge Compression Facility	2. Tank Name 400 bbl produced water tank
3. Emission Unit ID number T-07 thru T-08	4. Emission Point ID number 23E – 24E
5. Date Installed , Modified or Relocated *(for existing tanks)* Was the tank manufactured after August 23, 2011? ☒ Yes ☐ No	6. Type of change: ☒ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification *(if applicable)* NA	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☒ No	
7C. Was USEPA Tanks simulation software utilized? ☒ Yes ☐ No ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height.	
9A. Tank Internal Diameter (ft.)	9B. Tank Internal Height (ft.)
10A. Maximum Liquid Height (ft.)	10B. Average Liquid Height (ft.)
11A. Maximum Vapor Space Height (ft.)	11B. Average Vapor Space Height (ft.)
12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume".	
13A. Maximum annual throughput (gal/yr)	13B. Maximum daily throughput (gal/day)
14. Number of tank turnovers per year	15. Maximum tank fill rate (gal/min)
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☐ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☐ Fixed Roof ☐ vertical ☐ horizontal ☐ flat roof ☐ cone roof ☐ dome roof ☐ other (describe) ☐ External Floating Roof ☐ pontoon roof ☐ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting ☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm ☐ Pressurized ☐ spherical ☐ cylindrical ☐ Other (describe)	

PRESSURE/VACUUM CONTROL DATA – See EPA TANKS 4.0.9d Output in Attachment U

19. Check as many as apply: NA

☐ Does Not Apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket of _____ ☐ Carbon Adsorption[1]

☐ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig) ☐ Condenser[1]

Vacuum Setting Pressure Setting

☐ Emergency Relief Valve (psig)

Vacuum Setting Pressure Setting

☐ Thief Hatch Weighted ☐ Yes ☐ No

[1] Complete appropriate Air Pollution Control Device Sheet

20. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name	**Flashing Loss**		**Breathing Loss**		**Working Loss**		**Total Emissions Loss**		**Estimation Method[1]**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	

See Attached Emission Calculations for All Values

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

TANK CONSTRUCTION AND OPERATION INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
21. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)			
21A. Shell Color:	21B. Roof Color:	21C. Year Last Painted:	
22. Shell Condition (if metal and unlined): ☐ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable			
22A. Is the tank heated? ☐ Yes ☐ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?	
23. Operating Pressure Range (psig): TBD **Must be listed for tanks using VRUs with closed vent system.**			
24. Is the tank a **Vertical Fixed Roof Tank**? ☐ Yes ☐ No	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft):	
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☐			
25A. Year Internal Floaters Installed:			
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):			
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No			
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):			
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No			
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks** ☐ Does not apply			
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:		
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No			
28. Closed Vent System with Enclosed Combustor? ☐ Yes ☐ No			
SITE INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
29. Provide the city and state on which the data in this section are based:			
30. Daily Avg. Ambient Temperature (°F):	31. Annual Avg. Maximum Temperature (°F):		
32. Annual Avg. Minimum Temperature (°F):	33. Avg. Wind Speed (mph):		
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day):	35. Atmospheric Pressure (psia):		
LIQUID INFORMATION – See EPA TANKS 4.0.9d Output in Attachment U			
36. Avg. daily temperature range of bulk liquid (°F):	36A. Minimum (°F):	36B. Maximum (°F):	
37. Avg. operating pressure range of tank (psig):	37A. Minimum (psig):	37B. Maximum (psig):	
38A. Minimum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):		
39A. Avg. liquid surface temperature (°F):	39B. Corresponding vapor pressure (psia):		
40A. Maximum liquid surface temperature (°F):	40B. Corresponding vapor pressure (psia):		
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
41A. Material name and composition:			
41B. CAS number:			
41C. Liquid density (lb/gal):			
41D. Liquid molecular weight (lb/lb-mole):			
41E. Vapor molecular weight (lb/lb-mole):			
41F. Maximum true vapor pressure (psia):			
41G. Maximum Reid vapor pressure (psia):			
41H. Months Storage per year. From: To:			
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.			

STORAGE TANK DATA TABLE

List all deminimis storage tanks (i.e. lube oil, glycol, diesel etc.)

Source ID #[1]	Status[2]	Content[3]	Volume[4]
T-09	NEW	Lube Oil	4,200
T-10	NEW	Used Oil	4,200
T-11	NEW	Coolant	4,200
T-12	NEW	Used Coolant	4,200
T-13	NEW	Methanol	4,200
T-14	NEW	Engine Oil	520
T-15	NEW	Engine Oil	520
T-16	NEW	Engine Oil	520
T-17	NEW	Engine Oil	520
T-18	NEW	Compressor Oil	520
T-19	NEW	Compressor Oil	520
T-20	NEW	Compressor Oil	520
T-21	NEW	Compressor Oil	520
T-22	NEW	Triethylene Glycol	1,000

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the compressor station. Tanks should be designated T01, T02, T03, etc.
2. Enter storage tank Status using the following:
   - EXIST Existing Equipment
   - NEW Installation of New Equipment
   - REM Equipment Removed
3. Enter storage tank content such as condensate, pipeline liquids, glycol (DEG or TEG), lube oil, diesel, mercaptan etc.
4. Enter the maximum design storage tank volume in gallons.

ATTACHMENT L

Natural Gas Fired Fuel Burning Unit(s) Data Sheet

G35-D General Permit Registration

ATTACHMENT L – SMALL HEATERS AND REBOILERS NOT SUBJECT TO 40CFR60 SUBPART DC
DATA SHEET

Complete this data sheet for each small heater and reboiler not subject to 40CFR60 Subpart Dc at the facility. ***The Maximum Design Heat Input (MDHI) must be less than 10 MMBTU/hr.***

Emission Unit ID#[1]	Emission Point ID#[2]	Emission Unit Description (manufacturer, model #)	Year Installed/ Modified	Type[3] and Date of Change	Maximum Design Heat Input (MMBTU/hr)[4]	Fuel Heating Value (BTU/scf)[5]
RBV-01	14E	Dehydrator Reboiler 01	2017	NEW	2.0	1200
RBV-02	15E	Dehydrator Reboiler 02	2017	NEW	2.0	1200

1 Enter the appropriate Emission Unit (or Source) identification number for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For sources, use 1S, 2S, 3S…or other appropriate designation. Enter glycol dehydration unit Reboiler Vent data on the Glycol Dehydration Unit Data Sheet.

2 Enter the appropriate Emission Point identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For emission points, use 1E, 2E, 3E…or other appropriate designation.

3 New, modification, removal

4 Enter design heat input capacity in MMBtu/hr.

5 Enter the fuel heating value in BTU/standard cubic foot.

ATTACHMENT M

Internal Combustion Engine Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT M – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID#[1]	CE-01	CE-02	CE-03
Engine Manufacturer/Model	CAT G3616LE	CAT G3616LE	CAT G3616LE
Manufacturers Rated bhp/rpm	5,000/1,000	5,000/1,000	5,000/1,000
Source Status[2]	NEW	NEW	NEW
Date Installed/ Modified/Removed/Relocated[3]	2017	2017	2017
Engine Manufactured /Reconstruction Date[4]	After 2012	After 2012	After 2012
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]	4SLB	4SLB	4SLB
APCD Type[7]	A/F, OxCat	A/F, OxCat	A/F, OxCat
Fuel Type[8]	RG	RG	RG
H_2S (gr/100 scf)	<0.25	<0.25	<0.25
Operating bhp/rpm	5,000/1,000	5,000/1,000	5,000/1,000
BSFC (BTU/bhp-hr)	6,782 (LHV)	6,782 (LHV)	6,782 (LHV)
Hourly Fuel Throughput	36,859 ft^3/hr gal/hr	36,859 ft^3/hr gal/hr	36,859 ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	322.88 MMft^3/yr gal/yr	322.88 MMft^3/yr gal/yr	322.88 MMft^3/yr gal/yr
Fuel Usage or Hours of Operation Metered	Yes ☒ No ☐	Yes ☒ No ☐	Yes ☒ No ☐

Calculation Methodology[9]	**Pollutant**[10]	**Hourly PTE (lb/hr)** [11]	**Annual PTE (tons/year)** [11]	**Hourly PTE (lb/hr)** [11]	**Annual PTE (tons/year)** [11]	**Hourly PTE (lb/hr)** [11]	**Annual PTE (tons/year)** [11]
MD	NO_x	4.41	19.31	4.41	19.31	4.41	19.31
MD	CO	2.44	10.70	2.44	10.70	2.44	10.70
MD	VOC	1.34	5.85	1.34	5.85	1.34	5.85
AP	SO_2	0.02	0.10	0.02	0.10	0.02	0.10
AP	PM_{10}	0.37	1.64	0.37	1.64	0.37	1.64
MD	Formaldehyde	0.28	1.22	0.28	1.22	0.28	1.22
MD/AP	Total HAPs	0.39	1.69	0.39	1.69	0.39	1.69
MD/AP	GHG (CO_2e)	5,409	23,693	5,409	23,693	5,409	23,693

ATTACHMENT M – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID#[1]	CE-04	MT-01	GE-01
Engine Manufacturer/Model	CAT G3616LE	Capstone C1000	CAT G3516B
Manufacturers Rated bhp/rpm	5,000/1,000	1,000 kWe	1,818/1,800
Source Status[2]	NEW	NEW	NEW
Date Installed/ Modified/Removed/Relocated[3]	2017	2017	2017
Engine Manufactured /Reconstruction Date[4]	After 2012	After 2012	After 2012
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☒40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]	4SLB	NA	4SLB
APCD Type[7]	A/F, OxCat	LEC	LEC
Fuel Type[8]	RG	RG	RG
H_2S (gr/100 scf)	<0.25	<0.25	<0.25
Operating bhp/rpm	5,000/1,000	1,341 hp	1,818/1,800
BSFC (BTU/bhp-hr)	6,782 (LHV)	10,260 Btu/kW-hr (LHV)	7,479 (LHV)
Hourly Fuel Throughput	36,859 ft^3/hr gal/hr	11,152 ft^3/hr gal/hr	14,779 ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	322.88 $MMft^3$/yr gal/yr	97.69 $MMft^3$/yr gal/yr	7.39 $MMft^3$/yr gal/yr
Fuel Usage or Hours of Operation Metered	Yes ☒ No ☐	Yes ☒ No ☐	Yes ☒ No ☐

Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr) [11]**	**Annual PTE (tons/year) [11]**	**Hourly PTE (lb/hr) [11]**	**Annual PTE (tons/year) [11]**	**Hourly PTE (lb/hr) [11]**	**Annual PTE (tons/year) [11]**
MD	NO_x	4.41	19.31	0.80	3.50	2.00	0.50
MD	CO	2.44	10.70	2.20	9.64	11.22	2.81
MD	VOC	1.34	5.85	0.10	0.44	4.77	1.19
AP	SO_2	0.02	0.10	0.04	0.17	0.01	2.2E-3
AP	PM_{10}	0.37	1.64	0.08	0.33	0.15	0.04
MD	Formaldehyde	0.28	1.22	0.01	0.04	1.40	0.35
MD/AP	Total HAPs	0.39	1.69	0.01	0.05	1.70	0.42
MD/AP	GHG (CO_2e)	5,409	23,693	1,346	5,896	2,399	600

1 Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. Microturbine generator engines should be designated MT-1, MT-2, MT-3 etc. If more than three (3) engines exist, please use additional sheets.

2 Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Relocated Source
REM	Removal of Source		

3 Enter the date (or anticipated date) of the engine's installation (construction of source), modification, relocation or removal.

4 Enter the date that the engine was manufactured, modified or reconstructed.

5 Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart IIII/JJJJ? If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance as appropriate.

Provide a manufacturer's data sheet for all engines being registered.

6 Enter the Engine Type designation(s) using the following codes:

2SLB	Two Stroke Lean Burn	4SRB	Four Stroke Rich Burn
4SLB	Four Stroke Lean Burn		

7 Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

A/F	Air/Fuel Ratio	IR	Ignition Retard
HEIS	High Energy Ignition System	SIPC	Screw-in Precombustion Chambers
PSC	Prestratified Charge	LEC	Low Emission Combustion
NSCR	Rich Burn & Non-Selective Catalytic Reduction	OxCat	Oxidation Catalyst
SCR	Lean Burn & Selective Catalytic Reduction		

8 Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas /Production Gas	D	Diesel

9 Enter the Potential Emissions Data Reference designation using the following codes. Attach all reference data used.

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other	(please list)

10 Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

11 PTE for engines shall be calculated from manufacturer's data unless unavailable.

Engine Air Pollution Control Device
(Emission Unit ID# CE-01 thru CE-04, use extra pages as necessary)

Air Pollution Control Device Manufacturer's Data Sheet included?
Yes ☒ No ☐

☐ NSCR	☐ SCR	☒ Oxidation Catalyst

Provide details of process control used for proper mixing/control of reducing agent with gas stream: na

Manufacturer: Catalytic Combustion	Model #: REM-4815-D-20HB-HFX4 (or equivalent)
Design Operating Temperature: 825 ^{o}F	Design gas volume: 31,255 acfm
Service life of catalyst: 24000 hrs or 3 years, whichever comes first	Provide manufacturer data? ☒Yes ☐ No
Volume of gas handled: 31,255 acfm at 814 ^{o}F	Operating temperature range for NSCR/Ox Cat: From 450 ^{o}F to 1,350 ^{o}F
Reducing agent used, if any: NA	Ammonia slip (ppm): NA

Pressure drop against catalyst bed (delta P): < 2.0 inches of H_2O

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions: Engine is equipped with a monitoring device capable of measuring both the catalyst inlet and exit temperatures and to immediately shut the engine down should the catalyst exit temperature reach the 1,350^{o}F limit.

Is temperature and pressure drop of catalyst required to be monitored per 40CFR63 Subpart ZZZZ?
☐ Yes ☒ No

How often is catalyst recommended or required to be replaced (hours of operation)?
24,000

How often is performance test required?
☒ Initial
☐ Annual
☒ Every 8,760 hours of operation
☐ Field Testing Required
☐ No performance test required. If so, why (please list any maintenance required and the applicable sections in NSPS/GACT,

ATTACHMENT N

Tanker Truck Loading Data Sheet (If Applicable)

G35-D General Permit Registration

ATTACHMENT N – TANKER TRUCK LOADING DATA SHEET

Complete this data sheet for each new or modified bulk liquid transfer area or loading rack at the facility. This is to be used for bulk liquid transfer operations to tanker trucks. Use extra pages if necessary.

Truck Loadout Collection Efficiencies

The following applicable capture efficiencies of a truck loadout are allowed:

- For tanker trucks passing the MACT level annual leak test – 99.2%
- For tanker trucks passing the NSPS level annual leak test – 98.7%
- For tanker trucks not passing one of the annual leak tests listed above – 70%

Compliance with this requirement shall be demonstrated by keeping records of the applicable MACT or NSPS Annual Leak Test certification for ***every*** truck and railcar loaded/unloaded. This requirement can be satisfied if the trucking company provided certification that its entire fleet was compliant. This certification must be submitted in writing to the Director of the DAQ. These additional requirements must be noted in the Registration Application and will be noted on the issued G35-D Registration.

Emission Unit ID#: TLO	Emission Point ID#: 25E	Year Installed/Modified: 2017
Emission Unit Description: Truck Loadout of Stabilized Condensate/Produced Water		
Loading Area Data		
Number of Pumps: 1	Number of Liquids Loaded: 2	Max number of trucks loading at one (1) time: 1
Are tanker trucks pressure tested for leaks at this or any other location? ☐ Yes ☒ No ☐ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses.		
Are any of the following truck loadout systems utilized? ☐ Closed System to tanker truck passing a MACT level annual leak test? ☐ Closed System to tanker truck passing a NSPS level annual leak test? ☒ Closed System to tanker truck not passing an annual leak test and has vapor return?		

Projected Maximum Operating Schedule (for rack or transfer point as a whole)

Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	6	6	6	6
Days/week	7	7	7	7

Bulk Liquid Data (use extra pages as necessary)

Liquid Name	Stabilized Condensate	Produced Water	
Max. Daily Throughput (1000 gal/day)	21.633	3.45	
Max. Annual Throughput (1000 gal/yr)	7,896	1,260	
Loading Method[1]	SUB	SUB	
Max. Fill Rate (gal/min)	117	117	
Average Fill Time (min/loading)	60	60	
Max. Bulk Liquid Temperature (^{o}F)	50.3	50.3	
True Vapor Pressure[2]	5.4	0.3	
Cargo Vessel Condition[3]	U	U	
Control Equipment or Method[4]	TO	na	
Max. Collection Efficiency (%)	70.0	na	

Max. Control Efficiency (%)		98.0	na	
Max.VOC Emission Rate	Loading (lb/hr)	9.97	4.62	
	Annual (ton/yr)	5.62	0.42	
Max.HAP Emission Rate	Loading (lb/hr)	2.99	1.39	
	Annual (ton/yr)	1.69	0.12	
Estimation Method[5]		EPA	EPA	

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill

2 At maximum bulk liquid temperature

3 B Ballasted Vessel C Cleaned U Uncleaned (dedicated service)
O Other (describe)

4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets)
CA Carbon Adsorption VB Dedicated Vapor Balance (closed system)
ECD Enclosed Combustion Device F Flare
TO Thermal Oxidization or Incineration

5 EPA EPA Emission Factor in AP-42 MB Material Balance
TM Test Measurement based upon test data submittal O Other (describe)

ATTACHMENT O

Glycol Dehydration Unit Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT O – GLYCOL DEHYDRATION UNIT DATA SHEET

Complete this data sheet for each Glycol Dehydration Unit, Reboiler, Flash Tank and/or Regenerator at the facility. Include gas sample analysis and GRI- GLYCalc™ input and aggregate report. Use extra pages if necessary.

Manufacturer: Williams	Model: TBD
Max. Dry Gas Flow Rate: 125 MMscf/day	Reboiler Design Heat Input: 2.0 MMBTU/hr
Design Type: ☒ TEG ☐ DEG ☐ EG	Source Status[1]: NEW
Date Installed/Modified/Removed[2]: 2017	Regenerator Still Vent APCD/ERD[3]: TO
Control Device/ERD ID#[3]: TO-01	Fuel HV (BTU/scf): 1200
H_2S Content (gr/100 scf): < 0.25	Operation (hours/year): 8,760

Pump Rate (gal/min): 20.0 (electric - primary), 7.5 (gas-assisted - backup)

Water Content (wt %) in: Wet Gas: 0.068 vol% Dry Gas: 0.003 vol%

Is the glycol dehydration unit exempt from 40CFR63 Section 764(d)? ☒ Yes ☐ No: If Yes, answer the following:

The actual annual average flowrate of natural gas to the glycol dehydration unit is less than 85 thousand standard cubic meters per day, as determined by the procedures specified in §63.772(b)(1) of this subpart. ☐ Yes ☒ No

The actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram per year (1 ton per year), as determined by the procedures specified in §63.772(b)(2) of this subpart. ☒ Yes ☐ No

Is the glycol dehydration unit located within an Urbanized Area (UA) or Urban Cluster (UC)? ☐ Yes ☒ No

Is a lean glycol pump optimization plan being utilized? ☐ Yes ☒ No

Recycling the glycol dehydration unit back to the flame zone of the reboiler.
☒ Yes ☐ No
If yes:
Is the reboiler configured to accept flash drum vapors (straight from the glycol dehydrator)? ☒ Yes ☐ No
Is the reboiler configured to accept still vent vapors (after a condenser)? ☐ Yes ☒ No
Is the reboiler configured to accept both in the same operation? ☐ Yes ☒ No

Recycling the glycol dehydration unit back to the flame zone of the reboiler and mixed with fuel.
☒ Yes ☐ No

What happens when temperature controller shuts off fuel to the reboiler?
☐ Still vent emissions to the atmosphere. ☒ Still vent emissions to the thermal oxidizer.
☐ Still vent emissions stopped with valve.
☐ Still vent emissions to glow plug.

Please indicate if the following equipment is present.
☒ Flash Tank
☐ Burner management system that continuously burns condenser or flash tank vapors

Control Device Technical Data

Pollutants Controlled	Manufacturer's Guaranteed Control Efficiency (%)
VOC	98
HAPs	98

Emissions Data

Emission Unit ID / Emission Point ID[4]	Description	Calculation Methodology[5]	PTE[6]	Controlled Maximum Hourly Emissions (lb/hr)	Controlled Maximum Annual Emissions (tpy)
RBV-01, RBV-02 (each)	Reboiler Vent	EPA AP-42	NO_x	0.20	0.86
		EPA AP-42	CO	0.16	0.72
		EPA AP-42	VOC	0.01	0.05
		EPA AP-42	SO_2	1.2E-03	0.01

		EPA AP-42	PM_{10}	0.01	0.07
		EPA AP-42	GHG (CO_2e)	237	1,037
DSV-01, DSV-02 (each)	Glycol Regenerator Still Vent	GRI-GlyCalc™	VOC	1.07	4.70
		GRI-GlyCalc™	Benzene	0.02	0.08
		GRI-GlyCalc™	Toluene	0.08	0.36
		GRI-GlyCalc™	Ethylbenzene	0.06	0.25
		GRI-GlyCalc™	Xylenes	0.09	0.41
		GRI-GlyCalc™	n-Hexane	0.04	0.16
DFT-01, DFT-02 (each)	Glycol Flash Tank	GRI-GlyCalc™	VOC	0.58	2.56
		GRI-GlyCalc™	Benzene	1.7E-04	7.6E-04
		GRI-GlyCalc™	Toluene	5.1E-04	2.2E-03
		GRI-GlyCalc™	Ethylbenzene	1.9E-04	8.4E-04
		GRI-GlyCalc™	Xylenes	2.2E-04	9.5E-04
		GRI-GlyCalc™	n-Hexane	0.01	0.05

1 Enter the Source Status using the following codes:
NS Construction of New Source ES Existing Source
MS Modification of Existing Source

2 Enter the date (or anticipated date) of the glycol dehydration unit's installation (construction of source), modification or removal.

3 Enter the Air Pollution Control Device (APCD)/Emission Reduction Device (ERD) type designation using the following codes and the device ID number:
NA None CD Condenser FL Flare
CC Condenser/Combustion Combination TO Thermal Oxidizer O Other (please list)

4 Enter the appropriate Emission Unit ID Numbers and Emission Point ID Numbers for the glycol dehydration unit reboiler vent and glycol regenerator still vent. The glycol dehydration unit reboiler vent and glycol regenerator still vent should be designated RBV-1 and RSV-1, respectively. If the compressor station incorporates multiple glycol dehydration units, a Glycol Dehydration Emission Unit Data Sheet shall be completed for each, using Source Identification RBV-2 and RSV-2, RBV-3 and RSV-3, etc.

5 Enter the Potential Emissions Data Reference designation using the following codes:
MD Manufacturer's Data AP AP-42
GR GRI-GLYCalc™ OT Other (please list)

6 Enter the Reboiler Vent and Glycol Regenerator Still Vent Potential to Emit (PTE) for the listed regulated pollutants in lbs per hour and tons per year. The Glycol Regenerator Still Vent potential emissions may be determined using the most recent version of the thermodynamic software model GRI-GLYCalc™ (Radian International LLC & Gas Research Institute). **Attach all referenced Potential Emissions Data (or calculations) and the GRI-GLYCalc™ Aggregate Calculations Report (shall include emissions reports, equipment reports, and stream reports) to this Glycol Dehydration Emission Unit Data Sheet(s). Backup pumps do not have to be considered as operating for purposes of PTE.** This PTE data shall be incorporated in the Emissions Summary Sheet.

ATTACHMENT P

Pneumatic Controllers Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT P – PNEUMATIC CONTROLLERS DATA SHEET

Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

Are there any continuous bleed natural gas driven pneumatic controllers at this facility that commenced construction, modification or reconstruction after September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

Are there any continuous bleed natural gas driven pneumatic controllers at this facility with a bleed rate greater than 6 standard cubic feet per hour that are required based on functional needs, including but not limited to response time, safety and positive actuation that commenced construction, modification or reconstruction after September 18, 2015?

☐ Yes ☒ No

Please list approximate number.

ATTACHMENT Q

Centrifugal Compressor Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT Q – CENTRIFUGAL COMPRESSOR DATA SHEET

Are there any centrifugal compressors at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list:

Emission Unit ID#	Compressor Description

Are there any centrifugal compressors at this facility that commenced construction, modification or reconstruction after September 18, 2015?

☐ Yes ☒ No

Please list:

Emission Unit ID#	Compressor Description

ATTACHMENT R

Reciprocating Compressor Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT R – RECIPROCATING COMPRESSOR DATA SHEET

Are there any reciprocating compressors at this facility that commenced construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015?

☐ Yes ☒ No

Please list:

Emission Unit ID#	Compressor Description

Are there any reciprocating compressors at this facility that commenced construction, modification or reconstruction after September 18, 2015?

☒ Yes ☐ No

Please list:

Emission Unit ID#	Compressor Description
CRP	Natural Gas Compressor 01
CRP	Natural Gas Compressor 02
CRP	Natural Gas Compressor 03
CRP	Natural Gas Compressor 04
CRP	Stabilized Condensate Tanks VRU Compressor
CRP	Condensate Stabilizer Overheads VRU Compressor

** Note: There will be a backup condensate stabilizer overheads VRU compressor used when the primary VRU is inoperable. Only one condensate stabilizer overheads VRU compressor will operate at a time.

ATTACHMENT S

Blowdown and Pigging Operations Data Sheet(s)

G35-D General Permit Registration

ATTACHMENT S – BLOWDOWN AND PIGGING OPERATIONS DATA SHEET

Will there be any blowdown and pigging operations that occur at this facility?

☒ Yes ☐ No

Please list:

Type of Event	# of Events (event/yr)	Amount Vented per event (scf/event)	MW of vented gas (lb/lb-mol)	Total Emissions (ton/yr)	VOC weight fraction	VOC emissions (ton/yr)
Compressor Blowdown	**These emissions are accounted for under startup/shutdown/maintenance (SSM). Please reference Attachment U for details.**					
Compressor Startup						
Plant Shutdown						
Low Pressure Pig Venting						
High Pressure Pig Venting						

Type of Event	# of Events (event/yr)	Amount Vented per event (scf/event)	MW of vented gas (lb/lb-mol)	Total Emissions (ton/yr)	HAP weight fraction	HAP emissions (ton/yr)
Compressor Blowdown	**These emissions are accounted for under startup/shutdown/maintenance (SSM). Please reference Attachment U for details.**					
Compressor Startup						
Plant Shutdown						
Low Pressure Pig Venting						
High Pressure Pig Venting						

ATTACHMENT T

Air Pollution Control Device

G35-D General Permit Registration

ATTACHMENT T – AIR POLLUTION CONTROL DEVICE / EMISSION REDUCTION DEVICE SHEETS

Complete the applicable air pollution control device sheets for each flare, vapor combustor, thermal oxidizer, condenser, adsorption system, vapor recovery unit, BTEX Eliminator, Reboiler with and without Glow Plug, etc. at the facility. Use extra pages if necessary.

Emissions calculations must be performed using the most conservative control device efficiency.

The following five (5) rows are only to be completed if registering an alternative air pollution control device.	
Emission Unit ID:	Make/Model:
Primary Control Device ID:	Make/Model:
Control Efficiency (%):	APCD/ERD Data Sheet Completed: ☐ Yes ☐ No
Secondary Control Device ID:	Make/Model:
Control Efficiency (%):	APCD/ERD Data Sheet Completed: ☐ Yes ☐ No

VAPOR COMBUSTION
(Including Enclosed Combustors)

General Information

Control Device ID#: FLR-01	Installation Date: 2017 ☒ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity 7,401,144 scfh 177,627,461 scfd	Maximum Design Heat Input (from mfg. spec sheet) 8,030MMBTU/hr	Design Heat Content 1,085 BTU/scf (LHV)

Control Device Information

Type of Vapor Combustion Control?

☐ Enclosed Combustion Device ☒ Elevated Flare ☐ Ground Flare
☐ Thermal Oxidizer

Manufacturer: Zeeco Model: MJ-16 (Sonic Flare)	Hours of operation per year? 8,760

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# SSM)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
SSM	Startup/Shutdown/Maintenance		

If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.

Assist Type (Flares only)	Flare Height	Tip Diameter	Was the design per §60.18?
☐ Steam ☐ Air ☐ Pressure ☒ Non	130 feet	1.33 feet	☐ Yes ☒ No Provide determination.

Waste Gas Information

Maximum Waste Gas Flow Rate 56.7 (scfm)	Heat Value of Waste Gas Stream 1,085 BTU/ft^3 (LHV)	Exit Velocity of the Emissions Stream 1,212 ft/s (ft/s) - MAX

Provide an attachment with the characteristics of the waste gas stream to be burned.

Pilot Gas Information

Number of Pilot Lights	Fuel Flow Rate to Pilot Flame per Pilot	Heat Input per Pilot	Will automatic re-ignition be used?
2	54 scfh	65,000 BTU/hr	☒ Yes ☐ No

If automatic re-ignition is used, please describe the method. Automatic Flame Front Generator (FL-7002 BR) Ignition System

Is pilot flame equipped with a monitor to detect the presence of the flame? ☒ Yes ☐ No	If Yes, what type? ☒ Thermocouple ☐ Infrared ☐ Ultraviolet ☐ Camera ☐ Other:

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).*

Additional information attached? ☒ Yes ☐ No
Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11(b) and performance testing.

VAPOR COMBUSTION
(Including Enclosed Combustors)

General Information

Control Device ID#: TO-01	Installation Date: 2017 ☒ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity 6,730 scfh 161,511 scfd	Maximum Design Heat Input (from mfg. spec sheet) 7.84 MMBTU/hr	Design Heat Content 1,165 BTU/scf (HHV)

Control Device Information

Type of Vapor Combustion Control?

☐ Enclosed Combustion Device ☐ Elevated Flare ☐ Ground Flare
☒ Thermal Oxidizer

Manufacturer: Zeeco (or equivalent) Model: Z-HTO (or equivalent)	Hours of operation per year? 8,760

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# See Below)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
DFT-01	Dehydrator 01 Flash Tank Vent	T-03	Stabilized Condensate Tank 03
DSV-01	Dehydrator 01 Still Vent	T-04	Stabilized Condensate Tank 04
DFT-02	Dehydrator 02 Flash Tank Vent	T-05	Stabilized Condensate Tank 05
DSV-02	Dehydrator 02 Still Vent	T-06	Stabilized Condensate Tank 06
T-01	Stabilized Condensate Tank 01	TLO	Stabilized Condensate Truck Loading
T-02	Stabilized Condensate Tank 02		

If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.

Assist Type (Flares only) na	Flare Height	Tip Diameter	Was the design per §60.18?
☐ Steam ☐ Air ☐ Pressure ☐ Non	20 feet	2.0 feet	☐ Yes ☒ No Provide determination.

Waste Gas Information

Maximum Waste Gas Flow Rate 280 (scfm)	Heat Value of Waste Gas Stream 1165 BTU/ft^3	Exit Velocity of the Emissions Stream 24.36 (ft/s)

Provide an attachment with the characteristics of the waste gas stream to be burned.

Pilot Gas Information

Number of Pilot Lights 1	Fuel Flow Rate to Pilot Flame per Pilot 100 scfh	Heat Input per Pilot 100,000 BTU/hr	Will automatic re-ignition be used? ☒ Yes ☐ No

If automatic re-ignition is used, please describe the method. Electric spark

Is pilot flame equipped with a monitor to detect the presence of the flame? ☒ Yes ☐ No	If Yes, what type? ☒ Thermocouple ☐ Infrared ☐ Ultraviolet ☐ Camera ☐ Other:

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).*

Additional information attached? ☒ Yes ☐ No
Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11(b) and performance testing.

CONDENSER – *NOT APPLICABLE*		
General Information		
Control Device ID#:	Installation Date: ☐ New ☐ Modified ☐ Relocated	
Manufacturer:	Model:	Control Device Name:
Control Efficiency (%):		
Manufacturer's required temperature range for control efficiency. °F		
Describe the warning and/or alarm system that protects against operation when unit is not meeting the design requirements:		
Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty.		
Additional information attached? ☐ Yes ☐ No Please attach copies of manufacturer's data sheets.		
Is condenser routed to a secondary APCD or ERD? ☐ Yes ☐ No		

ADSORPTION SYSTEM – *NOT APPLICABLE*		
General Information		
Control Device ID#:	Installation Date: ☐ New ☐ Modified ☐ Relocated	
Manufacturer:	Model:	Control Device Name:
Design Inlet Volume: scfm	Adsorbent charge per adsorber vessel and number of adsorber vessels:	
Length of Mass Transfer Zone supplied by the manufacturer:	Adsorber diameter: ft Adsorber area: ft^2	
Adsorbent type and physical properties:	Overall Control Efficiency (%):	
Working Capacity of Adsorbent (%):		
Operating Parameters		
Inlet volume: scfm @ ^oF		
Adsorption time per adsorption bed (life expectancy):	Breakthrough Capacity (lbs of VOC/100 lbs of adsorbent):	
Temperature range of carbon bed adsorber. ^oF - ^oF		
Control Device Technical Data		
Pollutants Controlled	Manufacturer's Guaranteed Control Efficiency (%)	
Describe the warning and/or alarm system that protects against operation when unit is not meeting the design requirements:		
Has the control device been tested by the manufacturer and certified?		
Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty.		
Additional information attached? ☐ Yes ☐ No Please attach copies of manufacturer's data sheets, drawings, and performance testing.		

VAPOR RECOVERY UNIT – *NOT APPLICABLE*

General Information

Emission Unit ID#:	Installation Date: ☐ New ☐ Modified ☐ Relocated

Device Information

Manufacturer:
Model:

List the emission units whose emissions are controlled by this vapor recovery unit (Emission Point ID#)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description

If this vapor recovery unit controls emissions from more than six (6) emission units, please attach additional pages.

Additional information attached? ☐ Yes ☐ No
Please attach copies of manufacturer's data sheets, drawings, and performance testing.

The registrant may claim a capture and control efficiency of 95 % (which accounts for 5% downtime) for the vapor recovery unit.

The registrant may claim a capture and control efficiency of 98% if the VRU has a backup flare that meet the requirements of Section 8.1.2 of this general permit.

The registrant may claim a capture and control efficiency of 98% if the VRU has a backup VRU.

ATTACHMENT U

Emission Calculation(s)

G35-D General Permit Registration

- **EMISSION SUMMARIES:**
  - CRITERIA POLLUTANTS – CONTROLLED
  - HAZARDOUS AIR POLLUTANTS - CONTROLLED
  - GREENHOUSE GAS (GHG) - CONTROLLED
  - CRITERIA POLLUTANTS – PRE-CONTROLLED
  - HAZARDOUS AIR POLLUTANTS – PRE-CONTROLLED
- **POINT-SOURCE EMISSIONS:**
  - Compressor Engines (CE-01 thru CE-04) Emissions – 5,000 bhp CAT G3616LE
  - Microturbine (MT-01) Emissions – 1,000 kWe Capstone C1000
  - Emergency Generator Engine (GE-01) Emissions – 1,818 bhp CAT G3516B
  - Compressor Rod Packing (CRP) Emissions
  - Startup/Shutdown/Maintenance (Blowdown) (SSM) Emissions
  - Dehydrator Emissions (Flash Tank and Still Vent Components) – 125 MMscfd
  - Dehydrator Emissions (Total) – 125 MMscfd
  - Thermal Oxidizer (TO-01) Emissions
  - Reboiler (BLR-01 thru BLR-02) Emissions – 2.0 MMBtu/hr
  - Process Flare (FL-01) Emissions
  - Storage Tank (T-01 thru T-08) Emissions
  - Truck Load-Out (TLO) Emissions
- **FUGITIVE EMISSIONS:**
  - Gas/Light Oil Piping and Equipment Leak (FUG-G and FUG-L) Emissions
  - Engine Crankcase (ECC) Emissions
- **AP-42 and GHG EMISSION FACTORS**
- **GAS ANALYSES:**
  - Inlet Natural Gas Composition
  - Extended Inlet Gas Analysis Summary
  - Stabilized Condensate Composition
  - Extended Stabilized Condensate Analysis Summary
  - Btu Loading on Thermal Oxidizer
  - Btu Loading on Process Flare
- **ENGINE, MICROTURBINE AND OXIDATION CATALYST DATA SHEETS**
- **FLARE AND THERMAL OXIDIZER DATA SHEETS**
- **GRI-GLYCALC INPUT AND OUTPUT SUMMARIES**
- **EPA TANKS 4.0 SUMMARIES**

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Supporting Emissions Calculations

Controlled Emissions - Criteria Pollutants

Unit ID	Point ID	Control ID	Description	Design Capacity	NOx		CO		VOC		SOx		PM10/2.5	
					lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	**1E**	01-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64
CE-02	**2E**	02-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64
CE-03	**3E**	03-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64
CE-04	**4E**	04-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64
MT-01	**5E**	na	Generator Turbine - Capstone C1000	1,000 kWe	0.80	3.50	2.20	9.64	0.10	0.44	0.04	0.17	0.08	0.33
GE-01	**6E**	na	Emergency Generator Engine - CAT G3516B	1,818 bhp	2.00	0.50	11.22	2.81	4.77	1.19	0.01	2.2E-03	0.15	0.04
CRP	**7E**	na	Compressor Rod Packing	20,100 bhp	---	---	---	---	4.17	18.24	---	---	---	---
SSM	**8E**	FLR-01	Startup/Shutdown/Maintenance (Blowdown)	20,100 bhp	---	---	---	---	---	2.44	---	---	---	---
DFT-01	**9E**	TO-01	TEG Dehydrator - Flash Tank	125.0 MMscfd	---	---	---	---	0.58	2.56	---	---	---	---
DSV-01	**10E**	TO-01	TEG Dehydrator - Still Vent	125.0 MMscfd	---	---	---	---	1.07	4.70	---	---	---	---
DFT-02	**11E**	TO-01	TEG Dehydrator - Flash Tank	125.0 MMscfd	---	---	---	---	0.58	2.56	---	---	---	---
DSV-02	**12E**	TO-01	TEG Dehydrator - Still Vent	125.0 MMscfd	---	---	---	---	1.07	4.70	---	---	---	---
TO-01	**13E**	na	Dehys/Tanks/TLO Thermal Oxidizer	7.84 MMBtu/hr	0.77	3.37	2.43	10.65	See Dehys/Tanks/TLO		4.6E-03	0.02	0.06	0.26
RBV-01	**14E**	na	TEG Dehydrator - Reboiler Vent	2.00 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
RBV-02	**15E**	na	TEG Dehydrator - Reboiler Vent	2.00 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
FLR-01	**16E**	na	SSM Flare	5.21 MMBtu/hr	0.51	2.24	1.62	7.08	See SSM		3.1E-03	0.01	0.04	0.17
T-01	**17E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-02	**18E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-03	**19E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-04	**20E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-05	**21E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-06	**22E**	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-07	**23E**	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-08	**24E**	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
TLO	**25E**	TO-01	Truck Load-Out - Stabilized Condensate	187,998 bbl/yr	---	---	---	---	9.97	5.62	---	---	---	---
		na	Truck Load-Out - Produced Water	30,000 bbl/yr	---	---	---	---	4.62	0.42	---	---	---	---
			TOTAL POINT SOURCE PTE:		**22.11**	**88.58**	**27.57**	**74.41**	**32.42**	**66.87**	**0.15**	**0.60**	**1.85**	**7.47**
			WV-DEP Permit 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	
			Title V Permit Threshold:		---	100	---	100	---	100	---	100	---	100
FUG-G	**1F**	na	Process Piping Fugitives - Gas	4,981 fittings	---	---	---	---	0.55	2.40	---	---	---	---
FUG-L	**2F**	na	Process Piping Fugitives - Light Oil	2,276 fittings	---	---	---	---	1.40	6.13	---	---	---	---
ECC	**3F**	na	Engine Crankcase Emissions	21,818 bhp	0.05	0.21	0.33	1.43	0.09	0.40	2.4E-04	1.0E-03	4.0E-03	0.02
			TOTAL FUGITIVE SOURCE PTE:		**0.05**	**0.21**	**0.33**	**1.43**	**2.04**	**8.93**	**2.4E-04**	**1.0E-03**	**4.0E-03**	**0.02**
			TOTAL PTE:		**22.16**	**88.79**	**27.90**	**75.84**	**34.46**	**75.80**	**0.15**	**0.60**	**1.85**	**7.49**

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that GE-01, SSM and TLO emission generating activities are infrequent.

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 - Fugitive *criteria pollutant emissions* from compressor stations are *not* considered in major source determinations (45CSR30 Section 2.26.b.)

Controlled Emissions - Hazardous Air Pollutants (HAP)

Unit ID	Point ID	Benzene		Ethylbenzene		HCHO (HAP)		n-Hexane		Methanol		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	lb/hr	tpy
CE-01	1E	2.5E-03	0.01	2.2E-04	9.8E-04	0.28	1.22	0.01	0.03	0.01	0.06	2.3E-03	0.01	1.4E-03	0.01	1.0E-03	4.5E-03	0.08	0.36	0.39	1.69
CE-02	2E	2.5E-03	0.01	2.2E-04	9.8E-04	0.28	1.22	0.01	0.03	0.01	0.06	2.3E-03	0.01	1.4E-03	0.01	1.0E-03	4.5E-03	0.08	0.36	0.39	1.69
CE-03	3E	2.5E-03	0.01	2.2E-04	9.8E-04	0.28	1.22	0.01	0.03	0.01	0.06	2.3E-03	0.01	1.4E-03	0.01	1.0E-03	4.5E-03	0.08	0.36	0.39	1.69
CE-04	4E	2.5E-03	0.01	2.2E-04	9.8E-04	0.28	1.22	0.01	0.03	0.01	0.06	2.3E-03	0.01	1.4E-03	0.01	1.0E-03	4.5E-03	0.08	0.36	0.39	1.69
MT-01	5E	1.4E-04	6.0E-04	3.6E-04	1.6E-03	0.01	0.04	---	---	---	---	1.5E-03	0.01	---	---	7.3E-04	3.2E-03	1.2E-03	0.01	0.01	0.05
GE-01	6E	6.6E-03	1.7E-03	6.0E-04	1.5E-04	1.40	0.35	0.02	4.2E-03	0.04	0.01	0.01	1.5E-03	3.8E-03	9.4E-04	2.8E-03	6.9E-04	0.22	0.05	1.70	0.42
CRP	7E	0.02	0.10	0.02	0.10	---	---	0.11	0.48	---	---	0.02	0.10	0.02	0.10	0.02	0.10	---	---	0.22	0.97
SSM	8E	---	0.01	---	0.01	---	---	---	0.06	---	---	---	0.01	---	0.01	---	0.01	---	---	---	0.13
DFT-01	9E	1.7E-04	7.6E-04	1.9E-04	8.4E-04	---	---	0.01	0.05	---	---	5.1E-04	2.2E-03	2.2E-04	9.7E-04	2.2E-04	9.5E-04	---	---	0.01	0.06
DSV-01	10E	0.02	0.08	0.06	0.25	---	---	0.04	0.16	---	---	0.08	0.36	7.5E-04	3.3E-03	0.09	0.41	---	---	0.29	1.27
DFT-02	11E	1.7E-04	7.6E-04	1.9E-04	8.4E-04	---	---	0.01	0.05	---	---	5.1E-04	2.2E-03	2.2E-04	9.7E-04	2.2E-04	9.5E-04	---	---	0.01	0.06
DSV-02	12E	0.02	0.08	0.06	0.25	---	---	0.04	0.16	---	---	0.08	0.36	7.5E-04	3.3E-03	0.09	0.41	---	---	0.29	1.27
TO-01	13E	See Dehys/TKS/TLO		See Dehys/TKS/TLO		5.8E-04	2.5E-03	See Dehys/TKS/TLO		---	---	See Dehys/TKS/TLO		See Dehys/TKS/TLO		See Dehys/TKS/TLO		1.5E-05	6.4E-05	5.9E-04	2.6E-03
RBV-01	14E	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
RBV-02	15E	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
FLR-01	16E	See SSM		See SSM		3.8E-04	1.7E-03	See SSM		---	---	See SSM		See SSM		See SSM		9.7E-06	4.2E-05	3.9E-04	1.7E-03
T-01	17E	1.4E-04	6.2E-04	1.4E-04	6.2E-04	---	---	7.1E-04	3.1E-03	---	---	1.4E-04	6.2E-04	---	---	3.5E-04	1.6E-03	---	---	1.5E-03	0.01
T-02	18E	1.4E-04	6.2E-04	1.4E-04	6.2E-04	---	---	7.1E-04	3.1E-03	---	---	1.4E-04	6.2E-04	---	---	3.5E-04	1.6E-03	---	---	1.5E-03	0.01
T-03	19E	1.4E-04	6.2E-04	1.4E-04	6.2E-04	---	---	7.1E-04	3.1E-03	---	---	1.4E-04	6.2E-04	---	---	3.5E-04	1.6E-03	---	---	1.5E-03	0.01
T-04	20E	1.4E-04	6.2E-04	1.4E-04	6.2E-04	---	---	7.1E-04	3.1E-03	---	---	1.4E-04	6.2E-04	---	---	3.5E-04	1.6E-03	---	---	1.5E-03	0.01
T-05	21E	1.4E-04	6.2E-04	1.4E-04	6.2E-04	---	---	7.1E-04	3.1E-03	---	---	1.4E-04	6.2E-04	---	---	3.5E-04	1.6E-03	---	---	1.5E-03	0.01
T-06	22E	1.4E-04	6.2E-04	1.4E-04	6.2E-04	---	---	7.1E-04	3.1E-03	---	---	1.4E-04	6.2E-04	---	---	3.5E-04	1.6E-03	---	---	1.5E-03	0.01
T-07	23E	1.4E-04	6.0E-04	1.4E-04	6.0E-04	---	---	6.8E-04	3.0E-03	---	---	1.4E-04	6.0E-04	---	---	3.4E-04	1.5E-03	---	---	1.4E-03	0.01
T-08	24E	1.4E-04	6.0E-04	1.4E-04	6.0E-04	---	---	6.8E-04	3.0E-03	---	---	1.4E-04	6.0E-04	---	---	3.4E-04	1.5E-03	---	---	1.4E-03	0.01
TLO	25E	0.50	0.28	0.50	0.28	---	---	0.50	0.28	---	---	0.50	0.28	0.50	0.28	0.50	0.28	---	---	2.99	1.69
		0.23	0.02	0.23	0.02	---	---	0.23	0.02	---	---	0.23	0.02	0.23	0.02	0.23	0.02	---	---	1.39	0.12
Subtotal:		**0.80**	**0.62**	**0.87**	**0.92**	**2.52**	**5.26**	**0.99**	**1.45**	**0.09**	**0.26**	**0.94**	**1.20**	**7.6E-01**	**0.45**	**0.95**	**1.28**	**0.54**	**1.48**	**8.48**	**12.90**
FUG-G	1F	2.9E-03	0.01	2.9E-03	0.01	---	---	0.01	0.06	---	---	2.9E-03	0.01	2.9E-03	0.01	2.9E-03	0.01	---	---	0.03	0.13
FUG-L	2F	0.03	0.12	0.03	0.12	---	---	0.07	0.31	---	---	0.03	0.12	0.03	0.12	0.03	0.12	---	---	0.21	0.92
ECC	3F	1.8E-04	7.7E-04	1.6E-05	7.0E-05	0.02	0.07	4.5E-04	2.0E-03	1.0E-03	4.4E-03	1.6E-04	7.2E-04	1.0E-04	4.4E-04	7.4E-05	3.2E-04	0.01	0.03	0.02	0.11
Subtotal:		**0.03**	**0.14**	**0.03**	**0.14**	**0.02**	**0.07**	**0.08**	**0.37**	**1.0E-03**	**4.4E-03**	**0.03**	**0.14**	**0.03**	**0.14**	**0.03**	**0.14**	**0.01**	**0.03**	**0.26**	**1.15**
TOTAL PTE:		**0.84**	**0.75**	**0.90**	**1.06**	**2.54**	**5.33**	**1.08**	**1.82**	**0.09**	**0.26**	**0.97**	**1.33**	**0.79**	**0.58**	**0.98**	**1.41**	**0.55**	**1.51**	**8.74**	**14.05**
WV-DEP:		**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		**2 lb/hr *OR* 5 tpy**	
Title V:		---	10	---	10	---	10	---	10	---	10	---	10	---	10	---	10	---	10	---	25

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that GE-01, SSM and TLO emission generating activities are infrequent.
2 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), acetaldehyde, acrolein, and methanol.

Greenhouse Gas (GHG) Emissions

Unit ID	Point ID	Control ID	Description	Heat Input MMBtu/hr (HHV)	Hours of Operation hr/yr	kg/MMBtu: GWP: CO2 tpy	53.06 1 CO2e tpy	kg/MMBtu: GWP: CH4 tpy	1.00E-03 25 CO2e tpy	kg/MMBtu: GWP: N2O tpy	1.00E-04 298 CO2e tpy	TOTAL CO2e tpy
CE-01	**1E**	01-OxCat	Compressor Engine - CAT G3616 A4	37.60	8,760	20,664	20,664	120.70	3,018	0.04	10.77	**23,693**
CE-02	**2E**	02-OxCat	Compressor Engine - CAT G3616 A4	37.60	8,760	20,664	20,664	120.70	3,018	0.04	10.77	**23,693**
CE-03	**3E**	03-OxCat	Compressor Engine - CAT G3616 A4	37.60	8,760	20,664	20,664	120.70	3,018	0.04	10.77	**23,693**
CE-04	**4E**	04-OxCat	Compressor Engine - CAT G3616 A4	37.60	8,760	20,664	20,664	120.70	3,018	0.04	10.77	**23,693**
MT-01	**5E**	na	Generator Turbine - Capstone C1000	11.40	8,760	5,841	5,841	0.43	11	0.15	44.64	**5,896**
GE-01	**6E**	na	Emergency Generator Engine - CAT G3516B	15.07	500	517	517	3.30	82.41	8.3E-04	0.25	**600**
CRP	**7E**	na	Compressor Rod Packing	---	8,760	0.5	0.5	79.67	1,992	---	---	**1,992**
SSM	**8E**	FLR-01	Startup/Shutdown/Maintenance (Blowdown)	---	8,760	3.23	3.23	532.96	13,324	---	---	**13,327**
DFT-01	**9E**	TO-01	TEG Dehydrator - Flash Tank	---	8,760	---	---	3.16	79	---	---	**79**
DSV-01	**10E**	TO-01	TEG Dehydrator - Still Vent	---	8,760	---	---	0.20	5	---	---	**5**
DFT-02	**11E**	TO-01	TEG Dehydrator - Flash Tank	---	8,760	---	---	3.16	79	---	---	**79**
DSV-02	**12E**	TO-01	TEG Dehydrator - Still Vent	---	8,760	---	---	0.20	5	---	---	**5**
TO-01	**13E**	na	Dehys/Tanks/TLO Thermal Oxidizer	7.84	8,760	4,041	4,041	See DFT,DSV-01,-02		0.07	22.08	**4,063**
RBV-01	**14E**	na	TEG Dehydrator - Reboiler Vent	2.00	8,760	1,031	1,031	0.02	0.5	0.02	5.63	**1,037**
RBV-02	**15E**	na	TEG Dehydrator - Reboiler Vent	2.00	8,760	1,031	1,031	0.02	0.5	0.02	5.63	**1,037**
FLR-01	**16E**	na	SSM Flare	5.21	8,760	2,686	2,686	See SSM		0.05	14.67	**2,700**
T-01	**17E**	TO-01	Storage Tank - Stabilized Condensate	---	---	---	---	---	---	---	---	**---**
T-02	**18E**	TO-01	Storage Tank - Stabilized Condensate	---	---	---	---	---	---	---	---	**---**
T-03	**19E**	TO-01	Storage Tank - Stabilized Condensate	---	---	---	---	---	---	---	---	**---**
T-04	**20E**	TO-01	Storage Tank - Stabilized Condensate	---	---	---	---	---	---	---	---	**---**
T-05	**21E**	TO-01	Storage Tank - Stabilized Condensate	---	---	---	---	---	---	---	---	**---**
T-06	**22E**	TO-01	Storage Tank - Stabilized Condensate	---	---	---	---	---	---	---	---	**---**
T-07	**23E**	na	Storage Tank - Produced Water	---	---	---	---	---	---	---	---	**---**
T-08	**24E**	na	Storage Tank - Produced Water	---	---	---	---	---	---	---	---	**---**
TLO	**25E**	TO-01	Truck Load-Out - Stabilized Condensate	---	---	---	---	---	---	---	---	**---**
		na	Truck Load-Out - Produced Water	---	---	---	---	---	---	---	---	**---**
											TOTAL POINT SOURCE PTE:	**125,592**
FUG-G	**1F**	na	Process Piping Fugitives - Gas	---	8,760	0.06	0.06	10	262	---	---	**262**
FUG-L	**2F**	na	Process Piping Fugitives - Light Oil	---	---	---	---	---	---	---	---	**---**
ECC	**3F**	na	Engine Crankcase Emissions	---	8,760	221.53	221.53	1.29	32.35	0.00	0.12	**254**
											TOTAL FUGITIVE SOURCE PTE:	**516**

TOTAL FACILITY-WIDE PTE:	**98,029**		**1,118**		**0.46**		**126,108**
WV-DEP Threshold: (	**na**	**- OR -**	**na**	**- OR -**	**na**	**) - AND -**	**na**
Title V Permit Threshold:	**na**		**na**		**na**		**na**

Notes:
1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that GE-01, SSM and TLO emission generating activities are infrequent.
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 - GHG NSR/PSD Thresholds and Title V Major Source Thresholds are applicable only if other regulated air pollutants exceed the corresponding Thresholds.

PRE-Controlled Emissions - Criteria Pollutants

Unit ID	Point ID	Control ID	Description	Design Capacity	NOx		CO		VOC		SOx		PM10/2.5	
					lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	1E	01-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	30.53	133.74	8.60	37.66	0.02	0.10	0.37	1.64
CE-02	2E	02-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	30.53	133.74	8.60	37.66	0.02	0.10	0.37	1.64
CE-03	3E	03-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	30.53	133.74	8.60	37.66	0.02	0.10	0.37	1.64
CE-04	4E	04-OxCat	Compressor Engine - CAT G3616 A4	5,000 bhp	4.41	19.31	30.53	133.74	8.60	37.66	0.02	0.10	0.37	1.64
MT-01	5E	na	Generator Turbine - Capstone C1000	1,000 kWe	0.80	3.50	2.20	9.64	0.10	0.44	0.04	0.17	0.08	0.33
GE-01	6E	na	Emergency Generator Engine - CAT G3516B	1,818 bhp	2.00	8.78	11.22	49.15	4.77	20.89	0.01	0.04	0.15	0.66
CRP	7E	na	Compressor Rod Packing	20,100 bhp	---	---	---	---	4.17	18.24	---	---	---	---
SSM	8E	FLR-01	Startup/Shutdown/Maintenance (Blowdown)	20,100 bhp	---	---	---	---	---	122.06	---	---	---	---
DFT-01	9E	TO-01	TEG Dehydrator - Flash Tank	125 MMscfd	---	---	---	---	29.18	127.81	---	---	---	---
DSV-01	10E	TO-01	TEG Dehydrator - Still Vent	125 MMscfd	---	---	---	---	53.68	235.10	---	---	---	---
DFT-02	11E	TO-01	TEG Dehydrator - Flash Tank	125 MMscfd	---	---	---	---	29.18	127.81	---	---	---	---
DSV-02	12E	TO-01	TEG Dehydrator - Still Vent	125 MMscfd	---	---	---	---	53.68	235.10	---	---	---	---
TO-01	13E	na	Dehys/Tanks/TLO Thermal Oxidizer	7.84 MMBtu/hr	na									
RBV-01	14E	na	TEG Dehydrator - Reboiler Vent	2.0 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
RBV-02	15E	na	TEG Dehydrator - Reboiler Vent	2.0 MMBtu/hr	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	0.01	0.07
FLR-01	16E	na	SSM Flare	5.21 MMBtu/hr	na									
T-01	17E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.71	3.10	---	---	---	---
T-02	18E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.71	3.10	---	---	---	---
T-03	19E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.71	3.10	---	---	---	---
T-04	20E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.71	3.10	---	---	---	---
T-05	21E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.71	3.10	---	---	---	---
T-06	22E	TO-01	Storage Tank - Stabilized Condensate	400 bbl	---	---	---	---	0.71	3.10	---	---	---	---
T-07	23E	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
T-08	24E	na	Storage Tank - Produced Water	400 bbl	---	---	---	---	0.01	0.06	---	---	---	---
TLO	25E	TO-01	Truck Load-Out - Stabilized Condensate	187,998 bbl/yr	---	---	---	---	36.37	18.33	---	---	---	---
		na	Truck Load-Out - Produced Water	30,000 bbl/yr	---	---	---	---	4.62	0.42	---	---	---	---
			TOTAL POINT SOURCE PTE:		**20.83**	**91.25**	**135.89**	**595.19**	**254.43**	**1,075.64**	**0.14**	**0.60**	**1.75**	**7.67**
			WV-DEP Permit 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	
			Title V Permit Threshold:		---	100	**---**	**100**	**---**	**100**	---	100	---	100
FUG-G	1F	na	Process Piping Fugitives - Gas	4,981 fittings	---	---	---	---	2.34	10.24	---	---	---	---
FUG-L	2F	na	Process Piping Fugitives - Light Oil	2,276 fittings	---	---	---	---	5.11	22.39	---	---	---	---
ECC	3F	na	Engine Crankcase Emissions	21,818 bhp	0.05	0.21	0.33	1.43	0.09	0.40	2.4E-04	1.0E-03	4.0E-03	0.02
			TOTAL FUGITIVE SOURCE PTE:		**0.05**	**0.21**	**0.33**	**1.43**	**7.54**	**33.03**	**0.00**	**0.00**	**0.00**	**0.02**
			TOTAL PTE:		**20.88**	**91.46**	**136.22**	**596.62**	**261.97**	**1108.67**	**0.14**	**0.61**	**1.76**	**7.69**

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that GE-01, SSM and TLO emission generating activities are infrequent.

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 - Fugitive *criteria pollutant emissions* are *not* considered in major source determinations (45CSR30 Section 2.26.b.)

PRE-Controlled Emissions - Hazardous Air Pollutants (HAP)

Unit ID	Point ID	Benzene		Ethylbenzene		HCHO (HAP)		n-Hexane		Methanol		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	lb/hr	tpy
CE-01	1E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.41	0.02	0.07	0.01	0.04	0.01	0.03	0.54	2.37	2.27	9.94
CE-02	2E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.41	0.02	0.07	0.01	0.04	0.01	0.03	0.54	2.37	2.27	9.94
CE-03	3E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.41	0.02	0.07	0.01	0.04	0.01	0.03	0.54	2.37	2.27	9.94
CE-04	4E	0.02	0.07	1.5E-03	0.01	1.54	6.76	0.04	0.18	0.09	0.41	0.02	0.07	0.01	0.04	0.01	0.03	0.54	2.37	2.27	9.94
MT-01	5E	1.4E-04	6.0E-04	3.6E-04	1.6E-03	0.01	0.04	---	---	---	---	1.5E-03	0.01	---	---	7.3E-04	3.2E-03	1.2E-03	0.01	0.01	0.05
GE-01	6E	0.01	0.03	6.0E-04	2.6E-03	1.40	6.14	0.02	0.07	0.04	0.17	0.01	0.03	0.00	0.02	2.8E-03	0.01	0.22	0.96	1.70	7.43
CRP	7E	0.02	0.10	0.02	0.10	---	---	0.11	0.48	---	---	0.02	0.10	0.02	0.10	0.02	0.10	---	---	0.22	0.97
SSM	8E	---	0.65	---	0.65	---	---	---	3.23	---	---	---	0.65	---	0.65	---	0.65	---	---	---	6.47
DFT-01	9E	0.01	0.04	0.01	0.04	---	---	0.58	2.56	---	---	0.03	0.11	0.01	0.05	0.01	0.05	---	---	0.65	2.84
DSV-01	10E	0.87	3.80	2.85	12.49	---	---	1.86	8.17	---	---	4.16	18.23	0.04	0.16	4.73	20.72	---	---	14.51	63.57
DFT-02	11E	0.01	0.04	0.01	0.04	---	---	0.58	2.56	---	---	0.03	0.11	0.01	0.05	0.01	0.05	---	---	0.65	2.84
DSV-02	12E	0.87	3.80	2.85	12.49	---	---	1.86	8.17	---	---	4.16	18.23	0.04	0.16	4.73	20.72	---	---	14.51	63.57
TO-01	13E	na																			
RBV-01	14E	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
RBV-02	15E	4.1E-06	1.8E-05	---	---	1.5E-04	6.4E-04	3.5E-03	0.02	---	---	6.7E-06	2.9E-05	---	---	---	---	3.7E-06	1.6E-05	3.7E-03	0.02
FLR-01	16E	na																			
T-01	17E	0.01	0.03	0.01	0.03	---	---	0.04	0.16	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.33
T-02	18E	0.01	0.03	0.01	0.03	---	---	0.04	0.16	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.33
T-03	19E	0.01	0.03	0.01	0.03	---	---	0.04	0.16	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.33
T-04	20E	0.01	0.03	0.01	0.03	---	---	0.04	0.16	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.33
T-05	21E	0.01	0.03	0.01	0.03	---	---	0.04	0.16	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.33
T-06	22E	0.01	0.03	0.01	0.03	---	---	0.04	0.16	---	---	0.01	0.03	---	---	0.02	0.08	---	---	0.07	0.33
T-07	23E	1.4E-04	6.0E-04	1.4E-04	6.0E-04	---	---	6.8E-04	3.0E-03	---	---	1.4E-04	6.0E-04	---	---	3.4E-04	1.5E-03	---	---	1.4E-03	6.3E-03
T-08	24E	1.4E-04	6.0E-04	1.4E-04	6.0E-04	---	---	6.8E-04	3.0E-03	---	---	1.4E-04	6.0E-04	---	---	3.4E-04	1.5E-03	---	---	1.4E-03	6.3E-03
TLO	25E	1.59	0.90	1.59	0.90	---	---	1.59	0.90	---	---	1.59	0.90	1.59	0.90	1.59	0.90	---	---	9.53	5.37
		0.23	2.1E-02	0.23	2.1E-02	---	---	0.23	2.1E-02	---	---	0.23	2.1E-02	0.23	2.1E-02	0.23	2.1E-02	---	---	1.39	0.12
Subtotal:		**3.71**	**9.85**	**7.61**	**26.94**	**7.58**	**33.22**	**7.23**	**27.85**	**0.41**	**1.81**	**10.33**	**38.83**	**1.98**	**2.27**	**11.46**	**43.80**	**2.38**	**10.43**	**52.70**	**194.98**
FUG-G	1F	0.01	0.05	0.01	0.05	---	---	0.01	0.06	---	---	0.01	0.05	0.01	0.05	0.01	0.05	---	---	0.12	0.54
FUG-L	2F	0.10	0.45	0.10	0.45	---	---	0.26	1.12	---	---	0.10	0.45	0.10	0.45	0.10	0.45	---	---	0.77	3.36
ECC	3F	1.8E-04	7.7E-04	1.6E-05	7.0E-05	0.02	0.07	4.5E-04	2.0E-03	1.0E-03	4.4E-03	1.6E-04	7.2E-04	1.0E-04	4.4E-04	7.4E-05	3.2E-04	0.01	0.03	0.02	0.11
Subtotal:		**0.11**	**0.50**	**0.11**	**0.50**	**0.02**	**0.07**	**0.27**	**1.18**	**1.0E-03**	**4.4E-03**	**0.11**	**0.50**	**0.11**	**0.50**	**0.11**	**0.50**	**0.01**	**0.03**	**0.91**	**4.01**
TOTAL PTE:		**3.83**	**10.35**	**7.73**	**27.44**	**7.60**	**33.29**	**7.50**	**29.03**	**0.41**	**1.81**	**10.44**	**39.33**	**2.09**	**2.77**	**11.58**	**44.30**	**2.39**	**10.45**	**53.61**	**198.99**
WV-DEP:		**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**		**2 lb/hr *OR* 5 tpy**	
Title V:		---	10	**---**	**10**	**---**	**10**	**---**	**10**	---	10	**---**	**10**	---	10	**---**	**10**	**---**	**10**	**---**	**25**

Notes: 1 - Emissions are based on operation at 100% of rated load for 8,760 hrs/yr; except that GE-01, SSM and TLO emission generating activities are infrequent.
2 - HCHO is formaldehyde; Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), acetaldehyde, acrolein, and methanol.

Compressor Engine – 5,000 bhp CAT G3616 A4

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 (1E) CE-02 (2E) CE-03 (3E) CE-04 (4E) Each	**Engine 01 thru 04 (Each)**	Vendor Guarantee	NOX	0.40	0.12	4.41	19.31	0.0%	**0.40**	**0.12**	**4.41**	**19.31**
	Caterpillar (CAT)	Vendor Guarantee	CO	2.77	0.82	30.53	133.74	92.0%	**0.22**	**0.07**	**2.44**	**10.70**
	G3616 A4	Vendor Guarantee	THC	3.88	1.14	42.77	187.33	14.0%	**3.34**	**0.98**	**36.77**	**161.07**
	5,000 bhp (Site Rating)	Vendor Guarantee	NMHC	1.38	0.41	15.21	66.63	39.4%	**0.84**	**0.25**	**9.22**	**40.36**
	1,000 rpm	Vendor Guarantee	NMNEHC	0.64	0.19	7.05	30.90	85.0%	**0.10**	**0.03**	**1.06**	**4.64**
	1294 in3/cyl	NMNEHC+HCHO	VOC	0.78	0.24	8.60	37.66	84.5%	**0.12**	**0.04**	**1.34**	**5.85**
	V-16 / 4SLB / AFRC	AP-42 Table 3.2-2	SO2	2.0E-03	5.9E-04	0.02	0.10	---	**2.0E-03**	**5.9E-04**	**0.02**	**0.10**
	Catalytic Comb. OxCat	AP-42 Table 3.2-2	PM10/2.5	0.03	0.01	0.37	1.64	---	**0.03**	**0.01**	**0.37**	**1.64**
	NSPS JJJJ Affected	AP-42 Table 3.2-2	Benzene	1.49E-03	4.4E-04	1.6E-02	0.07	85.0%	**2.2E-04**	**6.6E-05**	**2.5E-03**	**0.01**
		AP-42 Table 3.2-2	Ethylbenzene	1.3E-04	4.0E-05	1.5E-03	6.5E-03	85.0%	**2.0E-05**	**6.0E-06**	**2.2E-04**	**9.8E-04**
	8,760 hr/yr	Vendor Guarantee	HCHO	0.14	0.05	1.54	6.76	82.0%	**0.03**	**0.01**	**0.28**	**1.22**
	920 Btu/scf (LHV)	AP-42 Table 3.2-2	n-Hexane	3.8E-03	1.1E-03	0.04	0.18	85.0%	**5.7E-04**	**1.7E-04**	**0.01**	**0.03**
	1,020 Btu/scf (HHV)	AP-42 Table 3.2-2	Methanol	0.01	2.5E-03	0.09	0.41	85.0%	**0.00**	**3.8E-04**	**0.01**	**0.06**
	6,782 Btu/bhp-hr (LHV)	AP-42 Table 3.2-2	Toluene	1.4E-03	4.1E-04	1.5E-02	0.07	85.0%	**2.1E-04**	**6.1E-05**	**2.3E-03**	**0.01**
	7,488 Btu/bhp-hr (HHV)	AP-42 Table 3.2-2	2,2,4-TMP	8.5E-04	2.5E-04	9.4E-03	0.04	85.0%	**1.3E-04**	**3.8E-05**	**1.4E-03**	**0.01**
	33.91 MMBtu/hr (LHV)	AP-42 Table 3.2-2	Xylenes	6.2E-04	1.8E-04	6.9E-03	0.03	85.0%	**9.4E-05**	**2.8E-05**	**1.0E-03**	**4.5E-03**
	37.60 MMBtu/hr (HHV)	AP-42 Table 3.2-2	Other HAP	0.05	0.01	0.54	2.37	85.0%	**0.01**	**2.2E-03**	**0.08**	**0.36**
	297,052 MMBtu/yr (LHV)	Sum	Total HAP	0.21	0.07	2.27	9.94	85.0%	**0.04**	**0.01**	**0.39**	**1.69**
	329,340 MMBtu/yr (HHV)	Vendor Guarantee	CO2	428	126	4,718	20,664	---	**428**	**126**	**4,718**	**20,664**
	36,859 scf/hr	THC-NMHC	CH4 (GWP=25)	2.50	0.74	27.56	120.70	---	**2.50**	**0.74**	**27.56**	**120.70**
	0.88 MMscfd	40CFR98 - Table C-2	N2O (GWP=298)	7.5E-04	2.2E-04	8.3E-03	0.04	---	**7.5E-04**	**2.2E-04**	**8.3E-03**	**0.04**
	322.88 MMscf/yr	40CFR98 - Table A-1	CO2e	491	144	5,409	23,693	---	**491**	**144**	**5,409**	**23,693**

Notes:
1 - The emissions are based on operation at 100% of rated load for 8,760 hr/yr.
2 - As per Engine Specifications, emission values are based on adjustment to specified NOX level, all other emission values are "Not to Exceed" (i.e., Vendor Guarantee).
3 - As per Engine Specifications, NMNEHC (non-methane/non-ethane hydrocarbon) does not include HCHO. VOC is the sum of NMNEHC and HCHO.
4 - PM10/2.5 is Filterable and Condensable Particulate Matter; including PM10 and PM2.5
5 - HCHO is Formaldehyde; Other HAP includes Acetaldehyde, Acrolein, 1,3-Butadiene, Methanol, Methylene Chloride, and traces of other HAP.
6 - The control efficiency (CE) for each HAP is assumed to be the same as the CE for NMHC, except for HCHO where the vendor provides specific data.
7 - 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.

Capstone C1000 Microturbine Generator (1,000 kWe)

Unit ID (Point ID)	Description	Reference	Pollutant	Emission Factor		Pre-Control		Control Efficiency	Controlled	
				lb/MMBtu	lb/MWhe	lb/hr	tpy		lb/hr	tpy
MT-01 (5E)	Capstone Turbine Corporation **C1000 Microturbine** 1,000 kWe **8,760 hr/yr** 920 Btu/scf (LHV) 1,020 Btu/scf (HHV) **10,260 Btu/kW-hr (LHV)** 11,375 Btu/kW-hr (HHV) 10.26 MMBtu/hr (LHV) 11.40 MMBtu/hr (HHV) 89,878 MMBtu/yr (LHV) 11,152 scf/hr (LHV) 0.27 MMscf/day (LHV) 1.87 MMscf/wk (LHV) 97.69 MMscf/yr (LHV)	Vendor	NOx	---	0.40	0.80	3.50	---	**0.80**	**3.50**
		Vendor	CO	---	1.10	2.20	9.64	---	**2.20**	**9.64**
		EPA AP-42 Table 3.1-2a	THC	0.01	---	0.13	0.55	---	**0.13**	**0.55**
		EPA AP-42 Table 3.1-2a	NMHC	2.4E-03	---	0.03	0.12	---	**0.03**	**0.12**
		Vendor	NMNEHC	---	0.10	0.10	0.44	---	**0.10**	**0.44**
		Vendor	VOC	---	0.10	0.10	0.44	---	**0.10**	**0.44**
		EPA AP-42 Table 3.1-2a	SOx	3.4E-03	---	0.04	0.17	---	**0.04**	**0.17**
		EPA AP-42 Table 3.1-2a	PM10/2.5	0.01	---	0.08	0.33	---	**0.08**	**0.33**
		EPA AP-42 Table 3.1-3	Benzene	1.2E-05	---	1.4E-04	6.0E-04	---	**1.4E-04**	**6.0E-04**
		EPA AP-42 Table 3.1-3	Ethylbenzene	3.2E-05	---	3.6E-04	1.6E-03	---	**3.6E-04**	**1.6E-03**
		EPA AP-42 Table 3.1-3	Formaldehyde	7.1E-04	---	0.01	0.04	---	**0.01**	**0.04**
		EPA AP-42 Table 3.1-3	n-Hexane	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 3.1-3	Methanol	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 3.1-3	Toluene	1.3E-04	---	1.5E-03	0.01	---	**1.5E-03**	**0.01**
		EPA AP-42 Table 3.1-3	2,2,4-TMP	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 3.1-3	Xylenes	6.4E-05	---	7.3E-04	3.2E-03	---	**7.3E-04**	**3.2E-03**
		EPA AP-42 Table 3.1-3	Other HAP	1.1E-04	---	1.2E-03	5.3E-03	---	**1.2E-03**	**0.01**
		SUM	Total HAP	1.1E-03	---	0.01	0.05	---	**0.01**	**0.05**
		EPA AP-42 Table 3.1-2a	CO2	117	---	1,334	5,841	---	**1,334**	**5,841**
		EPA AP-42 Table 3.1-2a	CH4	0.01	---	0.10	0.43	---	**0.10**	**0.43**
		EPA AP-42 Table 3.1-2a	N2O	3.0E-03	---	0.03	0.15	---	**0.03**	**0.15**
		40CFR98 Table C-1	CO2e	118	---	1,346	5,896	---	**1,346**	**5,896**

Notes: 1 - The microturbine generator is assumed to operate at 100% of rated load for 8,760 hrs/yr.

2 - The fuel heating value is based on 920 Btu/scf (LHV).

3 - Total PM is Filterable and Condensable Particulate Matter; including PM10 and PM2.5

4 - HCHO is Formaldehyde; Total HAP include HCHO, 1,3-Butadiene, Acetaldehyde, Acrolein, BTEX (Benzene, Toluene, Ethylbenzene, Xylene), Naphthalene, PAH and propylene oxide.

5 - A 100 percent contingency has been added to the NOx and CO mass emission rates to account for higher emissions at lower loads.

Emergency Generator Engine – 1,818 bhp CAT G3516B

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
GE-01 (6E)	**Emergency Generator Engine 01**	Vendor Guarantee	NOX	0.50	0.13	2.00	8.78	0.0%	**0.50**	**0.13**	**2.00**	**0.50**
		Vendor Guarantee	CO	2.80	0.74	11.22	49.15	0.0%	**2.80**	**0.74**	**11.22**	**2.81**
	Caterpillar (CAT)	Vendor Guarantee	THC	5.11	1.36	20.48	89.71	0.0%	**5.11**	**1.36**	**20.48**	**5.12**
	G3516B	Vendor Guarantee	NMHC	1.82	0.48	7.29	31.95	0.0%	**1.82**	**0.48**	**7.29**	**1.82**
	1,818 bhp (Site Rating)	Vendor Guarantee	NMNEHC	0.84	0.22	3.37	14.75	0.0%	**0.84**	**0.22**	**3.37**	**0.84**
	1,800 rpm	NMNEHC+HCHO	VOC	1.19	0.28	4.77	20.89	0.0%	**1.19**	**0.28**	**4.77**	**1.19**
	264 in3/cyl	AP-42 Table 3.2-2	SO2	2.2E-03	5.9E-04	0.01	0.04	---	**2.2E-03**	**5.9E-04**	**0.01**	**2.2E-03**
	V-16 / 4SLB / AFRC	AP-42 Table 3.2-2	PM10/2.5	0.04	0.01	0.15	0.66	---	**0.04**	**0.01**	**0.15**	**0.04**
		AP-42 Table 3.2-2	Benzene	1.66E-03	4.4E-04	6.6E-03	0.03	0.0%	**1.7E-03**	**4.4E-04**	**6.6E-03**	**1.7E-03**
	NSPS JJJJ Affected	AP-42 Table 3.2-2	Ethylbenzene	1.5E-04	4.0E-05	6.0E-04	2.6E-03	0.0%	**1.5E-04**	**4.0E-05**	**6.0E-04**	**1.5E-04**
	500 hr/yr	Vendor Guarantee	HCHO	0.35	0.05	1.40	6.14	0.0%	**0.35**	**0.05**	**1.40**	**0.35**
	920 Btu/scf (LHV)	AP-42 Table 3.2-2	n-Hexane	4.2E-03	1.1E-03	0.02	0.07	0.0%	**4.2E-03**	**1.1E-03**	**0.02**	**4.2E-03**
	1,020 Btu/scf (HHV)	AP-42 Table 3.2-2	Methanol	0.01	2.5E-03	0.04	0.17	0.0%	**0.01**	**2.5E-03**	**0.04**	**0.01**
	7,479 Btu/bhp-hr (LHV)	AP-42 Table 3.2-2	Toluene	1.5E-03	4.1E-04	0.01	0.03	0.0%	**1.5E-03**	**4.1E-04**	**0.01**	**1.5E-03**
	8,310 Btu/bhp-hr (HHV)	AP-42 Table 3.2-2	2,2,4-TMP	9.4E-04	2.5E-04	3.8E-03	0.02	0.0%	**9.4E-04**	**2.5E-04**	**3.8E-03**	**9.4E-04**
	13.60 MMBtu/hr (LHV)	AP-42 Table 3.2-2	Xylenes	6.9E-04	1.8E-04	2.8E-03	0.01	0.0%	**6.9E-04**	**1.8E-04**	**2.8E-03**	**6.9E-04**
	15.07 MMBtu/hr (HHV)	AP-42 Table 3.2-2	Other HAP	0.05	0.01	0.22	0.96	0.0%	**0.05**	**0.01**	**0.22**	**0.05**
	6,798 MMBtu/yr (LHV)	Sum	Total HAP	0.42	0.07	1.70	7.43	0.0%	**0.42**	**0.07**	**1.70**	**0.42**
	7,537 MMBtu/yr (HHV)	Vendor Guarantee	CO2	516	137	2,068	9,058	---	**516**	**137**	**2,068**	**517**
	14,779 scf/hr	THC-NMHC	CH4 (GWP=25)	3.29	0.87	13.19	57.76	---	**3.29**	**0.87**	**13.19**	**3.30**
	0.35 MMscfd	40CFR98 - Table C-2	N2O (GWP=298)	8.3E-04	2.2E-04	3.3E-03	0.01	---	**8.3E-04**	**2.2E-04**	**3.3E-03**	**8.3E-04**
	7.39 MMscf/yr	40CFR98 - Table A-1	CO2e	598	159	2,399	10,507	---	**598**	**159**	**2,399**	**600**

Notes:
1 - The emissions are based on operation at 100% of rated load for 500 hr/yr.
2 - As per Engine Specifications, emission values are based on adjustment to specified NOX level, all other emission values are "Not to Exceed" (i.e., Vendor Guarantee).
3 - As per Engine Specifications, NMNEHC (non-methane/non-ethane hydrocarbon) does not include HCHO. VOC is the sum of NMNEHC and HCHO.
4 - PM10/2.5 is Filterable and Condensable Particulate Matter; including PM10 and PM2.5
5 - HCHO is Formaldehyde; Other HAP includes Acetaldehyde, Acrolein, 1,3-Butadiene, Methanol, Methylene Chloride, and traces of other HAP.
6 - The control efficiency (CE) for each HAP is assumed to be the same as the CE for NMHC, except for HCHO where the vendor provides specific data.
7 - 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.

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment U - Supporting Emissions Calculations

Compressor Rod Packing (CRP) Emissions

Unit ID (Point ID)	Unit Description (Compressor Rod Packing) (Raw Natural Gas)	No of Cylinders	scfh per Cylinder	Margin of Safety	Total Leak Rate	
					scfh	MMscfy
CRP (7E)	Recip Compressor 01 thru 04 (ea)	6	12.00	15%	82.80	0.73
	Recip Compressor 05 and 06	4	12.00	15%	55.20	0.48
	Recip Compressor 01 thru 06 (tot)	6	12.00	15%	441.60	3.87

	VOC (w/HCHO) 9,433 lb/MMscf		CO2 250 lb/MMscf		CH4 41,188 lb/MMscf		CO2e CH4 GWP = 25 lb/MMscf	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
	0.78	3.42	0.02	0.1	3.4	15	85	374
	0.52	2.28	0.01	0.1	2.3	10	57	249
	4.17	18.24	0.1	0.5	18	80	455	1,992
TOTAL:	**4.17**	**18.24**	**0.1**	**0.5**	**18**	**80**	**455**	**1,992**

Unit ID (Point ID)	Unit Description (Compressor Rod Packing) (Raw Natural Gas)	Benzene 50.00 lb/MMscf		E-Benzene 50.00 lb/MMscf		n-Hexane 250.00 lb/MMscf		Toluene 50.00 lb/MMscf		2,2,4-TMP 50.00 lb/MMscf		Xylene 50.00 lb/MMscf		Tot HAP 500.00 lb/MMscf	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CRP (7E)	Recip Compressor 01 thru 04 (ea)	4.1E-03	0.02	4.1E-03	0.02	0.02	0.09	4.1E-03	0.02	4.1E-03	0.02	4.1E-03	0.02	0.04	0.18
	Recip Compressor 05 and 06	2.8E-03	0.01	2.8E-03	0.01	0.01	0.06	2.8E-03	0.01	2.8E-03	0.01	2.8E-03	0.01	0.03	0.12
	Recip Compressor 01 thru 06 (tot)	0.02	0.10	0.02	0.10	0.11	0.48	0.02	0.10	0.02	0.10	0.02	0.10	0.22	0.97
	TOTAL:	**0.02**	**0.10**	**0.02**	**0.10**	**0.11**	**0.48**	**0.02**	**0.10**	**0.02**	**0.10**	**0.02**	**0.10**	**0.22**	**0.97**

Notes: 1 - The results of a representative **Wet Gas Analysis** were used to determine the following worst-case VOC and HAP components (See Attachment D-3):

Pollutant	Wet Gas Analysis	Worst-Case
CO2	177.11 lb/MMscf	250 lb/MMscf
Methane (CH4)	34,324 lb/MMscf	41,188 lb/MMscf
Other (N2/C2/etc)	9,887 lb/MMscf	---
VOC	8,575.24 lb/MMscf	9,433 lb/MMscf
Benzene	1.33 lb/MMscf	50.00 lb/MMscf
Ethylbenzene	2.48 lb/MMscf	50.00 lb/MMscf
n-Hexane	156.37 lb/MMscf	250.00 lb/MMscf
Toluene	4.27 lb/MMscf	50.00 lb/MMscf
TMP, 2,2,4-	4.45 lb/MMscf	50.00 lb/MMscf
Xylenes	2.97 lb/MMscf	50.00 lb/MMscf
Total HAP	171.86 lb/MMscf	500 lb/MMscf
TOTAL Gas	52,963 lb/MMscf	--- lb/MMscf

2 - As per the Compressor Manufacturer (Ariel): "Typical leakage rates for traditional segmented packing rings are near 0.1 to 0.17 scfm (6.0 to 10.2 scfh) when the packing seals are in the new condition. Leakage rates of worn rings will increase until replaced. Typical rate for an 'alarm' point in order to schedule maintenance is near 1.7 to 3.4 scfm (10.2 to 20.4 scfh) scfm per packing case."
For this analysis, the 'alarm' point of 12 scfh was used.

3 - One Ariel KBZ/6 reciprocating compressor will be driven by each CAT G3616 engine and one small reciprocating compressor will be driven by an electric motor (< 50 hp) and used to compress stabilizer overhead vapors and stabilized condensate tank vapors.

Startup/Shutdown/Maintenance (Blowdown)

Unit ID (Point ID)	Description	No of Units	Total bhp	SSM and Blowdown Events/yr	Blowdown Gas Volume scf/unit	Blowdown Gas Volume scf/SSM	Total Gas Vented MMscf/yr	VOC 9,433 lb/MMscf tpy	n-Hexane 250 lb/MMscf tpy	BTEX, Hex, TMP (Ea) 50 lb/MMscf tpy	Total HAP 500 lb/MMscf tpy	CO2 250 lb/MMscf tpy	CH4 41,188 lb/MMscf tpy	CO2e GWP = 25 tpy
SSM (8E)	Full Blowdown (Ariel Recip. Comp)	4	20,000	104	54,732	218,926	22.77	107.38	2.85	0.57	5.69	2.85	469	11,725
	Full Blowdown (Electric Comps.)	2	100	6	400	800	0.005	0.02	6.0E-04	1.2E-04	1.2E-03	6.0E-04	0.10	2
	Pigging Events (Launcher/Receiver)	3	na	156	na	14,236	2.22	10.47	0.28	0.06	0.56	0.28	46	1,144
	Station ESD	1	na	1	na	885,000	0.89	4.17	0.11	0.02	0.22	0.11	18	456
TOTAL Pre-Control Blowdown:								**122.06**	**3.23**	**0.65**	**6.47**	**3.23**	**533**	**13,327**
Blowdown Control:								**98%**				**---**	**98%**	**---**
TOTAL Controlled Blowdown:								**2.44**	**0.06**	**0.01**	**0.13**	**3.23**	**11**	**13,327**

Each CAT G3616 Compressor Engine (CE-01 thru CE-04) Drives One (1) Ariel Reciprocating Compressor.

Notes: 1 - SSM Emissions are the sum of full compressor blowdowns and pigging events. Each engine will be equipped with an air starter.

2 - Compressor engine, pigging and station ESD blowdown volumes provided by Engineering Department. Compressor engine blowdown volume assumed the same as that for Dunbar station in New York.

Compressor Engine	Full Blowdown Volume:	54,732	scf/blowdown

Motor Driven Compressor	Full Blowdown Volume:	400	scf/blowdown

Station ESD	Blowdown Volume:	885,000	scf/blowdown

3 - To be conservative, the following gas characteristics were assumed:

Pollutant	Inlet Gas Analysis	Estimated
Carbon Dioxide	177 lb/MMscf	250 lb/MMscf
Methane	34,324 lb/MMscf	41,188 lb/MMscf
VOC (Propane)	8,575 lb/MMscf	9,433 lb/MMscf
n-Hexane	156 lb/MMscf	250 lb/MMscf
BTEX, TMP (ea)	3 lb/MMscf	50 lb/MMscf
Total HAP:	172 lb/MMscf	500 lb/MMscf

4 - Emission estimates are conservatively based on:

2	Full Gas Compressor Blowdowns each week	**3**	Pigging Events each week
6	Full Electric Compressor Blowdowns each year	**1**	Station ESD event per year

5 - Pigging volumes are estimated as follows:

PIG	No. of Units	D (in)	L (ft)	Pa (psig)	Vacf	Gas Density (lb/ft3)	Total Mass of Flammable Gas (lbm)	Vscf*
20" Receiver	1	24	14.0	740	43.98	3.3243	146.210	2,788
	1	20	12.0	740	26.18	3.3243	87.030	1,659
	1	16	5.0	740	6.98	3.3243	23.208	443
	1	10	25.0	740	13.64	3.3243	45.328	864
							TOTAL:	**5,754**
16" Launcher	1	20	10.0	1,440	21.82	7.7086	168.176	3,198
	1	16	14.5	1,440	20.25	7.7086	156.067	2,968
	1	12	9.0	1,440	7.07	7.7086	54.489	1,036
	1	8	25.0	1,440	8.73	7.7086	67.270	1,279
							TOTAL:	**8,482**

*Vscf = lbm gas * [379.482 scf/lb-mol] / [gas MW]

Dehydrators 01 and 02 (Flash Tank and Still Vent) – 125.0 MMscfd

Unit ID	Description	Capacity	Reference	Pollutant	GRI-GLYCalc Estimated Pre-Controlled Emissions		120% Worst-Case Pre-Controlled Emissions		Control Efficiency	Controlled Emissions	
					lb/hr	tpy	lb/hr	tpy	%	lb/hr	tpy
DFT-01 (9E) DFT-02 (11E)	Dehy 01 (DFT-01) Dehy 02 (DFT-02) Flash Tank (Controlled w/ Thermal Oxidizer)	Flow Rate **125.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	24.32	106.51	29.18	127.81	98.0%	**0.58**	**2.56**
			GRI-GLYCalc 4.0	Benzene	0.01	0.03	0.01	0.04	98.0%	**1.7E-04**	**7.6E-04**
			GRI-GLYCalc 4.0	Ethylbenzene	8.0E-03	0.03	0.01	0.04	98.0%	**1.9E-04**	**8.4E-04**
			GRI-GLYCalc 4.0	n-Hexane	0.49	2.13	0.58	2.56	98.0%	**0.01**	**0.05**
			GRI-GLYCalc 4.0	Toluene	0.02	0.09	0.03	0.11	98.0%	**5.1E-04**	**2.2E-03**
			GRI-GLYCalc 4.0	2,2,4-TMP	0.01	0.04	0.01	0.05	98.0%	**2.2E-04**	**9.7E-04**
			GRI-GLYCalc 4.0	Xylenes	0.01	0.04	0.01	0.05	98.0%	**2.2E-04**	**9.5E-04**
			GRI-GLYCalc 4.0	Tot HAP	0.54	2.37	0.65	2.84	98.0%	**0.01**	**0.06**
			GRI-GLYCalc 4.0	CH4	30.08	131.75	36.09	158.10	98.0%	**0.72**	**3.16**
			40CFR98 - Table A-1	CO2e	752	3,294	902	3,952	98.0%	**18**	**79**
DSV-01 (10E) DSV-02 (12E)	Dehy 01 (DSV-01) Dehy 02 (DSV-02) Still Vent (aka Regenerator) (Controlled w/ Thermal Oxidizer)	Flow Rate **125.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	44.73	195.92	53.68	235.10	98.0%	**1.07**	**4.70**
			GRI-GLYCalc 4.0	Benzene	0.72	3.17	0.87	3.80	98.0%	**0.02**	**0.08**
			GRI-GLYCalc 4.0	Ethylbenzene	2.38	10.41	2.85	12.49	98.0%	**0.06**	**0.25**
			GRI-GLYCalc 4.0	n-Hexane	1.55	6.80	1.86	8.17	98.0%	**0.04**	**0.16**
			GRI-GLYCalc 4.0	Toluene	3.47	15.19	4.16	18.23	98.0%	**0.08**	**0.36**
			GRI-GLYCalc 4.0	2,2,4-TMP	0.03	0.14	0.04	0.16	98.0%	**7.5E-04**	**3.3E-03**
			GRI-GLYCalc 4.0	Xylenes	3.94	17.27	4.73	20.72	98.0%	**0.09**	**0.41**
			GRI-GLYCalc 4.0	Tot HAP	12.10	52.98	14.51	63.57	98.0%	**0.29**	**1.27**
			GRI-GLYCalc 4.0	CH4	1.91	8.37	2.29	10.04	98.0%	**0.05**	**0.20**
			40CFR98 - Table A-1	CO2e	48	209	57	251	98.0%	**1**	**5**
DEHY 01, 02 (Sum of DSV and DFT) EACH UNIT	Dehy 01 (Total) Dehy 02 (Total) Total Dehydrator Emissions	Flow Rate **125.0** MMscfd **8,760** hr/yr	GRI-GLYCalc 4.0	VOC	69.05	302.42	82.86	362.91	98.0%	**1.66**	**7.26**
			GRI-GLYCalc 4.0	Benzene	0.73	3.20	0.88	3.84	98.0%	**0.02**	**0.08**
			GRI-GLYCalc 4.0	Ethylbenzene	2.38	10.44	2.86	12.53	98.0%	**0.06**	**0.25**
			GRI-GLYCalc 4.0	n-Hexane	2.04	8.94	2.45	10.72	98.0%	**0.05**	**0.21**
			GRI-GLYCalc 4.0	Toluene	3.49	15.28	4.19	18.34	98.0%	**0.08**	**0.37**
			GRI-GLYCalc 4.0	2,2,4-TMP	4.1E-02	0.18	4.9E-02	0.21	98.0%	**9.7E-04**	**4.3E-03**
			GRI-GLYCalc 4.0	Xylenes	3.95	17.31	4.74	20.77	98.0%	**0.09**	**0.42**
			GRI-GLYCalc 4.0	Tot HAP	12.64	55.35	15.16	66.42	98.0%	**0.30**	**1.33**
			GRI-GLYCalc 4.0	CH4	31.99	140.12	38.39	168.14	98.0%	**0.77**	**3.36**
			40CFR98 - Table A-1	CO2e	800	3,503	960	4,203	98.0%	**19**	**84**

Notes: 1 - Used GRI-GLYCalc V4.0 to calculate combined regenerator vent/flash gas emissions.

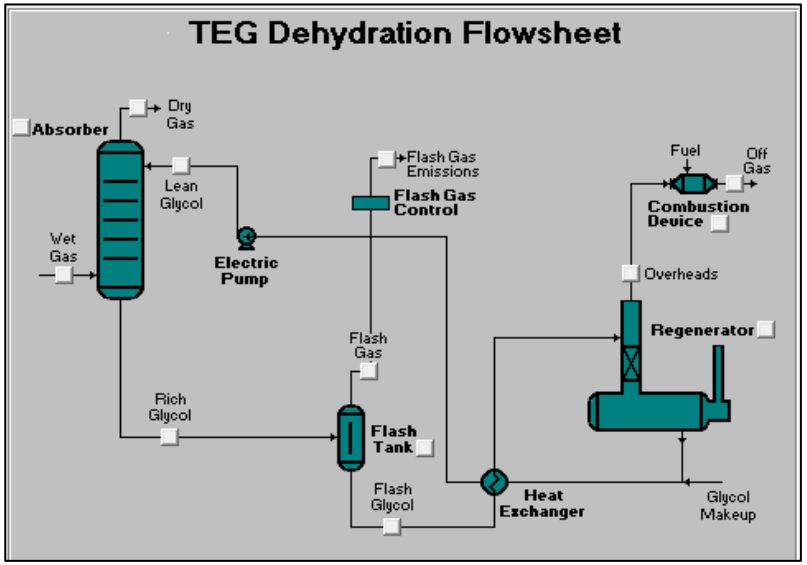
2 - Total HAP includes n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), and other components.

3 - A 20% contingency has been added to the GRI-GLYCalc results to account for potential future changes in gas quality.

4 - Normal dehydration unit operation to include an electric glycol pump; however, during periods of electric power interruption, a smaller gas-assisted glycol pump will be used. Dehydrator emissions associated with operation of an electric glycol pump are presented above as they are higher than emissions associated with operation of a gas-assisted glycol pump.

Dehydrators 01 and 02 (Summary) – 125.0 MMscfd

Unit ID	Description	Reference	Pollutant	GRI-GLYCalc Results		W/ 20% Margin		Control Eff	Controlled Emissions	
				lb/hr	tpy	lb/hr	tpy	%	lb/hr	tpy
DEHY-01 (9E/10E) DEHY-02 (11E/12E)	Dehydrator 01 Dehydrator 02 Sum of Flash Tank and Still Vent - (Flash Tank Offgas and Still Vent Controlled w/ Thermal Oxidizer) 125.0 MMscfd 8,760 Hr/yr 45,625 MMscf/yr 5.21 MMscf/hr NESHAP HH - Exempt	---	NOX	---	---	---	---	---	**---**	**---**
		---	CO	---	---	---	---	---	**---**	**---**
		GRI-GLYCalc 4.0	VOC	69.05	302.42	82.86	362.91	98.0%	**1.66**	**7.26**
		---	SO2	---	---	---	---	---	**---**	**---**
		---	PM10/2.5	---	---	---	---	---	**---**	**---**
		GRI-GLYCalc 4.0	Benzene	0.73	3.20	0.88	3.84	98.0%	**0.02**	**0.08**
		GRI-GLYCalc 4.0	Ethylbenzene	2.38	10.44	2.86	12.53	98.0%	**0.06**	**0.25**
		---	HCHO	---	---	---	---	---	**---**	**---**
		GRI-GLYCalc 4.0	n-Hexane	2.04	8.94	2.45	10.72	98.0%	**0.05**	**0.21**
		---	Methanol	---	---	---	---	---	**---**	**---**
		GRI-GLYCalc 4.0	Toluene	3.49	15.28	4.19	18.34	98.0%	**0.08**	**0.37**
		GRI-GLYCalc 4.0	2,2,4-TMP	0.04	0.18	0.05	0.21	98.0%	**9.7E-04**	**4.3E-03**
		GRI-GLYCalc 4.0	Xylenes	3.95	17.31	4.74	20.77	98.0%	**0.09**	**0.42**
		---	Other HAP	---	---	---	---	---	**---**	**---**
		GRI-GLYCalc 4.0	Total HAP	12.64	55.35	15.16	66.42	98.0%	**0.30**	**1.33**
		---	CO2	---	---	---	---	---	**---**	**---**
		GRI-GLYCalc 4.0	CH4	31.99	140.12	38	168	98.0%	**1**	**3**
		---	N2O	---	---	---	---	---	**---**	**---**
		40CFR98 - Table A-1	CO2e	800	3,503	960	4,203	98.0%	**19**	**84**



***Dehydrator Operating Parameters**

Dry Gas Flow Rate:	125.0 MMscfd	Extended Gas Analysis:	Process Simulation
Wet Gas Temperature:	80 oF	Flash Tank Temperature:	110 oF
Wet Gas Pressure:	1,000 psig	Flash Tank Pressure:	60 psig
Wet Gas Water Content:	Saturated	Flash Tank Off-Gas:	≥ 98% Control
Dry Gas Water Content:	7.0 lb H2O/MMscf	Stripping Gas:	na
Lean Glycol Water Content:	1.5 wt% H2O	Stripping Gas Flow Rate:	na
Glycol Pump Type:	Electric	Regen Overhead Control:	98% Thermal Oxidizer
Glycol Pump Model:	na	Condenser Temperature:	na
Lean Glycol Circulation Rate:	20.00 gpm	Condenser Pressure:	na

Note: Each dehydrator will be equipped with an electric glycol pump (primary) and gas-assist pump (backup).

Additional GRI-GLYCalc 4.0 Model Results:

Flash Tank Off-Gas Flow:	1,170 scfh	Wet Gas Water Content:	0.068 Vol%
Regen Overhead Stream:	3,740 scfh	Dry Gas Water Content:	0.003 Vol%
Lean Glycol Recirc Ratio:	7.4 gal/lb-H2O	Rich Glycol Water Content:	2.850 wt%

Thermal Oxidizer 01 - 7.84 MMBtu/hr

Unit ID (Point ID)	Description	Reference	Pollutant	Emission Factor		Pre-Controlled		Control	Controlled	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
TO-01 (13E) Controls Dehydrators, Stabilized Condensate Tanks and Stabilized Condensate Loading	**Thermal Oxidizer 01 (Combustion Only)**	EPA AP-42 Table 1.4-2	NOx	114.18	0.098	na	na	na	**0.77**	**3.37**
		EPA AP-42 Table 13.5-2	CO	361.04	0.31	na	na	na	**2.43**	**10.65**
		GRI-GLYCalc, EPA AP-42	VOC	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-2	SO2	0.69	5.9E-04	na	na	na	**4.6E-03**	**0.02**
	7.07 MMBtu/hr (LHV)	EPA AP-42 Table 1.4-2	PM10/2.5	8.68	0.01	na	na	na	**0.06**	**0.26**
	7.84 MMBtu/hr (HHV)	GRI-GLYCalc, EPA AP-42	Benzene	See Dehys, Tanks, TLO						
		GRI-GLYCalc, EPA AP-42	Ethylbenzene	See Dehys, Tanks, TLO						
	8,760 hr/yr	EPA AP-42 Table 1.4-3	HCHO	0.09	7.35E-05	na	na	na	**5.8E-04**	**2.5E-03**
		GRI-GLYCalc, EPA AP-42	n-Hexane	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-3	Methanol	---	---	na	na	na	**---**	**---**
	1,050 Btu/scf (LHV)	GRI-GLYCalc, EPA AP-42	Toluene	See Dehys, Tanks, TLO						
	1,165 Btu/scf (HHV)	GRI-GLYCalc, EPA AP-42	2,2,4-TMP	See Dehys, Tanks, TLO						
		GRI-GLYCalc, EPA AP-42	Xylenes	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-3	Other HAP	2.2E-03	1.9E-06	na	na	na	**1.5E-05**	**6.4E-05**
	6,734 scf/hr	Sum	Total HAP	0.09	7.5E-05	na	na	na	**5.9E-04**	**2.6E-03**
	161.62 Mscfd	EPA AP-42 Table 1.4-2	CO2	137,018	118	na	na	na	**923**	**4,041**
	58.99 MMscf/yr	GRI-GLYCalc, EPA AP-42	CH4	See Dehys, Tanks, TLO						
		EPA AP-42 Table 1.4-2	N2O	2.51	2.2E-03	na	na	na	**1.7E-02**	**0.07**
		40CFR98 - Table A-1	CO2e	137,766	118	na	na	na	**928**	**4,063**

Notes:

1 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

3 - Max Heat Input calculated as follows:

Total Flash Tank Offgas (GRI-GLYCalc):

	2,340	scf/hr Total Flash Tank Off-Gas
	1,465	Btu/scf (HHV)
SubTotal:	**3.43**	**MMBtu/hr**

Total Regenerator/Still Vent Gas (GRI-GLYCalc):

	7,480	scf/hr Total Still Vent Gas
	282	Btu/scf (HHV)
SubTotal:	**2.11**	**MMBtu/hr**

Stabilized Condensate Storage Tanks:

	28	scf/hr
	3,242	Btu/scf (HHV)
SubTotal:	**0.09**	**MMBtu/hr**

Stabilized Condensate Truck Loading:

	27	scf/hr
	3,242	Btu/scf (HHV)
SubTotal:	**0.09**	**MMBtu/hr**

Pilot and Fuel Gas:

	850	scf/hr - Estimate
	1,300	Btu/scf (HHV)
SubTotal:	**1.11**	**MMBtu/hr**

Total Heat Input:

Flash Tank Offgas:	3.43	MMBtu/hr	1,465	Btu/scf
Regenerator/Still Vents:	2.11	MMBtu/hr	282	Btu/scf
Stabilized Condensate Storage Tanks:	0.09	MMBtu/hr	3,242	Btu/scf
Stabilized Condensate Truck Loading:	0.09	MMBtu/hr	3,242	Btu/scf
Pilot and Fuel Gas:	1.11	MMBtu/hr	1,300	Btu/scf
15% Contingency:	1.02	MMBtu/hr	1,465	Btu/scf
TOTAL:	**7.84**	MMBtu/hr (HHV)	**1,165**	Btu/scf (HHV)

Dehydrator Reboiler - 2.00 MMBtu/hr

Unit ID	Description	Reference	Pollutant	Emission Factor		Pre-Controlled		Control	Controlled	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
RBV-01 (14E) RBV-02 (15E)	**Reboiler 01** **Reboiler 02** **2.00 MMBtu/hr (HHV)** **8,760 hr/yr** 1,020 Btu/scf (HHV) 1,961 scf/hr 47.06 Mscfd 17.18 MMscf/yr	EPA AP-42 Table 1.4-2	NOX	100.00	0.10	0.20	0.86	na	**0.20**	**0.86**
		EPA AP-42 Table 1.4-2	CO	84.00	0.08	0.16	0.72	na	**0.16**	**0.72**
		EPA AP-42 Table 1.4-2	VOC	5.68	0.01	0.01	0.05	na	**0.01**	**0.05**
		EPA AP-42 Table 1.4-2	SO2	0.60	5.9E-04	1.2E-03	0.01	na	**1.2E-03**	**0.01**
		EPA AP-42 Table 1.4-2	PM10/2.5	7.60	0.01	0.01	0.07	na	**0.01**	**0.07**
		EPA AP-42 Table 1.4-3	Benzene	2.1E-03	2.1E-06	4.1E-06	1.8E-05	na	**4.1E-06**	**1.8E-05**
		EPA AP-42 Table 1.4-3	Ethylbenzene	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	HCHO	0.08	7.4E-05	1.5E-04	6.4E-04	na	**1.5E-04**	**6.4E-04**
		EPA AP-42 Table 1.4-3	n-Hexane	1.80	1.8E-03	3.5E-03	0.02	na	**3.5E-03**	**0.02**
		EPA AP-42 Table 1.4-3	Methanol	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Toluene	3.4E-03	3.3E-06	6.7E-06	2.9E-05	---	**6.7E-06**	**2.9E-05**
		EPA AP-42 Table 1.4-3	2,2,4-TMP	---	---	---	---	na	**---**	**---**
		EPA AP-42 Table 1.4-3	Xylenes	---	---	---	---	---	**---**	**---**
		EPA AP-42 Table 1.4-3	Other HAP	1.9E-03	1.9E-06	3.7E-06	1.6E-05	na	**3.7E-06**	**1.6E-05**
		EPA AP-42 Table 1.4-3	Total HAP	1.88	1.8E-03	3.7E-03	0.02	na	**3.7E-03**	**0.02**
		EPA AP-42 Table 1.4-2	CO2	120,000	118	235	1,031	na	**235**	**1,031**
		EPA AP-42 Table 1.4-2	CH4	2.30	2.3E-03	4.5E-03	0.02	na	**4.5E-03**	**0.02**
		EPA AP-42 Table 1.4-2	N2O	2.20	2.2E-03	4.3E-03	0.02	na	**4.3E-03**	**0.02**
		40CFR98 - Table A-1	CO2e	120,713	118	237	1,037	na	**237**	**1,037**

Notes: 1 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

3 - Total HAP includes HCHO, n-hexane, BTEX (benzene, toluene, ethylbenzene, xylene), acetaldehyde, acrolein, and methanol.

Flare 01 - 5.21 MMBtu/hr

Unit ID (Point ID)	Description	Reference	Pollutant	Emission Factor		Pre-Controlled		Control	Controlled	
				lb/MMscf	lb/MMBtu	lb/hr	tpy	%	lb/hr	tpy
FLR-01 (16E) Controls Blowdowns	**Flare 01 (Combustion Only)** 4.70 MMBtu/hr (LHV) **5.21 MMBtu/hr (HHV)** **8,760 hr/yr** 1,099 Btu/scf (LHV) 1,218 Btu/scf (HHV) 4,279 scf/hr 102.70 Mscfd 37.49 MMscf/yr	EPA AP-42 Table 1.4-2	NOx	119.41	0.098	na	na	na	**0.51**	**2.24**
		EPA AP-42 Table 13.5-2	CO	377.56	0.31	na	na	na	**1.62**	**7.08**
		Engineering Judgement	VOC	See SSM						
		EPA AP-42 Table 1.4-2	SO2	0.72	5.9E-04	na	na	na	**3.1E-03**	**0.01**
		EPA AP-42 Table 1.4-2	PM10/2.5	9.07	0.01	na	na	na	**0.04**	**0.17**
		Engineering Judgement	Benzene	See SSM						
		Engineering Judgement	Ethylbenzene	See SSM						
		EPA AP-42 Table 1.4-3	HCHO	0.09	7.4E-05	na	na	na	**3.8E-04**	**1.7E-03**
		Engineering Judgement	n-Hexane	See SSM						
		EPA AP-42 Table 1.4-3	Methanol	---	---	na	na	na	**---**	**---**
		Engineering Judgement	Toluene	See SSM						
		Engineering Judgement	2,2,4-TMP	See SSM						
		Engineering Judgement	Xylenes	See SSM						
		EPA AP-42 Table 1.4-3	Other HAP	2.3E-03	1.9E-06	na	na	na	**9.7E-06**	**4.2E-05**
		Sum	Total HAP	0.09	7.5E-05	na	na	na	**3.9E-04**	**1.7E-03**
		EPA AP-42 Table 1.4-2	CO2	143,287	118	na	na	na	**613**	**2,686**
		Engineering Judgement	CH4	See SSM						
		EPA AP-42 Table 1.4-2	N2O	2.63	2.2E-03	na	na	na	**1.1E-02**	**0.05**
		40CFR98 - Table A-1	CO2e	144,070	118	na	na	na	**617**	**2,700**

Notes:

1 - The combustion emission factors are based on a default fuel heat content of 1,020 Btu/scf (HHV).

2 - PM10/2.5 is filterable and condensable particulate matter; including PM10 and PM2.5.

3 - Max Heat Input calculated as follows:

Total Blowdown Volume:

	2,853	scf/hr
	1,218	Btu/scf (HHV)
SubTotal:	**3.48**	**MMBtu/hr**

Pilot and Purge Gas:

	868	scf/hr
	1,218	Btu/scf (HHV)
SubTotal:	**1.06**	**MMBtu/hr**

Total Heat Input:

Blowdowns:	3.48	MMBtu/hr	1,218	Btu/scf
Pilot and Purge Gas:	1.06	MMBtu/hr	1,218	Btu/scf
15% Contingency:	0.68	MMBtu/hr	1,218	Btu/scf
TOTAL:	**5.21**	MMBtu/hr (HHV)	**1,218**	Btu/scf (HHV)

Storage Tanks - Stabilized Condensate / Produced Water

Unit ID (Point ID)	Material Stored	Capa-city bbl	Turn-overs /yr	T-Put bbl/yr	TANKS 4.0 (Working Losses)	TANKS 4.0 (Breathing Losses)	VOC 100.00 Wgt%		n-Hexane 5.00 Wgt%		Benzene 1.00 Wgt%		Toluene 1.00 Wgt%		Ethylbenzene 1.00 Wgt%		Xylenes 2.50 Wgt%		Total HAP 10.50 Wgt%	
							lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-01 (17E)	Stab. Cond.	400	78.3	31,333	0.170 lb/bbl	0.028 lb/bbl	0.71	3.10	0.04	0.16	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.33
T-02 (18E)	Stab. Cond.	400	78.3	31,333	0.170 lb/bbl	0.028 lb/bbl	0.71	3.10	0.04	0.16	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.33
T-03 (19E)	Stab. Cond.	400	78.3	31,333	0.170 lb/bbl	0.028 lb/bbl	0.71	3.10	0.04	0.16	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.33
T-04 (20E)	Stab. Cond.	400	78.3	31,333	0.170 lb/bbl	0.028 lb/bbl	0.71	3.10	0.04	0.16	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.33
T-05 (21E)	Stab. Cond.	400	78.3	31,333	0.170 lb/bbl	0.028 lb/bbl	0.71	3.10	0.04	0.16	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.33
T-06 (22E)	Stab. Cond.	400	78.3	31,333	0.170 lb/bbl	0.028 lb/bbl	0.71	3.10	0.04	0.16	0.01	0.03	0.01	0.03	0.01	0.03	0.02	0.08	0.07	0.33
Total Pre-Control Emissions:							**4.25**	**18.60**	**0.21**	**0.93**	**0.04**	**0.19**	**0.04**	**0.19**	**0.04**	**0.19**	**0.11**	**0.47**	**0.45**	**1.95**
Thermal Oxidizer Control:							**98%**													
Total Controlled Emissions:							**0.08**	**0.37**	**0.00**	**0.02**	**8.5E-04**	**3.7E-03**	**8.5E-04**	**3.7E-03**	**8.5E-04**	**3.7E-03**	**2.1E-03**	**0.01**	**0.01**	**0.04**

Unit ID (Point ID)	Material Stored	Capa-city bbl	Turn-overs /yr	T-Put bbl/yr	TANKS 4.0 (Working Losses)	TANKS 4.0 (Breathing Losses)	VOC 100.00 Wgt%		n-Hexane 2.00 Wgt%		Benzene 1.00 Wgt%		Toluene 1.00 Wgt%		Ethylbenzene 1.00 Wgt%		Xylenes 1.00 Wgt%		Total HAP 6.00 Wgt%	
							lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-07 (23E)	Prod. H2O	400	37.5	15,000	0.007 lb/bbl	0.001 lb/bbl	0.01	0.06	6.8E-04	3.0E-03	1.4E-04	6.0E-04	1.4E-04	6.0E-04	1.4E-04	6.0E-04	3.4E-04	1.5E-03	1.4E-03	0.01
T-08 (24E)	Prod. H2O	400	37.5	15,000	0.007 lb/bbl	0.001 lb/bbl	0.01	0.06	6.8E-04	3.0E-03	1.4E-04	6.0E-04	1.4E-04	6.0E-04	1.4E-04	6.0E-04	3.4E-04	1.5E-03	1.4E-03	0.01
TOTAL EMISSIONS:							**0.03**	**0.12**	**1.4E-03**	**0.01**	**2.7E-04**	**1.2E-03**	**2.7E-04**	**1.2E-03**	**2.7E-04**	**1.2E-03**	**6.8E-04**	**3.0E-03**	**2.9E-03**	**0.01**

Notes: 1 - Storage tanks emissions are estimated using the EPA TANKS 4.0.9d software program. The stabilized condensate composition is based on a process simulation and the produced water composition is estimated to be 95% water and 5% condensate (gasoline RVP=12).

Table 1. Produced Water Storage Tank Flash Loss Emissions Factors for Barnett Shale Special Inventory Purposes ONLY

Pollutant	Average Produced Water Emission Factor (lb/bbl)	
	Gas Production Only Sites	Liquid Hydrocarbon and Gas Production Sites
VOC	0.01	0.0402
Benzene	0.0001	0.000054
Toluene	0.0003	0.000130
Ethylbenzene	0.000006	0.000003
Xylene(s)	0.00006	0.000049
n-Hexane	NA	0.000987

2 - Total HAP from the produced water tanks is estimated at 6.0% of VOC emissions. This is conservative based on an investigation of other produced water emission estimating protocols, as exemplified above (e.g., (0.0001+0.0003+0.000006+0.00006)*100 = 4.7%).

3 - There will be no flashing losses from the stabilized condensate tanks as the product is heated to remove the lighter-end hydrocarbons prior to the liquids being placed in the storage tanks.

4 - It is estimated that each stabilized condensate tank will be emptied up to: **78** t-o/yr = **31,333** bbl/yr

5 - It is estimated that each produced water tank will be emptied up to: **38** t-o/yr = **15,000** bbl/yr

6 - It is projected each stabilized condensate storage tank will have an average throughput of 31,333 bbl/yr; however, it is possible that all product (188,000 bbl/yr) could be moved through one tank.

7 - It is projected each produced water storage tank will have an average throughput of 15,000 bbl/yr; however, it is possible that all product (30,000 bbl/yr) could be moved through one tank.

Truck Load-Out - Stabilized Condensate / Produced Water

Unit ID (Point ID)	Description	S	P	M	T	CE	L_L	T-Put	VOC AP-42 Sect 5.2		n-Hexane, BTEX, and 2,2,4-TMP (Ea) 5.00% of VOC		Total HAP 30.00% of VOC	
		sat. fac.	psia	lb/lb-mol	°R	%	lb/Mgal	Mgal/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TLO (25E)	Truck Load-Out - Stabilized Condensate	0.60	5.4	57.1	510	68.6%	1.42	7,896	9.97	5.62	0.50	0.28	2.99	1.69

Unit ID (Point ID)	Description	S	P	M	T	CE	L_L	T-Put	VOC AP-42 Sect 5.2		n-Hexane, BTEX, and 2,2,4-TMP (Ea) 5.00% of VOC		Total HAP 30.00% of VOC	
		sat. fac.	psia	lb/lb-mol	°R	%	lb/Mgal	Mgal/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
TLO (25E)	Truck Load-Out - Produced Water	0.60	1.5	30.0	510	0.0%	0.66	1,260	4.62	0.42	0.23	0.02	1.39	0.12
								TOTAL EMISSIONS:	**14.59**	**6.04**	**0.73**	**0.30**	**4.38**	**1.81**

Notes: 1 - Emission factors and formulas are from AP-42 Section 5.2 "Transportation and Marketing of Petroleum Liquids":

$L_L = 12.46 \times S \times P \times M / T \times (1 - CE)$

where:
- L_L = loading loss, lb/1000 gal of liquid loaded
- S = saturation factor, use 0.60 for submerged fill.
- P = true vapor pressure of liquid loaded, psia. Stab. condensate vapor pressure from EPA TANKS 4.0.9d output. Vapor pressure for produced water is estimated.
- M = molecular weight of vapors, lb/lb-mol. Stab. Condensate MW from EPA TANKS 4.0, MW for produced water is estimated.
- T = temperature of bulk liquid loaded, °R = °F + 460 (Conservatively assumed 50 °F.)
- CE = overall emission reduction efficiency (collection efficiency x control efficiency). For condensate loading, the collection efficiency is 70% for tanker trucks not passing the NSPS level annual leak test and the control efficiency is 98%.

2 - Produced water molecular weight and vapor pressure are based on operator experience and sampling data at various locations in the Marcellus Shale basin.

3 - The total stabilized condensate storage tank capacity at the facility is:	**2,400**	bbl	=	**100,800**	gal.
4 - The total produced water storage tank capacity at the facility is:	**800**	bbl	=	**33,600**	gal.
5 - It is estimated the stabilized condensate tanks will be emptied up to:	**78**	t-o/yr	=	**187,998**	bbl/yr
6 - It is estimated the produced water tanks will be emptied up to:	**38**	t-o/yr	=	**30,000**	bbl/yr

7 - n-Hexane, each BTEX, and 2,2,4-TMP components are conservatively estimated at 5% of VOC emissions and Total HAP is estimated at 30% of VOC emissions.

8 - Emissions from loading of stabilized condensate will be controlled with a 98% efficient combustor.

9 - It is assumed each tanker truck holds 7,000 gallons and can be loaded in one hour.

Piping and Equipment Fugitives - Gas & Light Oil

Unit ID (Point ID)	Description	Component (Unit) Type (Gas)	Unit Count	THC Factor	LDAR Control Credit	Hydrocarbons (THC)		VOC 17.81 Wgt%		n-Hexane 0.47 Wgt%		BTEX, TMP-ea 0.09 Wgt%		Total HAP 0.94 Wgt%		CO2 0.47 Wgt%		CH4 77.77 Wgt%		CO2e GWP = 25	
				lb/hr/Unit		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG-G (1F)	Process Piping Fugitives (Gas)	Valves	960	0.00992	92%	0.76	3.34	0.14	0.59	3.6E-03	0.02	7.2E-04	3.2E-03	0.01	0.03	0.00	0.02	0.59	2.60	15	65
		Pump Seals	0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		Other	72	0.01940	0%	1.40	6.12	0.25	1.09	6.6E-03	2.9E-02	1.3E-03	5.8E-03	1.3E-02	0.06	6.6E-03	0.03	1.09	4.76	27	119
		Connectors	3,132	0.00044	93%	0.10	0.42	0.02	0.08	4.6E-04	2.0E-03	9.1E-05	4.0E-04	9.1E-04	4.0E-03	4.6E-04	2.0E-03	0.08	0.33	2	8
		Flanges	783	0.00086	0%	0.67	2.95	0.12	0.53	3.2E-03	1.4E-02	6.4E-04	2.8E-03	6.4E-03	0.03	3.2E-03	1.4E-02	0.52	2.29	13	57
		Open-ended	34	0.00441	0%	0.15	0.65	0.03	0.12	7.0E-04	3.1E-03	1.4E-04	6.1E-04	1.4E-03	6.1E-03	7.0E-04	3.1E-03	0.12	0.50	3	13
			4,981		**Subtotal:**	**3.08**	**13.48**	**0.55**	**2.40**	**0.01**	**0.06**	**2.9E-03**	**1.3E-02**	**0.03**	**0.13**	**0.01**	**0.06**	**2.39**	**10.48**	**60**	**262**

Unit ID (Point ID)	Description	Component (Unit) Type (Light Oil)	Unit Count	THC Factor	LDAR Control Credit	Hydrocarbons (THC)		VOC 100.00 Wgt%		n-Hexane 5.00 Wgt%		BTEX, TMP-ea 2.00 Wgt%		Total HAP 15.00 Wgt%		CO2 --- Wgt%		CH4 --- Wgt%		CO2e GWP = 25	
				lb/hr/Unit		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
FUG-L (2F)	Process Piping Fugitives (Light Oil)	Valves	576	0.00551	88%	0.38	1.67	0.38	1.67	0.02	0.08	7.6E-03	0.03	0.06	0.25	---	---	---	---	---	---
		Pump Seals	17	0.02866	75%	0.12	0.53	0.12	0.53	6.0E-03	0.03	2.4E-03	1.1E-02	1.8E-02	0.08	---	---	---	---	---	---
		Other	43	0.01653	0%	0.71	3.13	0.71	3.13	0.04	0.16	0.01	0.06	0.11	0.47	---	---	---	---	---	---
		Connectors	1,296	0.00046	93%	0.04	0.18	0.04	0.18	2.1E-03	0.01	8.4E-04	3.7E-03	6.3E-03	0.03	---	---	---	---	---	---
		Flanges	324	0.00024	0%	0.08	0.34	0.08	0.34	3.9E-03	0.02	1.6E-03	6.9E-03	1.2E-02	0.05	---	---	---	---	---	---
		Open-ended	20	0.00309	0%	0.06	0.27	0.06	0.27	3.1E-03	0.01	1.2E-03	5.5E-03	0.01	0.04	---	---	---	---	---	---
			2,276		**Subtotal:**	**1.40**	**6.13**	**1.40**	**6.13**	**0.07**	**0.31**	**0.03**	**0.12**	**0.21**	**0.92**	**---**	**---**	**---**	**---**	**---**	**---**
		TOTAL FUGITIVE EMISSIONS:				**4.48**	**19.60**	**1.95**	**8.53**	**0.08**	**0.37**	**0.03**	**0.14**	**0.24**	**1.05**	**0.01**	**0.06**	**2.39**	**10.48**	**60**	**262**

Notes: 1 - Assumed 8,760 hours per year of fugitive emissions.

2 - Gas and Light Oil emissions calculated using EPA Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

TABLE 2.4 O&G PROD (AVE)	Gas		Light Oil	
	kg/hr	lb/hr	kg/hr	lb/hr
Valves	4.5E-03	0.00992	2.5E-03	0.00551
Pump Seals	na	na	1.3E-02	0.02866
Others	8.8E-03	0.01940	7.5E-03	0.01653
Connectors	2.0E-04	0.00044	2.1E-04	0.00046
Flanges	3.9E-04	0.00086	1.1E-04	0.00024
Open-Ended Lines	2.0E-03	0.00441	1.4E-03	0.00309

3 - Component counts based on engineering judgement and include a 20% contingency.

4 - "Other" components include compressor seals, relief valves, diaphragms, drains, meters, etc.

5 - To be conservative, the following gas and water/oil characteristics were assumed:

Pollutant	Gas		Light Oil	
	Analysis	Estimated	Analysis	Estimated
Carbon Dioxide	0.33 Wgt%	0.47 Wgt%	--- Wgt%	--- Wgt%
Methane	64.81 Wgt%	77.77 Wgt%	--- Wgt%	--- Wgt%
VOC	16.19 Wgt%	17.81 Wgt%	--- Wgt%	100.00 Wgt%
n-Hexane	0.30 Wgt%	0.47 Wgt%	--- Wgt%	5.00 Wgt%
BTEX, TMP-ea	0.01 Wgt%	0.09 Wgt%	--- Wgt%	2.00 Wgt%
Total HAP	0.32 Wgt%	0.94 Wgt%	--- Wgt%	15.00 Wgt%

6 - As the facility will be subject to the equipment leak standards under NSPS Subpart OOOOa, an LDAR control credit has been taken for a 500 ppm leak definition LDAR program.

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Engine Crankcase (ECC) Emissions (Fugitive)

Unit ID (Point ID)	Site Rating	Operations	Leak Rate	NOx		CO		VOC w/ HCHO		SO2		PM10/2.5	
			0.39 scf/bhp-hr	6.02 lb/MMscf		41.70 lb/MMscf		11.74 lb/MMscf		0.03 lb/MMscf		0.51 lb/MMscf	
			MMscf/yr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
ECC (3F)	5,000 bhp (ea)	8,760 hr/yr	17.10	0.01	0.05	0.08	0.36	0.02	0.10	5.9E-05	2.6E-04	1.0E-03	4.4E-03
	1,818 bhp	500 hr/yr	0.35	4.3E-03	1.1E-03	0.03	0.01	0.01	2.1E-03	2.1E-05	5.3E-06	3.6E-04	9.1E-05
	21,818 bhp (tot)	8,760 hr/yr	68.77	0.05	0.21	0.33	1.43	0.09	0.40	2.4E-04	1.0E-03	4.0E-03	0.02
TOTAL:	**21,818 bhp**		**TOTAL:**	**0.05**	**0.21**	**0.33**	**1.43**	**0.09**	**0.40**	**2.4E-04**	**1.0E-03**	**4.0E-03**	**0.02**

Unit ID	Site Rating	Operations	Leak Rate	Benzene		Ethylbenzene		Formaldehyde		n-Hexane		Methanol		Toluene		TMP, 2,2,4-	
			0.39 scf/bhp-hr	0.02 lb/MMscf		2.0E-03 lb/MMscf		2.11 lb/MMscf		0.06 lb/MMscf		0.13 lb/MMscf		0.02 lb/MMscf		0.01 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
ECC (3F)	5,000 bhp (ea)	8,760 hr/yr	17.10	4.4E-05	1.9E-04	4.0E-06	1.7E-05	4.1E-03	0.02	1.1E-04	4.9E-04	2.5E-04	1.1E-03	4.1E-05	1.8E-04	2.5E-05	1.1E-04
	1,818 bhp	500 hr/yr	0.35	1.6E-05	4.0E-06	1.4E-06	3.6E-07	1.5E-03	3.7E-04	4.0E-05	1.0E-05	9.1E-05	2.3E-05	1.5E-05	3.7E-06	9.1E-06	2.3E-06
	21,818 bhp (tot)	8,760 hr/yr	68.77	1.8E-04	7.7E-04	1.6E-05	7.0E-05	0.02	0.07	4.5E-04	2.0E-03	1.0E-03	4.4E-03	1.6E-04	7.2E-04	1.0E-04	4.4E-04
TOTAL:	**21,818 bhp**		**TOTAL:**	**1.8E-04**	**7.7E-04**	**1.6E-05**	**7.0E-05**	**0.02**	**0.07**	**4.5E-04**	**2.0E-03**	**1.0E-03**	**4.4E-03**	**1.6E-04**	**7.2E-04**	**1.0E-04**	**4.4E-04**

Unit ID	Site Rating	Operations	Leak Rate	Xylenes		Other/Trace		Total HAPs		CO2		CH4		N2O		CO2e	
			0.39 scf/bhp-hr	0.01 lb/MMscf		0.74 lb/MMscf		3.10 lb/MMscf		6,443 lb/MMscf		38 lb/MMscf		0.011 lb/MMscf		7,387 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
ECC (3F)	5,000 bhp (ea)	8,760 hr/yr	17.10	1.8E-05	8.0E-05	1.4E-03	0.01	0.01	0.03	13	55	0.07	0.32	2.2E-05	9.6E-05	14	63
	1,818 bhp	500 hr/yr	0.35	6.7E-06	1.7E-06	5.2E-04	1.3E-04	2.2E-03	5.5E-04	5	1	0.03	0.01	8.0E-06	2.0E-06	5	1
	21,818 bhp (tot)	8,760 hr/yr	68.77	7.4E-05	3.2E-04	0.01	0.03	0.02	0.11	51	222	0.3	1.3	8.8E-05	3.9E-04	58	254
TOTAL:	**21,818 bhp**		**TOTAL:**	**7.4E-05**	**3.2E-04**	**0.01**	**0.03**	**0.02**	**0.11**	**51**	**222**	**0.3**	**1.3**	**8.8E-05**	**3.9E-04**	**58**	**254**

Notes:

As per Caterpillar's Application & Installation Guide - Crankcase Ventilation Systems:
"[B]low-by on a new engine is approx. 0.5 ft3/bhp-hr
and design for a worn engine should be 1.0 ft3/bhp-hr."
http://s7d2.scene7.com/is/content/Caterpillar/CM20160713-53120-62603

Actual (acf) to Standard (scf) Conversions

1.0 acf/hp-hr = 0.39 scf/hp-hr

31,255 acf/min = 12,205 scf/min

1,400 Ft Elev 13.97 Patm 0.0 psig (P) 825 oF (T)

(13.97 = Patm @ 1,400 ft elev)

scf = acf * [(P+Patm)/14.7] * [528/(T+460)]

Potentially Applicable

AP-42 and GHG EMISSION FACTORS

(Preferentially use test data or vendor data where available)

	Pollutant	GAS-FIRED ENGINE			GAS-FIRED TURBINE		
		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)	3.170E+00	4.080E+00	2.210E+00	3.200E-01	1.300E-01	9.900E-02
	CO (≥ 90% Load)	3.860E-01	3.170E-01	3.720E+00	8.200E-02	3.000E-02	1.500E-02
	THC (TOC)	1.640E+00	1.470E+00	3.580E-01	1.100E-02	1.100E-02	1.100E-02
	NMHC (THC-CH4)	1.900E-01	2.200E-01	1.280E-01	2.400E-03	2.400E-03	2.400E-03
	NMNEHC (NMHC-C2H6)	1.191E-01	1.150E-01	5.760E-02	2.100E-03	2.100E-03	2.100E-03
	VOC	1.200E-01	1.180E-01	2.960E-02	2.100E-03	2.100E-03	2.100E-03
	SO2*** (2,000 gr-S/MMscf)	5.880E-04	5.880E-04	5.880E-04	3.400E-03	3.400E-03	3.400E-03
	PM10/2.5 (Filter+Cond)	4.831E-02	9.987E-03	1.941E-02	6.600E-03	6.600E-03	6.600E-03
HAPs	Benzene	1.940E-03	4.400E-04	1.580E-03	1.200E-05	1.200E-05	9.100E-07
	Ethylbenzene	1.080E-04	3.970E-05	2.480E-05	3.200E-05	3.200E-05	3.200E-05
	Formaldehyde (HCHO)	5.520E-02	5.280E-02	2.050E-02	7.100E-04	7.100E-04	2.000E-05
	n-Hexane	4.450E-04	1.110E-03	---	---	---	---
	Methanol (MeOH)	2.480E-03	2.500E-03	3.060E-03	---	---	---
	Toluene	9.630E-04	4.080E-04	5.580E-04	1.300E-04	1.300E-04	1.300E-04
	TMP, 2,2,4- (i-Octane)	8.460E-04	2.500E-04	---	---	---	---
	Xylenes	2.680E-04	1.840E-04	1.950E-04	6.400E-05	6.400E-05	6.400E-05
	Other HAPs	1.715E-02	1.443E-02	6.359E-03	1.061E-04	1.061E-04	1.061E-04
GHG	CO2**** (GWP=1)	1.170E+02	1.170E+02	1.170E+02	1.170E+02	1.170E+02	1.170E+02
	CH4 (GWP=25)	1.450E+00	1.250E+00	2.300E-01	8.600E-03	8.600E-03	8.600E-03
	N2O (GWP=298)	*2.205E-04*	*2.205E-04*	*2.205E-04*	3.000E-03	3.000E-03	3.000E-03
	CO2e	*1.533E+02*	*1.483E+02*	*1.228E+02*	*1.181E+02*	*1.181E+02*	*1.181E+02*

(#Lean Pre-Mix - aka: Dry Low Emissions (DLE or DLN) and SoLoNOx)

	Pollutant	GAS-FIRED EXTERNAL COMBUSTION			FLARE	DIESEL ENGINE
		AP-42 Table 1.4-1; 1.4-2; 1.4-3 (<100 MMBtu/hr) 07/98			13.5-1 04/15	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	9.804E-02	4.902E-02	3.137E-02	6.800E-02	4.410E+00
	CO	8.235E-02	8.235E-02	8.235E-02	3.100E-01	9.500E-01
	THC (TOC)	1.078E-02	1.078E-02	1.078E-02	≥98% Destruction and Removal Efficiency	3.600E-01
	NMHC (THC-CH4)	8.529E-03	8.529E-03	8.529E-03		3.534E-01
	NMNEHC (NMHC-C2H6)	5.490E-03	5.490E-03	5.490E-03		3.503E-01
	VOC (NMNEHC+HCHO)	5.564E-03	5.564E-03	5.564E-03		3.600E-01
	SO2 (2,000 gr-S/MMscf)	5.882E-04	5.882E-04	5.882E-04	*5.882E-04*	2.900E-01
	PM10/2.5 (Filter+Condense)	7.451E-03	7.451E-03	7.451E-03	*7.451E-03*	3.100E-01
HAPs	Benzene	2.059E-06	2.059E-06	2.059E-06	≥98% Destruction and Removal Efficiency	9.330E-04
	Ethylbenzene	---	---	---		---
	HCHO (Formaldehyde)	7.353E-05	7.353E-05	7.353E-05		1.180E-03
	n-Hexane	1.765E-03	1.765E-03	1.765E-03		---
	Methanol (MeOH)	---	---	---		---
	Toluene	3.333E-06	3.333E-06	3.333E-06		4.090E-04
	2,2,4-TMP (i-Octane)	---	---	---		---
	Xylenes	---	---	---		2.850E-04
	Other HAPs	1.861E-06	1.861E-06	1.861E-06		1.050E-03
GHG	CO2 (GWP=1)	1.176E+02	1.176E+02	1.176E+02	*1.176E+02*	1.640E+02
	CH4 (GWP=25)	2.255E-03	2.255E-03	2.255E-03	*98% DRE*	*6.614E-03*
	N2O (GWP=298)	2.157E-03	6.275E-04	6.275E-04	*2.157E-03*	*1.323E-03*
	CO2e	*1.183E+02*	*1.179E+02*	*1.179E+02*	*1.183E+02*	*1.646E+02*

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 lb CO2/MMBtu	Methane lb CH4/MMBtu	Nitrous Oxide lb N2O/MMBtu
Fuel Oil No. 2 (Diesel)	0.138 MMBtu/gal	163.054	6.614E-03	1.323E-03
Propane	0.091 MMBtu/gal	138.605	6.614E-03	1.323E-03
Natural Gas	1,026 Btu/scf	116.977	2.205E-03	2.205E-04

Global Warming Potential (100 Yr) (GWP)		
Table A-1 to Subpart A of Part 98		
CO2	CH4*	N2O#
1.00	25.00	298.00

#Revised by EPA on 11/29/13

Conversion Factors

http://www.onlineconversion.com/

1.0 lb	=	453.592 g
1.0 kg	=	2.205 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 cf	=	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
1.0 %	=	10,000 ppm
UGC (stp)	=	379.48 scf/lb-mol

*Converted Ext Comb Emission Factors to lb/MMBtu by dividing lb/MMscf by AP-42 default HHV of 1,020 Btu/scf.

**Converted GHG Emission Factors to lb/MMBtu by multiplying kg/MMBtu by 2.2046 lb/kg.

***Assumes 100% conversion of fuel sulfur to SOX (2,000 gr/MMscf).

****Assumes 99.5% conversion of fuel carbon to CO2 for natural gas.

Inlet Natural Gas Composition

BLAKE RIDGE	
	Mol %
Water	0.005137
TEG	0.000054
Nitrogen	0.383459
Methane	81.192035
CO2	0.152720
Ethane	12.117556
Propane	3.698665
i-Butane	0.544208
n-Butane	1.032159
i-Pentane	0.261443
n-Pentane	0.244724
2,3-Dimethylbutane	0.099396
3-Methylpentane	0.064441
Hexane	0.068860
2,2-Dimethylpentane	0.000628
Methylcyclopentane	0.005695
Benzene	0.000644
3,3-Dimethylpentane	0.000501
Cyclohexane	0.008151
2-Methylhexane	0.019482
2,3-Dimethylpentane	0.000617
3-Methylhexane	0.016431
Heptane	0.032625
Toluene	0.001759
Octane	0.007486
Ethylbenzene	0.000885
o-Xylene	0.000131
2-Methylheptane	0.006808
Methylcyclohexane	0.014670
2,5-Dimethylhexane	0.001538
1,t-3-Dimethylcyclohexane	0.000430
Nonane	0.001682
n-Undecane	0.000028
n-Decane	0.000338
m-Xylene	0.000452
p-Xylene	0.000480
2,2,4-Trimethylpentane	0.001477
2,4-Dimethylpentane	0.000227
3-Ethylpentane	0.002392
2,4-Dimethylhexane	0.001556
trans-1,2-Dimethylcyclohexane	0.005249
cis-1,2-Dimethylcyclohexane	0.002002
cis-1,3-Dimethylcyclohexane	0.000780

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment H - Gas Analysis

Extended Inlet Gas Analysis Summary

Representative Gas Analysis - Process Simulation

Compound	CAS	Formula	Molecular Weight (MW)	Mole % (M%)	Mole Fraction (M%/Sum-M%)	Weighted Sum (MW*MF)	Weight % (WS/Sum-WS)	lb/MMscf (WS/UGC#)
Water	109-86-4	H2O	18.02	**0.0051**	0.00005	0.0009	0.0046	**2.44**
Carbon Monoxide	630-08-0	CO	28.01	**---**	---	---	---	**---**
Nitrogen	7727-37-9	N2	28.01	**0.3835**	0.00383	0.1074	0.5345	**283.07**
Oxygen	7782-44-7	O2	32.00	**---**	---	---	---	**---**
Hydrogen Sulfide	2148-87-8	H2S	34.09	**---**	---	---	---	**---**
Carbon Dioxide	124-38-9	CO2	44.01	**0.1527**	0.00153	0.0672	0.3344	**177.11**
Methane*	75-82-8	CH4	16.04	**81.1920**	0.81192	13.0252	64.8067	**34,323.65**
Ethane*	74-84-0	C2H6	30.07	**12.1176**	0.12118	3.6436	18.1288	**9,601.60**
Propane**	74-98-6	C3H8	44.10	**3.6987**	0.03699	1.6310	8.1148	**4,297.83**
i-Butane**	75-28-5	C4H10	58.12	**0.5442**	0.00544	0.3163	1.5738	**833.52**
n-Butane**	106-97-8	C4H10	58.12	**1.0322**	0.010322	0.5999	2.9849	**1,580.88**
Cyclopentane**	287-92-3	C5H10	70.10	**---**	---	---	---	**---**
i-Pentane**	78-78-4	C5H12	72.15	**0.2614**	0.002614	0.1886	0.9385	**497.07**
n-Pentane**	109-66-0	C5H12	72.15	**0.2447**	0.002447	0.1766	0.8785	**465.28**
Cyclohexane**	110-82-7	C6H12	84.16	**0.0138**	0.000138	0.0117	0.0580	**30.71**
Other Hexanes**	110-54-3	C6H14	86.18	**0.1638**	0.001638	0.1412	0.7025	**372.05**
Methylcyclohexanes**	varies	C7H14	98.19	**0.0147**	0.000147	0.0144	0.0717	**37.96**
Heptanes**	varies	C7H16	100.20	**0.0729**	0.000729	0.0731	0.3635	**192.50**
C8+ Heavies**	varies	C8+	130.00 est	**0.0279**	0.000279	0.0363	0.1805	**95.58**
Benzene***	71-43-2	C6H6	78.11	**0.0006**	0.000006	0.0005	0.0025	**1.33**
Ethylbenzene***	100-41-4	C8H10	106.17	**0.0009**	0.000009	0.0009	0.0047	**2.48**
n-Hexane***	110-54-3	C6H14	86.18	**0.0689**	0.000689	0.0593	0.2952	**156.37**
Toluene***	108-88-3	C7H8	92.14	**0.0018**	0.000018	0.0016	0.0081	**4.27**
2,2,4-Trimethylpentane***	540-84-1	C8H18	114.23	**0.0015**	0.000015	0.0017	0.0084	**4.45**
Xylenes***	1330-20-7	C8H10	106.17	**0.0011**	0.000011	0.0011	0.0056	**2.97**
Total:				**100.00**	**1.0000**	**20.10**	**100.00**	**52,963**
THC:				**99.46**	**0.9946**	**19.92**	**99.13**	**52,500**
Total CH4:				**81.19**	**0.8119**	**13.03**	**64.81**	**34,324**
Total VOC:				**6.15**	**0.0615**	**3.25**	**16.19**	**8,575**
Total HAP:				**0.07**	**0.0007**	**0.07**	**0.32**	**172**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (EPA-VOC) *** = also Hazardous Air Pollutant (EPA-HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 ^{o}F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

To be conservative, the following "worst-case" values were assumed:

Compound	CAS	Formula	Representative Gas Analysis			Assumed "Worst-Case"		
			Mole %	Wgt %	lb/MMscf	Mole %	Wgt %	lb/MMscf
Nitrogen	7727-37-9	N2	0.3835	0.5345	283.0700	0.000	**0.000**	**0.00**
Carbon Dioxide	124-38-9	CO2	0.1527	0.3344	177.11	0.216	**0.472**	**250.00**
Methane*	75-82-8	CH4	81.1920	64.8067	34,323.65	97.430	**77.768**	**41,188.38**
Ethane*	74-98-6	C2H6	12.1176	18.1288	9,601.60	0.000	**0.000**	**0.00**
VOC**	Various	C3 thru C10+	6.1490	16.1910	8,575.24	6.764	**17.810**	**9,432.76**
Benzene***	71-43-2	C6H6	0.0006	0.0025	1.33	0.0243	**0.094**	**50.00**
Ethylbenzene***	100-41-4	C8H10	0.0009	0.0047	2.48	0.0179	**0.094**	**50.00**
n-Hexane***	110-54-3	C6H14	0.0689	0.2952	156.37	0.1101	**0.472**	**250.00**
Toluene***	108-88-3	C7H8	0.0018	0.0081	4.27	0.0206	**0.094**	**50.00**
2,2,4-Trimethylpentane***	540-84-1	C8H18	0.0015	0.0084	4.45	0.0166	**0.094**	**50.00**
Xylenes***	1330-20-7	C8H10	0.0011	0.0056	2.97	0.0179	**0.094**	**50.00**
Total HAP***	Various	C6 thru C8	0.0747	0.3245	171.86	0.2173	**0.944**	**500.00**

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment H - Gas Analysis

Stabilized Condensate Composition

Constituent	mol%
Propane	2.2330
i-Butane	2.1103
n-Butane	6.3720
i-Pentane	4.7241
n-Pentane	6.0527
2,3-Dimethylbutane	5.8506
3-Methylpentane	4.5988
Hexane	6.4426
2,2-Dimethylpentane	0.0801
Methylcyclopentane	0.5229
Benzene	0.0740
3,3-Dimethylpentane	0.0829
Cyclohexane	0.9756
2-Methylhexane	3.9594
2,3-Dimethylpentane	0.1230
3-Methylhexane	3.7492
Heptane	9.8465
Toluene	0.7593
Octane	7.5166
Ethylbenzene	1.1999
o-Xylene	0.2510
2-Methylheptane	4.7059
Methylcyclohexane	4.5644
2,5-Dimethylhexane	0.7111
1,t-3-Dimethylcyclohexane	0.3382
Nonane	5.6557
n-Undecane	0.8931
n-Decane	3.3755
Dodecane	0.2973
Tridecane	0.0967
Tetradecane	0.0336
Pentadecane	0.0276
Hexadecane	0.0792
Heptadecane	0.0569
Octadecane	0.0676
Nonadecane	0.0616
Eicosane	0.0795
C21	0.2259
C22	0.6105
C23	1.2654
C24	0.1519
m-Xylene	0.6616
p-Xylene	0.6505
2,2,4-Trimethylpentane	0.4091
2,4-Dimethylpentane	0.0316
3-Ethylpentane	0.5512
2,4-Dimethylhexane	0.6954
trans-1,2-Dimethylcyclohexane	3.7620
cis-1,2-Dimethylcyclohexane	1.9114
cis-1,3-Dimethylcyclohexane	0.5052

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Attachment H - Gas Analysis

Extended Stabilized Condensate Analysis Summary

Representative Analysis - ProMax Process Simulation

Compound	CAS	Formula	Molecular Weight (MW)	Mole % (M%)	Mole Fraction (M%/Sum-M%)	Weighted Sum (MW*MF)	Weight % (WS/Sum-WS)	lb/MMscf (WS/UGC#)
Water	109-86-4	H2O	18.02	---	---	---	---	---
Carbon Monoxide	630-08-0	CO	28.01	---	---	---	---	---
Nitrogen	7727-37-9	N2	28.01	---	---	---	---	---
Oxygen	7782-44-7	O2	32.00	---	---	---	---	---
Hydrogen Sulfide	2148-87-8	H2S	34.09	---	---	---	---	---
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	**2.2330**	0.02233	0.9847	1.0134	**2,594.74**
i-Butane**	75-28-5	C4H10	58.12	**2.1103**	0.02110	1.2266	1.2624	**3,232.18**
n-Butane**	106-97-8	C4H10	58.12	**6.3720**	0.063720	3.7036	3.8117	**9,759.49**
Cyclopentane**	287-92-3	C5H10	70.10	---	---	---	---	---
i-Pentane**	78-78-4	C5H12	72.15	**4.7241**	0.047241	3.4084	3.5080	**8,981.68**
n-Pentane**	109-66-0	C5H12	72.15	**6.0527**	0.060527	4.3670	4.4945	**11,507.67**
Cyclohexane**	110-82-7	C6H12	84.16	**1.4985**	0.014985	1.2611	1.2980	**3,323.30**
Other Hexanes**	110-54-3	C6H14	86.18	**10.4494**	0.104494	9.0048	9.2679	**23,729.24**
Methylcyclohexanes**	varies	C7H14	98.19	**4.5644**	0.045644	4.4816	4.6125	**11,809.81**
Heptanes**	varies	C7H16	100.20	**18.4239**	0.184239	18.4611	19.0005	**48,648.22**
C8+ Heavies**	varies	C8+	123.00 est	**33.1236**	0.331236	40.5526	41.7374	**106,863.16**
Benzene***	71-43-2	C6H6	78.11	**0.0740**	0.000740	0.0578	0.0595	**152.32**
Ethylbenzene***	100-41-4	C8H10	106.17	**1.1999**	0.011999	1.2739	1.3111	**3,356.88**
n-Hexane***	110-54-3	C6H14	86.18	**6.4426**	0.064426	5.5519	5.7141	**14,630.31**
Toluene***	108-88-3	C7H8	92.14	**0.7593**	0.007593	0.6996	0.7200	**1,843.59**
2,2,4-Trimethylpentane***	540-84-1	C8H18	114.23	**0.4091**	0.004091	0.4673	0.4810	**1,231.44**
Xylenes***	1330-20-7	C8H10	106.17	**1.5631**	0.015631	1.6595	1.7079	**4,372.98**

Total:	**100.00**	**1.0000**	**97.16**	**100.00**	**256,037**
THC:	**100.00**	**1.0000**	**97.16**	**100.00**	**256,037**
Total CH4:	**---**	**---**	**---**	**---**	**---**
Total VOC:	**100.00**	**1.0000**	**97.16**	**100.00**	**256,037**
Total HAP:	**10.45**	**0.1045**	**9.71**	**9.99**	**25,588**

* = Hydrocarbon (HC) ** = also Volatile Organic Compound (EPA-VOC) *** = also Hazardous Air Pollutant (EPA-HAP)

#UGC (Universal Gas Constant) = 379.482 scf/lb-mol @ 60 ^{o}F and 14.696 psia. Pound "X"/scf = M% of "X" * MW of "X" / UGC

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Btu Loading on the Thermal Oxidizer (TO-01)

Component	Formula	Component Btu/scf (HHV)	Dehy-01 and -02 Flash Gas Elect. Pump Flowrate: 2,340 scf/hr		Dehy-01 and -02 Still Vents Elect. Pump Flowrate: 7,480 scf/hr		Stabilized Condensate Tanks Flowrate: 28 scf/hr		Stabilized Condensate Loading Flowrate: 27 scf/hr		TOTAL 9,875 scf/hr
			Mol%	MMBtu/hr	Mol%	MMBtu/hr	Mol%	MMBtu/hr	Mol%	MMBtu/hr	MMBtu/Hr
Water	H2O	---	0.1150	---	90.8000	---	---	---	---	---	---
Carbon Monoxide	CO	---	---	---	---	---	---	---	---	---	---
Nitrogen	N2	---	0.3440	---	0.0066	---	---	---	---	---	---
Oxygen	O2	---	---	---	---	---	---	---	---	---	---
Hydrogen Sulfide	H2S	637.64	---	---	---	---	---	---	---	---	---
Carbon Dioxide	CO2	---	0.9510	---	0.2540	---	---	---	---	---	---
Methane	CH4	1,010.00	60.8000	1.4369	1.2100	0.0914	---	---	---	---	1.5284
Ethane	C2H6	1,769.70	23.0000	0.9525	1.7200	0.2277	---	---	---	---	1.1801
Propane	C3H8	2,516.20	8.3100	0.4893	1.3700	0.2579	38.3231	0.0272	38.3231	0.0262	0.8005
i-Butane	C4H10	3,252.00	1.3500	0.1027	0.3510	0.0854	12.7794	0.0117	12.7794	0.0113	0.2111
n-Butane	C4H10	3,262.40	2.9100	0.2221	1.0100	0.2465	26.1331	0.0241	26.1331	0.0232	0.5158
Cyclopentane	C5H10	3,763.60	0.0000	0.0000	0.0000	0.0000	---	---	---	---	0.0000
i-Pentane	C5H12	4,000.90	0.6300	0.0590	0.2600	0.0778	6.9331	0.0078	6.9331	0.0075	0.1522
n-Pentane	C5H12	4,008.90	0.6640	0.0623	0.3500	0.1050	6.4818	0.0073	6.4818	0.0071	0.1816
Cyclohexane	C6H12	4,481.60	0.0517	0.0054	0.2110	0.0707	0.3208	0.0004	0.3208	0.0004	0.0770
Other Hexanes	C6H14	4,750.30	0.4150	0.0461	0.3090	0.1098	4.4863	0.0060	4.4863	0.0058	0.1677
Methylcyclohexane	C7H14	5,215.90	0.0428	0.0052	0.2320	0.0905	0.3825	0.0006	0.3825	0.0005	0.0968
Heptanes	C7H16	5,502.50	0.1770	0.0228	0.3830	0.1576	1.4681	0.0023	1.4681	0.0022	0.1849
C8+ Heavies	C8+	7,150.00 est	0.0098	0.0016	0.2440	0.1305	0.6680	0.0013	0.6680	0.0013	0.1348
Benzene	C6H6	3,741.90	0.0030	0.0003	0.0940	0.0263	0.0132	0.0000	0.0132	0.0000	0.0266
Ethylbenzene	C8H10	5,222.00	0.0024	0.0003	0.2270	0.0887	0.0194	0.0000	0.0194	0.0000	0.0890
n-Hexane	C6H14	4,756.00	0.1830	0.0204	0.1830	0.0651	1.8915	0.0025	1.8915	0.0024	0.0905
Toluene	C7H8	4,474.90	0.0074	0.0008	0.3820	0.1279	0.0378	0.0000	0.0378	0.0000	0.1287
2,2,4-TMP (i-Octane)	C8H18	6,213.60	0.0026	0.0004	0.0028	0.0013	0.0370	0.0001	0.0370	0.0001	0.0018
Xylenes	C8H10	5,208.67	0.0028	0.0003	0.3770	0.1469	0.0248	0.0000	0.0248	0.0000	0.1473

Mol%=Vol% Values from GRI-GLYCalc Model Results					
	MMBtu/hr:	3.43	2.11	0.09	0.09 / 5.71
	scf/hr:	2,340	7,480	28	27 / 9,875
	Btu/scf:	1,465	282	3,242	3,242 / 579

Appalachia Midstream Services, LLC

BLAKE RIDGE COMPRESSION FACILITY

Application for G35-D General Permit Registration

Btu Loading on the Flare (FLR-01)

Component	Formula	Molecular Weight (MW)	Component Btu/scf (HHV)	SSM Activities (Blowdowns) Flowrate: 2,853 scf/hr		TOTAL 2,853 scf/hr
				Mol%	MMBtu/hr	MMBtu/Hr
Water	H2O	18.02	---	---	---	**---**
Carbon Monoxide	CO	28.01	---	---	---	**---**
Nitrogen	N2	28.01	---	**0.3835**	---	**---**
Oxygen	O2	32.00	---	---	---	**---**
Hydrogen Sulfide	H2S	34.09	637.64	---	---	**---**
Carbon Dioxide	CO2	44.01	---	**0.1527**	---	**---**
Methane	CH4	16.04	1,010.00	**81.1920**	2.3395	**2.3395**
Ethane	C2H6	30.07	1,769.70	**12.1176**	0.6118	**0.6118**
Propane	C3H8	44.10	2,516.20	**3.6987**	0.2655	**0.2655**
i-Butane	C4H10	58.12	3,252.00	**0.5442**	0.0505	**0.0505**
n-Butane	C4H10	58.12	3,262.40	**1.0322**	0.0961	**0.0961**
Cyclopentane	C5H10	70.10	3,763.60	**0.0000**	0.0000	**0.0000**
i-Pentane	C5H12	72.15	4,000.90	**0.2614**	0.0298	**0.0298**
n-Pentane	C5H12	72.15	4,008.90	**0.2447**	0.0280	**0.0280**
Cyclohexane	C6H12	84.16	4,481.60	**0.0138**	0.0018	**0.0018**
Other Hexanes	C6H14	86.18	4,750.30	**0.1638**	0.0222	**0.0222**
Methylcyclohexane	C7H14	98.19	5,215.90	**0.0147**	0.0022	**0.0022**
Heptanes	C7H16	100.20	5,502.50	**0.0729**	0.0114	**0.0114**
C8+ Heavies	C8+	130.00 est	7,150.00 est	**0.0279**	0.0057	**0.0057**
Benzene	C6H6	78.11	3,741.90	**0.0006**	0.0001	**0.0001**
Ethylbenzene	C8H10	106.17	5,222.00	**0.0009**	0.0001	**0.0001**
n-Hexane	C6H14	86.18	4,756.00	**0.0689**	0.0093	**0.0093**
Toluene	C7H8	92.14	4,474.90	**0.0018**	0.0002	**0.0002**
2,2,4-TMP (i-Octane)	C8H18	114.23	6,213.60	**0.0015**	0.0003	**0.0003**
Xylenes	C8H10	106.17	5,208.67	**0.0011**	0.0002	**0.0002**
				99.9948		

Mol%=Vol% Values from GRI-GLYCalc Model Results

MMBtu/hr:	**3.47**	**3.47**
scf/hr:	**2,853**	**2,853**
Btu/scf:	**1,218**	**1,218**

G3616

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1000	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	7.6	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	GAV
AFTERCOOLER - STAGE 2 INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 INLET (°F):	174	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	190	FUEL:	Blake Ridge
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
COOLING SYSTEM:	JW+1AC, OC+2AC	FUEL METHANE NUMBER:	61.0
CONTROL SYSTEM:	ADEM4	FUEL LHV (Btu/scf):	1098
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	500
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	77
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3	STANDARD RATED POWER:	5000 bhp@1000rpm
SET POINT TIMING:	17		

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	5000	5000	3750	2500
INLET AIR TEMPERATURE			°F	77	77	77	77
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(3)	Btu/bhp-hr	6782	6782	6949	7414
FUEL CONSUMPTION (HHV)		(3)	Btu/bhp-hr	7488	7488	7673	8186
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(4)(5)	ft3/min	12278	12278	9268	6310
AIR FLOW	(WET)	(4)(5)	lb/hr	54443	54443	41097	27977
FUEL FLOW (60ºF, 14.7 psia)			scfm	515	515	396	281
INLET MANIFOLD PRESSURE		(6)	in Hg(abs)	107.2	107.2	80.0	55.8
EXHAUST TEMPERATURE - ENGINE OUTLET		(7)	°F	825	825	871	938
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(8)(5)	ft3/min	31255	31255	24465	17520
EXHAUST GAS MASS FLOW	(WET)	(8)(5)	lb/hr	56061	56061	42340	28861
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(9)(10)	g/bhp-hr	0.30	0.30	0.30	0.30
CO		(9)(10)	g/bhp-hr	2.77	2.77	2.77	2.77
THC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	3.88	3.88	4.26	4.51
NMHC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	1.38	1.38	1.51	1.61
NMNEHC (VOCs) (mol. wt. of 15.84)		(9)(10)(11)	g/bhp-hr	0.64	0.64	0.70	0.74
HCHO (Formaldehyde)		(9)(10)	g/bhp-hr	0.14	0.14	0.15	0.19
CO2		(9)(10)	g/bhp-hr	428	428	445	471
EXHAUST OXYGEN		(9)(12)	% DRY	11.0	11.0	10.7	10.4
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(13)	Btu/min	53143	53143	43141	36287
HEAT REJ. TO ATMOSPHERE		(13)	Btu/min	18050	18050	16742	15302
HEAT REJ. TO LUBE OIL (OC)		(13)	Btu/min	30494	30494	27343	24076
HEAT REJ. TO A/C - STAGE 1 (1AC)		(13)(14)	Btu/min	45539	45539	23364	6191
HEAT REJ. TO A/C - STAGE 2 (2AC)		(13)(14)	Btu/min	11548	11548	8091	4994

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(14)(15)	Btu/min	106273
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(14)(15)	Btu/min	48718
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

CONDITIONS AND DEFINITIONS

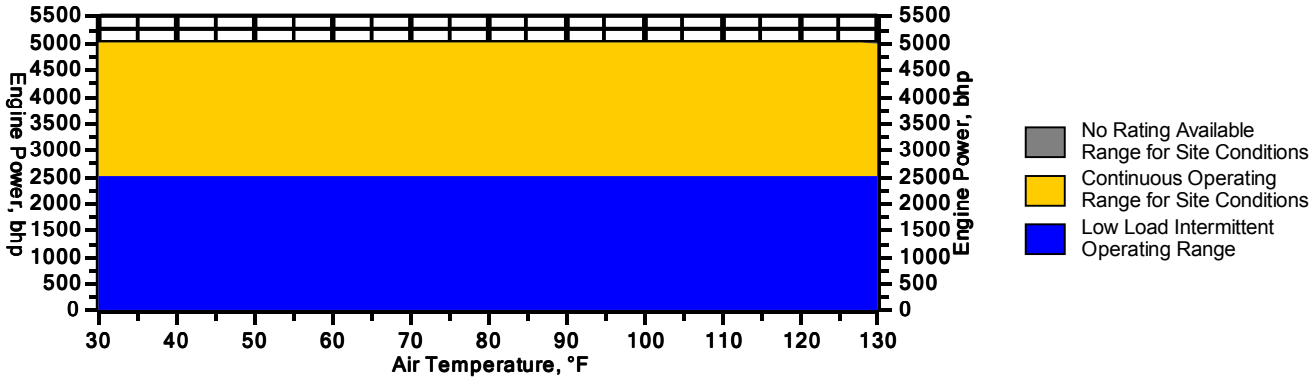
Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating 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.

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 6.04.00
Ref. Data Set EM1426-04-001, Printed 03May2017

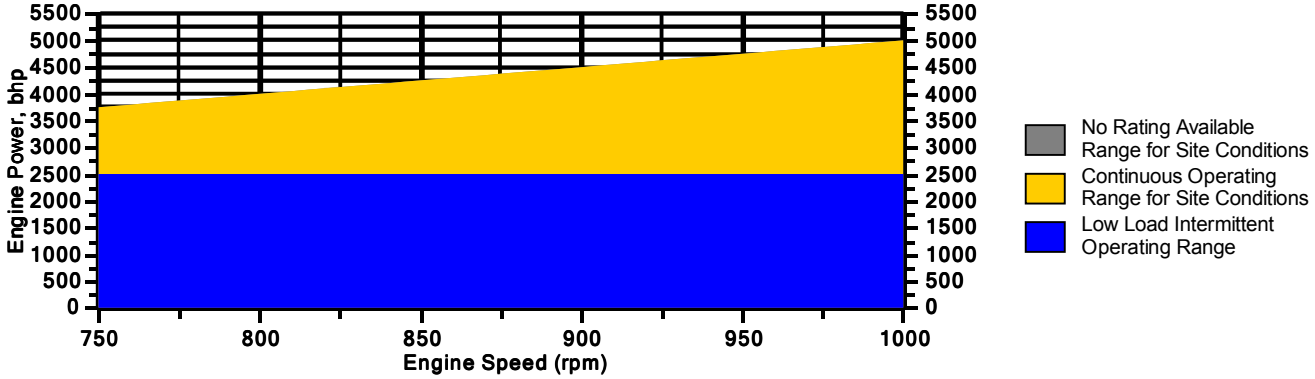
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 500 ft and 1000 rpm



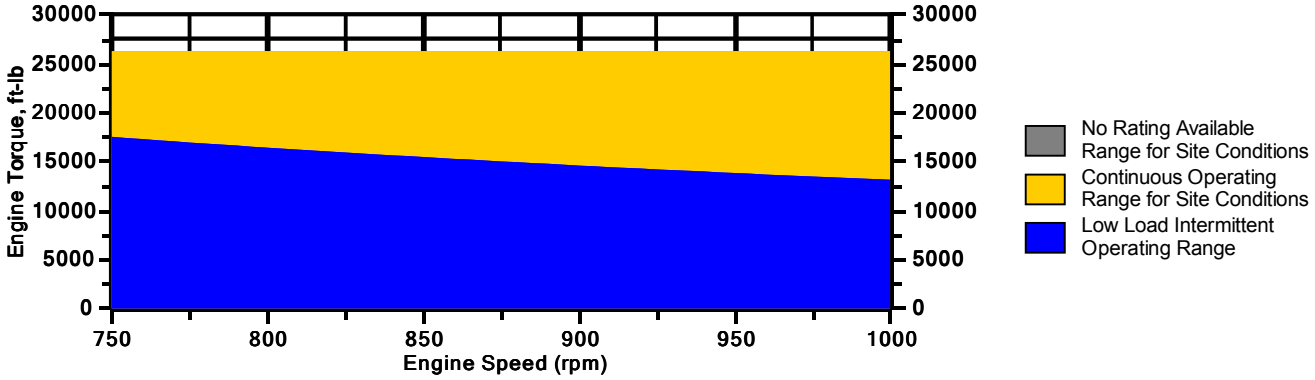
Engine Power vs. Engine Speed

Data represents speed sweep at 500 ft and 77 ºF



Engine Torque vs. Engine Speed

Data represents speed sweep at 500 ft and 77 ºF



Note: At site conditions of 500 ft and 77°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

NOTES

1. Fuel pressure range specified is to the engine gas shutoff valve (GSOV). Additional fuel train components should be considered in pressure and flow calculations.

2. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

3. Fuel consumption tolerance is ± 2.5% of full load data.

4. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

5. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

6. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

7. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

8. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

9. Emissions data is at engine exhaust flange prior to any after treatment.

10. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

11. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

12. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

13. 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.

14. 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.

15. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0051	0.0051
Methane	CH4	81.1920	81.4014
Ethane	C2H6	12.1176	12.1488
Propane	C3H8	3.6987	3.7082
Isobutane	iso-C4H1O	0.5442	0.5456
Norbutane	nor-C4H1O	1.0322	1.0349
Isopentane	iso-C5H12	0.2614	0.2621
Norpentane	nor-C5H12	0.2447	0.2453
Hexane	C6H14	0.0689	0.0691
Heptane	C7H16	0.0326	0.0327
Nitrogen	N2	0.3835	0.3845
Carbon Dioxide	CO2	0.1527	0.1531
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	0.0075	0.0075
Nonane	C9H20	0.0017	0.0017
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		99.7428	100.0000

Fuel Makeup:	Blake Ridge
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	61.0
Lower Heating Value (Btu/scf):	1098
Higher Heating Value (Btu/scf):	1212
WOBBE Index (Btu/scf):	1324
THC: Free Inert Ratio:	185
Total % Inerts (% N2, CO2, He):	0.54%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	11.40
Stoich A/F Ratio (Mass/Mass):	16.59
Specific Gravity (Relative to Air):	0.688
Fuel Specific Heat Ratio (K):	1.287

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
311 Riggs Street, Bloomer, WI 54724
Tel: (715) 568-2882 • Fax: (715)568-2884
E-mail : bweninger@catalyticcombustion.com

CATALYTIC COMBUSTION
EMISSION TECHNOLOGIES

To Williams
Attn Austin Day
Via E-mail

Our Ref. QT-117-2097-2
Date: 25 May, 2017

PERFORMANCE EXPECTATION

For : Location : Blake Ridge

Engine Parameters

				Raw Exhaust	
Engine Manufacturer	Caterpillar				
Engine Model	G3616		NOx	0.30	g/bhp-hr
Horsepower	5000	bhp	CO	2.77	g/bhp-hr
Speed	1000	rpm	NMHC	1.38	g/bhp-hr
Exhaust Flowrate	31255	acfm	NMNEHC (VOC)	0.64	g/bhp-hr
Exhaust Temperature	825	° F	HCHO	0.14	g/bhp-hr
Fuel			Oxygen	11.10	%

Catalyst Description and Performance Expectations

Substrate Type	Folded Metal Foil	Catalyst Dimensions	47.875 x 14.875 x 3.50"
Cell Pattern	200 cpsi Herringbone	Quantity Required	4 per Unit
Banding	CCC C-Channel Design	Formulation	HFX4

	Warranted Performance	
NOx	na	% Conversion
CO	92	% Conversion
NMHC	58	% Conversion
NMNEHC (VOC)	85	% Conversion
HCHO	82	% Conversion

General Terms and Conditions of Sale and Manufacturers Warranty documents are available upon request.

This catalyst is to be installed into a converter housing produced by another manufacturer. CCC cannot verify that the housing is structurally sound and permits proper catalyst sealing. Therefore, should the catalyst not reach the catalyst outlet targets with the engine operating as listed above, then all efforts must be made to ensure that a proper catalyst seal has been obtained before questioning the performance of the catalyst.

Please contact us if you have any questions or to let us know how we can be of further help.

Best regards,

Brian Weninger
Mechanical Engineer, Catalyst Group

Emergency Generator Engine Specifications

G3516B

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Blake Ridge

PACKAGED GENSET APPLICATION

ENGINE SPEED (rpm):	1800	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	11	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	CAT LOW PRESSURE WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 2 INLET (°F):	130		
AFTERCOOLER - STAGE 1 INLET (°F):	192	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	198	FUEL:	G17-3500-148 (00) Fuel
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig):	1.5-5.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	61.0
CONTROL SYSTEM:	ADEM3	FUEL LHV (Btu/scf):	1098
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	1499
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	100
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5	STANDARD RATED POWER:	1818 bhp@1800rpm
FAN POWER (bhp):	70	POWER FACTOR:	0.8
SET POINT TIMING:	22	VOLTAGE(V):	380-4160

RATING		NOTES	LOAD	MAXIMUM RATING 100%	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE 100%	75%	56%
PACKAGE POWER	(WITH FAN)	(1)(2)	ekW	1057	1057	792	596
PACKAGE POWER	(WITH FAN)	(1)(2)	kVA	1321	1321	991	744
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	1557	1557	1185	909
INLET AIR TEMPERATURE			°F	100	100	100	100
GENERATOR EFFICIENCY		(1)	%	95.3	95.3	95.3	95.1
PACKAGE EFFICIENCY	(ISO 3046/1)	(3)	%	31.6	31.6	29.8	28.0
THERMAL EFFICIENCY		(4)	%	52.4	52.4	53.7	55.2
TOTAL EFFICIENCY		(5)	%	84.0	84.0	83.5	83.2
ENGINE DATA							
PACKAGE FUEL CONSUMPTION	(ISO 3046/1)	(6)	Btu/ekW-hr	10808	10808	11443	12166
PACKAGE FUEL CONSUMPTION	(NOMINAL)	(6)	Btu/ekW-hr	11018	11018	11666	12402
ENGINE FUEL CONSUMPTION	(NOMINAL)	(6)	Btu/bhp-hr	7479	7479	7802	8123
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(7)	ft3/min	3680	3680	2871	2249
AIR FLOW	(WET)	(7)	lb/hr	15636	15636	12198	9555
FUEL FLOW (60ºF, 14.7 psia)			scfm	177	177	140	112
INLET MANIFOLD PRESSURE		(8)	in Hg(abs)	67.7	67.7	54.0	42.6
EXHAUST TEMPERATURE - ENGINE OUTLET		(9)	°F	998	998	1009	1025
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(10)	ft3/min	10276	10276	8084	6411
EXHAUST GAS MASS FLOW	(WET)	(10)	lb/hr	16192	16192	12640	9908
MAX INLET RESTRICTION		(11)	in H2O	8.85	8.85	6.90	4.15
MAX EXHAUST RESTRICTION		(11)	in H2O	15.67	15.67	8.42	3.54
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(12)(13)	g/bhp-hr	0.50	0.50	0.50	0.50
CO		(12)(13)	g/bhp-hr	2.80	2.80	2.89	3.06
THC (mol. wt. of 15.84)		(12)(13)	g/bhp-hr	5.11	5.11	5.44	6.02
NMHC (mol. wt. of 15.84)		(12)(13)	g/bhp-hr	1.82	1.82	1.94	2.14
NMNEHC (VOCs) (mol. wt. of 15.84)		(12)(13)(14)	g/bhp-hr	0.84	0.84	0.89	0.99
HCHO (Formaldehyde)		(12)(13)	g/bhp-hr	0.35	0.35	0.38	0.41
CO2		(12)(13)	g/bhp-hr	516	516	539	560
EXHAUST OXYGEN		(12)(15)	% DRY	10.3	10.3	10.2	10.1
HEAT REJECTION							
LHV INPUT		(16)	Btu/min	194034	194034	154076	123092
HEAT REJ. TO JACKET WATER (JW)		(17)	Btu/min	30677	30677	26324	23593
HEAT REJ. TO ATMOSPHERE	(INCLUDES GENERATOR)	(17)	Btu/min	9622	9622	7878	6645
HEAT REJ. TO LUBE OIL (OC)		(17)	Btu/min	7048	7048	6471	5966
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(17)	Btu/min	54717	54717	43392	34832
HEAT REJ. TO A/C - STAGE 1 (1AC)		(17)(19)	Btu/min	5605	5605	3673	994
HEAT REJ. TO A/C - STAGE 2 (2AC)		(17)(19)	Btu/min	6043	6043	4463	2912
PUMP POWER		(18)	Btu/min	977	977	977	977
COOLING SYSTEM SIZING CRITERIA							
TOTAL JACKET WATER CIRCUIT (JW+OC+1AC)		(20)	Btu/min	50479	50479		
TOTAL AFTERCOOLER CIRCUIT (2AC)		(20)	Btu/min	7083	7083		
HEAT REJECTION TO EXHAUST (LHV TO 248°F)		(20)	Btu/min	60189	60189		
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.							
MINIMUM HEAT RECOVERY							
TOTAL JACKET WATER CIRCUIT (JW+OC+1AC)		(21)	Btu/min	38572	38572		
TOTAL AFTERCOOLER CIRCUIT (2AC)		(21)	Btu/min	5740	5740		
HEAT REJECTION TO EXHAUST(LHV TO 248°F)		(21)	Btu/min	46415	46415		

CONDITIONS AND DEFINITIONS

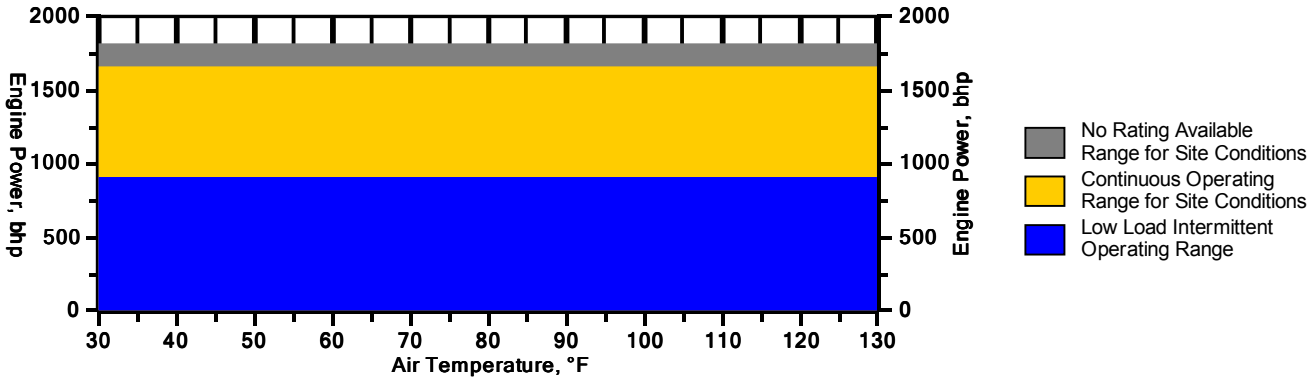
Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating 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.

PREPARED BY:
Data generated by Data Maintenance Utility Version 6.05.00
Special Rating Request G17-3500-148 (01), Printed 15Jun2017

Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 1499 ft and 1800 rpm



NOTES

1. Generator efficiencies, power factor, and voltage are based on specified generator. [Package Power (ekW) is calculated as: (Engine Power (bkW) - Fan Power (bkW)) x Generator Efficiency], [Package Power (kVA) is calculated as: (Engine Power (bkW) - Fan Power (bkW)) x Generator Efficiency / Power Factor]

2. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load.

3. Package Effieciency published in accordance with ISO 3046/1.

4. Thermal Efficiency is calculated based on energy recovery from the jacket water, lube oil, 1st stage aftercooler, and exhaust to 248ºF with engine operation at ISO 3046/1 Package Efficiency, and assumes unburned fuel is converted in an oxidation catalyst.

5. Total efficiency is calculated as: Package Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.

6. ISO 3046/1 Package fuel consumption tolerance is (+)5, (-)0% at the specified power factor. Nominal package and engine fuel consumption tolerance is ± 3.0% of full load data at the specified power factor.

7. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

8. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

9. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

10. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

11. Inlet and Exhaust Restrictions are maximum allowed values at the corresponding loads. Increasing restrictions beyond what is specified will result in a significant engine derate.

12. Emissions data is at engine exhaust flange prior to any after treatment.

13. NOx tolerance's are ± 18% of specified value. All other emission values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes, adjusted to the specified NOx level at 100% load.

14. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

15. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

16. LHV rate tolerance is ± 3.0%.

17. Heat rejection values are representative of site conditions. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for atmosphere, ± 20% for lube oil circuit, ± 10% for exhaust, and ± 5% for aftercooler circuit.

18. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.

19. Aftercooler heat rejection is nominal for site conditions and does not include an aftercooler heat rejection factor. Aftercooler heat rejection values at part load are for reference only.

20. Cooling system sizing criteria represent the expected maximum circuit heat rejection for the ratings at site, with applied plus tolerances. Total circuit heat rejection is calculated using formulas referenced in the notes on the standard tech data sheet with the following qualifications. Aftercooler heat rejection data (1AC & 2AC) is based on the standard rating. Jacket Water (JW) and Oil Cooler (OC) heat rejection values are based on the respective site or maximum column. Aftercooler heat rejection factors (ACHRF) are specific for the site elevation and inlet air temperature specified in the site or maximum column, referenced from the table on the standard data sheet

21. Minimum heat recovery values represent the expected minimum heat recovery for the site, with applied minus tolerances. Do not use these values for cooling system sizing.

G3516B

PACKAGED GENSET APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Blake Ridge

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0051	0.0051
Methane	CH4	81.1920	81.4014
Ethane	C2H6	12.1176	12.1489
Propane	C3H8	3.6987	3.7082
Isobutane	iso-C4H1O	0.5442	0.5456
Norbutane	nor-C4H1O	1.0322	1.0349
Isopentane	iso-C5H12	0.2614	0.2621
Norpentane	nor-C5H12	0.2447	0.2453
Hexane	C6H14	0.0689	0.0691
Heptane	C7H16	0.0326	0.0327
Nitrogen	N2	0.3835	0.3845
Carbon Dioxide	CO2	0.1527	0.1531
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	0.0075	0.0075
Nonane	C9H20	0.0017	0.0017
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		99.7428	100.0000

Fuel Makeup:	G17-3500-148 (00) Fuel
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	61.0
Lower Heating Value (Btu/scf):	1098
Higher Heating Value (Btu/scf):	1212
WOBBE Index (Btu/scf):	1324
THC: Free Inert Ratio:	185.009
Total % Inerts (% N2, CO2, He):	0.5376%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	11.40
Stoich A/F Ratio (Mass/Mass):	16.59
Specific Gravity (Relative to Air):	0.688
Fuel Specific Heat Ratio (K):	1.287

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 Data Maintenance Utility 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.

C1000 Megawatt Power Package
High-pressure Natural Gas

1MW of reliable electrical power in one small, ultra-low emission, and highly efficient package.

- High electrical efficiency over a very wide operating range
- Low-maintenance air bearings require no lube oil or coolant
- Ultra-low emissions
- High availability – part load redundancy
- Proven technology with tens of millions of operating hours
- Integrated utility synchronization and protection with a modular design
- 5 and 9 year Factory Protection Plans available
- Remote monitoring and diagnostic capabilities
- Internal fuel gas compressor available for low fuel pressure natural gas applications

C1000 Power Package

Electrical Performance[1]

Electrical Power Output	1000kW
Voltage	400–480 VAC
Electrical Service	3-Phase, 4 wire
Frequency	50/60 Hz, grid connect operation
	10–60 Hz, stand alone operation
Maximum Output Current	1,450A RMS @ 400V, grid connect operation
	1,200A RMS @ 480V, grid connect operation
	1,550A RMS, stand alone operation[2]
Electrical Efficiency LHV	33%

Fuel/Engine Characteristics[1]

Natural Gas HHV	30.7–47.5 MJ/m^3 (825–1,275 BTU/scf)
Inlet Pressure[3]	517–552 kPa gauge (75–80 psig)
Fuel Flow HHV	12,000 MJ/hr (11,400,000 BTU/hr)
Net Heat Rate LHV	10.9 MJ/kWh (10,300 BTU/kWh)

Exhaust Characteristics[1]	Standard	Low-Emissions Version
NOx Emissions @ 15% O_2[4]	< 9 ppmvd (18 mg/m^3)	< 4 ppmvd (8 mg/m^3)
NOx / Electrical Output[4]	0.14 g/bhp-hr (0.4 lb/MWhe)	0.05 g/bhp-hr (0.14 lb/MWhe)
Exhaust Gas Flow	6.7 kg/s (14.7 lbm/s)	6.7 kg/s (14.7 lbm/s)
Exhaust Gas Temperature	280°C (535°F)	280°C (535°F)
Exhaust Energy	7,100 MJ/hr (6,750,000 BTU/hr)	7,100 MJ/hr (6,750,000 BTU/hr)

Reliable power when and where you need it. Clean and simple.

Dimensions & Weight[5]

Width x Depth x Height	2.4 x 9.1 x 2.9 m (96 x 360 x 114 in)
Weight - Grid Connect Model	16874 kg (37,200 lbs)
Weight - Dual Mode Model	20956 kg (46,200 lbs)

Minimum Clearance Requirements[6]

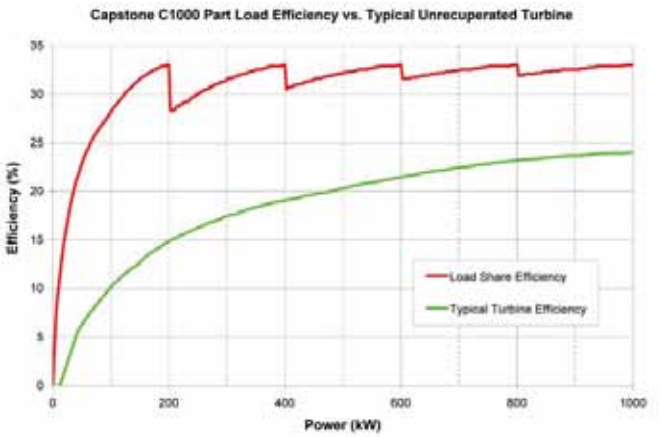
Vertical Clearance	0.6 m (24 in)
Horizontal Clearance	
Left	1.5 m (60 in)
Right	0.0 m (0 in)
Front	1.5 m (60 in)
Rear	2.0 m (80 in)

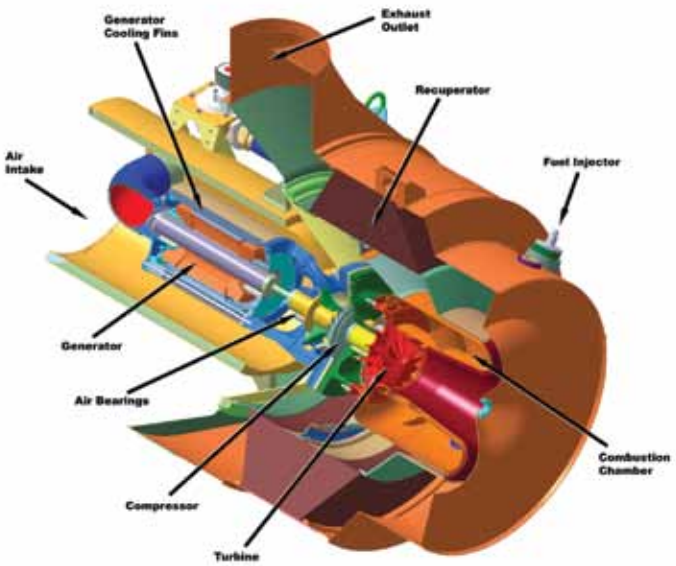
Sound Levels

Acoustic Emissions at Full Load Power	
Nominal at 10 m (33 ft)	65 dBA

Certifications

- UL 2200 and UL 1741 for natural gas operation[7]
- Will comply with IEEE 1547 and will meet statewide utility interconnection requirements for California Rule 21 and the New York State Public Service Commission
- CE certified





C200 Engine

(1) Nominal full power performance at ISO conditions: 59°F, 14.696 psia, 60% RH
(2) With linear load
(3) Inlet pressure for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(4) Emissions for standard natural gas at 39.4 MJ/Nm³ (1,000 BTU/scf) (HHV)
(5) Approximate dimensions and weights
(6) Clearance requirements may increase due to local code considerations
(7) All natural gas models are planned to be UL Listed

Specifications are not warranted and are subject to change without notice.

21211 Nordhoff Street • Chatsworth • CA • 91311 • 866.422.7786 • 818.734.5300 • www.capstoneturbine.com

Capstone Turbine Corporation • 21211 Nordhoff Street • Chatsworth • CA 91311 • USA
Phone: (818) 734-5300 • Fax: (818) 734-5320 • Web: www.microturbine.com

Technical Reference

Capstone MicroTurbine™ Systems Emissions

Summary

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

Maximum Exhaust Emissions at ISO Conditions

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

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

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

C200 X 5 = C1000 (Five C200 modules make up a C1000 unit)

Notes:

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

-Burners
-Flares
-Incinerators

22151 East 91st Street
Broken Arrow, OK 74014 USA
Phone: 918-258-8551
Fax: 918-251-5519
www.zeeco.com

PRICED

July 13, 2017

Williams
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh, PA 15275
Ph: 412-787-3132
fax:

Attention: Austin Day, Sr. Project Engr

Subject: Williams Ref.: BR
Zeeco Reference: 2017-03133FL-01 -- Rev. 2

Thank you for your interest in Zeeco, Inc. We look forward to the opportunity to work with you on this project. In response to your above referenced inquiry, we are pleased to provide you with our proposal for the combustion equipment designed specifically for your needs.

Zeeco's flare systems are designed to handle peak releases immediately, with no adverse effects on the flare itself or on the pilots or ignition system. Zeeco's design also offers exceptional reliability and life expectancy as well as provisions for easy maintenance and repair.

Zeeco appreciates the opportunity to propose our products to Williams. We are confident that we offer the best flaring equipment in the world at competitive prices. Should you have additional questions or require additional information, please feel free to contact us.

Best Regards,

Nikki Jenlink
Flare Application Engineer
(reach me by email at: nikki_jenlink@zeeco.com)

AVAILABLE ATTACHMENTS

Attachment A Company Introduction*

Attachment B Commercial Proposal

Attachment C Process Conditions

Attachment D Specification Sheets:

- Flare Tip Specification Sheet
- Flare Pilot Specification Sheet
- Flare Stack Structure Specification Sheet
- Flame Front Generator (FFG) Specification Sheet
- Utility Piping Scope of Supply Specification Sheet
- Typical High-Temp Thermocouple Wiring Spec Sheet

Attachment E Spare Parts

- Spare Parts for Start-up & Commissioning
- Spare Parts for Two Years Operation

Attachment F Clarifications and Exceptions

Attachment G Start-up & Maintenance Services*

Attachment H Radiation/Noise**

Attachment I Typical GA Drawing - Upon Request

Attachment J ISO &ASME Sec. VIII Code Certificates*

Attachment K Sample Inspection and Test Plan*

Attachment L Zeeco Rental Brochure*

*See R0 Proposal
**See R1 Proposal

ATTACHMENTS

Attachment B

Commercial Proposal

COMMERCIAL PROPOSAL

Scope of Supply

Our scope of supply will include:

1) General Arrangement Drawings for customer approval.
2) Operation & Maintenance Manual.
3) The equipment necessary for flaring the waste streams as specified in the inquiry documents, including:

Flare Tip (FL-7002 BR) with Integral Velocity Seal & Two (2) Pilots
Self-supported Flare Stack (FL-7002 BR)
Manual/Automatic Flame Front Generator (FL-7002 BR) Ignition System

Process Engineering & Design Work for the Complete Flare System
Ladders & Platforms Per OSHA from Flare Tip to Near Grade
Utility Piping & Supports Along Flare Stack from Tip to Near Grade
Conduit & High Temp Thermocouple Wiring Along Stack with JB Near Grade
Conduit & High Temp HEI Ignition Wiring Along Stack with JB Near Grade
One (1) Duplex Fixed Type K 310 SS Sheathed Thermocouple per Pilot

BASE Proposal: MJ Sonic/Multi-nozzle Tips

Scope of Supply (Continued)

Our Scope of Supply does NOT include:

1) Stack or Piping External Insulation, Fireproofing, or Heat Tracing.
2) Field Assembly and / or Erection.
3) Commissioning, Start-up, Supervision, Training, etc. (PER DIEM BASIS).
4) Foundation Design / Supply or Civil Engineering.
5) Interconnecting Piping, Wiring or Conduit Between Stack Base and LCP.
6) Ocean or Inland Freight to Jobsite.
7) Shop Details / Fabrication Drawings of Proprietary Equipment.
8) Any Containerization of Equipment for Shipment or Storage Purposes.
9) Flare Stack Base Plate Templates.
10) Foundation Imbedded Anchor Bolts.
11) Spare Parts Quoted Separately and Priced Lists Included in Proposal.
12) Any Motor Starters or Motor Drivers or Motor Controls.
13) Any Third Party Inspection / Testing / Certification Services.
14) Any Export/Domestic Packing of Quoted Items.
15) Any Delivery of Quoted Items.
16) Any VFD for Pressure Blower/Air Assist Option.
17) Any Automatic Controls/Instrumentation for Blowers.

ATTACHMENTS

Attachment C

Process Conditions

Process Conditions -- English Units

Client:	Williams	Zeeco Ref.: 2017-03133FL-01		Date:	13-Jul-17
Location:	West Virgina	Client Ref.: BR		Rev.	2

	Mol %					
	MJ Flare Tip					
			BR Flare			
			BR Max	BR Min		BR FG
METHANE			81.34	81.34		81.19
ETHANE			11.97	11.97		12.11
PROPANE			3.64	3.64		3.69
BUTANE			1.54	1.54		1.58
PENTANE			0.50	0.50		0.51
HEXANE			0.07	0.07		0.07
HEPTANE						0.03
OCTANE						0.01
NONANE						
DECANE						
DODECANE						
TRIDECANE						
CYCLOPENTANE						
ETHYLENE						
PROPYLENE						
BUTYLENE						
ACETYLENE						
BENZENE						
TOLUENE						
XYLENE						
CARBON MONOXIDE						
CARBON DIOXIDE			0.15	0.15		0.15
HYDROGEN SULFIDE						
SULFUR DIOXIDE						
AMMONIA						
AIR						
HYDROGEN						
OXYGEN						
NITROGEN			0.38	0.38		0.38
WATER						
BUTADIENE						
METHANOL						
Total			**100**	**100**		**100**
Mol. Wt.			19.74	19.74		20.04
L. H. V. (BTU/SCF):			1,085	1,085		1,211.0
Temperature (Deg. F):			-15.0			
Avail. Static Pressure (psig):			35.00			
Flow Rate (lbs/hr):			384,399			
Smokeless Rate (lbs/hr):			384,399			

ATTACHMENTS

Attachment D

Specification Sheets:

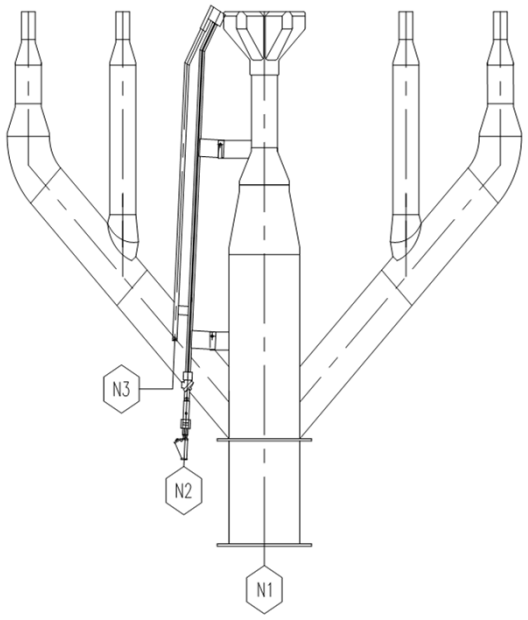
Flare Tip Specification Sheet
• Flare Pilot Specification Sheet
• Flare Stack Structure Specification Sheet
• Flame Front Generator (FFG) Specification Sheet
• Utility Piping Scope of Supply Specification Sheet
• Typical High-Temp Thermocouple Wiring Spec Sheet

Flare Tip Specification Sheet

Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	BR	Rev.	2

General Information:

Tag No.:	FL-7002 BR		
Model:	MJ-16	Type:	Sonic
Length:	10'- 0 " ft.		
Weight:	1622.83055555556 lbs		
No. of Pilots:	2		



(Typical drawing only)

Design Case:

Governing Case:	BR Max	
Molecular Weight:	19.7	
L. H. V. :	1,085	BTU/SCF
Temperature:	-15	Deg. F
Available Static Pressure:	35	psig
Design Flow Rate:	384,399	lbs/hr
Approximate Exit Velocity:	1212	ft/s
Mach No.:	1.00	
Approx. Tip Press. Drop:	31.70	psig

Construction:

Upper Section:	310 SS	Windshield:	NO
Lower Section:	304 SS	Flame Retention Ring:	310 SS
Refractory:	NA	Lifting Lugs:	YES - S.S. Type
Refractory Thk:	NA		

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	16 "	150# RFSO	304 SS
N2 - Pilot Gas:	1	1"	150# RFSW	304 SS
N3 - Ignition Line:	2	1 "	SW	304 SS

Miscellaneous Notes:

1. Includes Integral Purge Reducing Velocity Seal.
2. Required Fuel Gas Purge Rate = 760 SCFH.

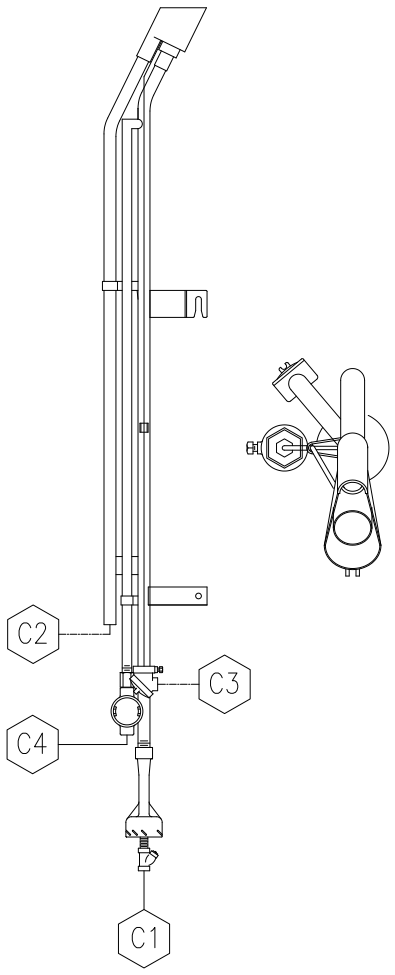
Pre-Mix Flare Pilot Assembly Specification Sheet

Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	BR	Rev.	2

General Information:		
Tag No.:	FP-1	
Model:	HSLF	
Length:	9.135	feet
Weight:	68	lbs.
Pilot Type:	Pre-Mix	High Stability
Ignition Type:	Flame Front Generator	

Process Design Data:		
Design Heat Release:	65,000	BTU/hr
Fuel Gas MW:	22.40	
Fuel Gas LHV:	1,342	BTU/SCF
Fuel Gas Temperature:	100	Deg. F
Fuel Gas Inlet Pressure:	15.00	psig
Fuel Gas Flow rate:	48.4	SCFH
Design Wind Velocity:	150	mph
Design Rainfall:	50.00	inches/hr
Mounting Position:	Vertical	
Thermocouple Type:	K	Ungrounded

Construction:	
Pilot Firing Tip:	HK
Windshield Assembly:	HK
Integral Thermowell:	HK
FFG Ignition Line:	310 SS
Mounting Brackets:	HK
Premix Fuel Line:	310 SS
Thermocouple Sheath:	310 SS
Thermocouple Head:	316 SS
Fuel Mixer / Spud Assembly:	CF-3M / 18-8
Fuel Strainer Assembly:	CF-8M
HEI Probe and Support:	N/A
HEI Junction Head:	N/A



Connections:	**Qty.**	**Size**	**Type**	**Material**
C1 - Fuel Gas Inlet:	1	1/2"	FNPT	CF8M
C2 - FFG Ignition Inlet:	1	1 "	SW	310 SS
C3 - Thermocouple:	1	3/4"	Conduit	Cast Iron
C4 - HEI Ignition:	0	n/a	n/a	n/a

Misc. Notes: (see ignition system datasheet for type applicable to this quote)

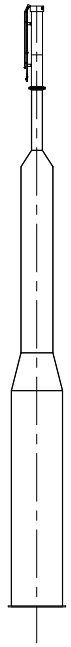
1. Upper mounting bracket is reinforced hook type for pilot removal from platform.
2. Pilot mounting brackets and thermocouple mounting brackets are investment cast assemblies.
3. Pilot mixer assembly is investment cast, high efficiency computer modeled venturi section.
4. Thermocouples are duplex fixed type. Retractable type (replaceable from grade) available upon request.

Self-supported Flare Stack Specification Sheet

Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	BR	Rev.:	2

General Information:

Tag No.:	FL-7002 BR
Overall Height:	130'- 0 "



(Typical drawing only)

Design Criteria:

Wind Design Code:	ASCE 7-10	
Seismic Design Code:	ASCE 7-10	
Importance Factor:	1.25	
Structural Design Code:	AISC	
Wind Speed (Structural):	120	mph
Seismic Zone:	D	
Max. Design Temperature:	150	Deg. F
Min. Design Temperature:	-65	Deg. F
Design Pressure:	50	psig
Riser Corrosion Allow.:	0.000	in.

Construction:

Inner Gas Riser Material:	304 SS	Ladders & Step-offs:	per OSHA
Inner Gas Riser Diameter:	16"	Platform at Tip:	360 deg.
Outer Support Stack Material:	A36CS	Additional Platforms:	None
Outer Support Stack Diameter:	Varies Along Height (for SS Stack)	ACWL:	None

Surface Finish (Carbon Steel Surfaces):

Surface Preparation:	per spec	Primer:	per spec
Int. Coat:	per spec	Finish Paint:	per spec

Utility Piping:

Per Attached Utility Piping Scope of Supply

Miscellaneous Notes:

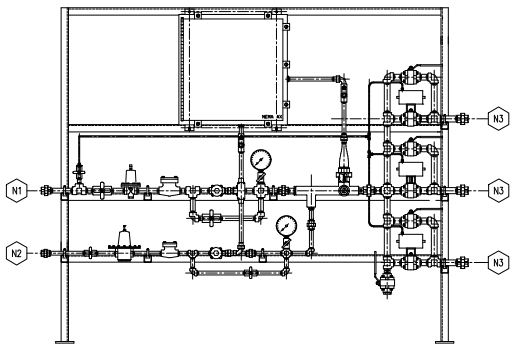
Flame Front Generator Specification Sheet

Client:	Williams	Zeeco Ref.:	2017-03133FL-01	Date:	13-Jul-17
Location:	West Virgina	Client Ref.:	BR	Rev.	2

General Information:	
Tag No.:	FL-7002 BR
Model No.:	LMC-2-DT/S
Operation:	Manual/Automatic
No. of Pilots Ignited:	2
Area Classification:	Class 1, Div 2, Group C&D

Fuel Gas Data:	
Molecular Weight:	20.0
L. H. V.:	1211 BTU/SCF
Temperature:	100 deg. F
Pressure:	15 psig

Utility Consumption:	
Pilot Gas (Per Pilot):	54 SCFH
Pilot Gas (Total):	107 SCFH
Ignition Gas (Intermittent):	91 SCFH
Ignition Air (Intermittent):	910 SCFH
Power Available:	120 Volt, 1 Phase, 60 Hertz



(Typical drawing only)

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/7	Propane Backup:	No
Sun / Rain Shield:	No	Ignition Air PCV:	YES
Pilot Gas PCV:	YES	Ignition Gas PCV:	YES

Surface Finish (Carbon Steel Surfaces):

Surface Preparation:	SSPC-SP6	First Coat:	High Build Epoxy; 1 Coat (4~6 mils)
Second Coat:	Polyurethane; 1 Coat (2~3 mils)	Finish Color:	Grey - RAL7038

Connections:	**Qty.**	**Size**	**Type**	**Material**
N1 - Instrument Air Inlet:	1	3/4"	3000# Thrd. Union	Galvanized C.S.
N2 - Pilot Gas Inlet:	1	1/2"	150# RFSW	Carbon Steel
N3 - Ignition Line Outlet:	2	1 "	150# RFSW	Carbon Steel
Pilot Gas Out. (Not Shown):	1	1/2"	150# RFSW	Carbon Steel

Miscellaneous Notes:

1. Zeeco has considered relay logic. PLC can be considered upon request.
2. Piping/valves/instruments shall be CS w/ SW connections

• Burners
• Flares
• Incinerators
• Combustion Systems

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Broken Arrow, OK 74014 USA
Phone: 918-258-8551
Fax: 918-251-5519
www.zeeco.com
sales@zeeco.com

July 20, 2017

Williams - NE G&P
2000 Commerce Drive
Pittsburgh, PA 15275

Attention: Ignacio Russo
Ignacio.Russo@williams.com

Reference: Pioneer and Blake Ridge Thermal Oxidizers
Zeeco Proposal No. 2017-02645IN-01 Rev 4

Dear Mr. Russo:

Thank you for your inquiry. We appreciate this opportunity to provide our **revised** proposal **to include Waste Stream 5 & 6 as shown in the updated process data provided on July 18, 2017,** for the following equipment:

- Two (2) Zeeco Standard, Direct Fired Horizontal Thermal Oxidizer Packages

The attached proposal describes specific features and performance of Zeeco's standard thermal oxidizer system. Our design incorporates a proven thermal process to effectively treat the waste gas stream from your process. The design and materials of construction have been chosen to maximize on-line time and operational life.

Please note that the base of the thermal oxidizer is mounted on a pre-wired and pre-piped rectangular structural steel skid that will also house the fuel rack and control panel. This is intended to reduce installation time associated with interconnecting piping and wiring between the fuel rack/control panel and the thermal oxidizer.

Furthermore, the unit is ***NFPA 86 compliant*** to ensure personnel and equipment safety.

Again, we appreciate the opportunity to quote on your combustion equipment requirements. After you have had an opportunity to review our proposal, should you have any questions or require additional information, please contact me at (918)893-8416 or email me at sydney_levine@zeeco.com.

Best regards,

Sydney Levine
Applications Engineer

Cc: Ryan B. Tate, Zeeco- Broken Arrow

TABLE OF CONTENTS

1.0 INTRODUCTION

Zeeco has been designing and manufacturing burners, flares, incinerators, air pre-heaters, and combustion systems for world wide use since 1980.

Zeeco's Engineering Staff offers over 1,000 years of experience in the development, design, and testing of Combustion Systems. Zeeco has the proven skills and innovative abilities to design a practical and environmentally friendly combustion system to thermally treat virtually any industrial waste. This learned "art" gained by research and design efforts which are refined by testing and field experience has been implemented in the process plants of numerous industries throughout the world.

From project planning through design, procurement, manufacturing, installation, and even start-up, Zeeco will provide project management and support as deemed necessary. It is our world class HANDS ON type design skills, quality products, experienced staff, and especially our responsiveness to our customers needs that truly set Zeeco apart from our competition.

Quality: Our customers expect it. We demand it!

2.0 SCOPE OF SUPPLY

Zeeco will provide, as specified in your inquiry, One (1) Zeeco Standard Thermal Oxidizer Package for each location, Blake Ridge and Pioneer. A more detailed description of this equipment is included in Section 5.0 entitled: EQUIPMENT DESCRIPTION.

Our Scope of Supply **will include:**

- All Equipment as listed in this Proposal Designed as a Zeeco Standard Unit using Zeeco Standard Suppliers
- General Arrangement and Plot Layout Drawings for Customer Approval
- Required Documentation for Customer Information
- Field Service per the attached Rate Sheet
- Required Inspection and Testing as per Zeeco Standard Inspection and Test Plan

Our Scope of Supply **does not include:**

- Delivery to Jobsite
- Equipment Anchor Bolts, Templates or Slide Plates
- Field Installation and/or Erection
- Start-Up (available on a per diem basis)
- Foundations or Foundation Design
- Environmental Licensing, Registration and Associated Testing
- Area Lighting
- Heat Tracing and External Insulation
- Oxygen Analyzer (can be included as an option)
- Detonation Arrestor (can be included as an option)
- Knock Out Drum (can be included as an option)
- Waste Block Valves or Controls (can be included as an option)
- Process Control System (can be included as an option)

The Zeeco standard, skid mounted horizontal thermal oxidizer package can ship ***32 weeks*** from the date of firm order commitment and release to proceed with procurement of raw materials. One (1) review and approval cycle has been considered in the above shipping schedule and consists of the following:

1. Williams has 2 weeks to review initial submissions of Zeeco's standard drawing and documentation package
2. Zeeco to update the documents and drawings as necessary and send final revision within 2 weeks of receiving the formal drawing comments

Both options presented above are based on using the Zeeco existing standard design and on current materials availability, drafting, and shop schedules. Expedited delivery is available if required. Please contact Zeeco for an updated proposal.

3.5 Preliminary Shipping Weights:

Blake Ridge & Pioneer Scope- Skidded Horizontal Zeeco Standard Thermal Oxidizers

Item	Approximate Shipping Weight (lb)	Approximate Shipping Dimensions
Skid including thermal oxidizer base with refractory installed, fuel rack, and combustion air fan	10,200	8' W x 20' L x 8' H
Thermal Oxidizer Stack	6,000	3' W x 3' L x 22' H

3.6 Start-Up

Start-up and installation are not included in this proposal. If such assistance is required it will be charged in accordance with Zeeco's Standard Rate Schedule attached.

3.7 Limited Liability

Seller shall not be liable for any loss of profit, special, indirect, incidental or consequential damages whether arising under warranty, contract, strict liability, indemnification, or any other cause or combination of causes whatsoever. This limitation shall apply notwithstanding any failure of essential purpose of any limited remedy.

Seller's cumulative liability, inclusive of insurance proceeds paid to Agent under Seller's insurance policies and liquidated damages paid to Agent, shall in no event be in excess of the value of the purchase price, whether arising under warranty, contract, strict liability, indemnification, or any other cause or combination of causes whatsoever. These limitations shall prevail over any conflicting or inconsistent provisions stated elsewhere.

4.0 DESIGN BASIS

4.1 Site Conditions

Elevation, feet	Blake Ridge: 1,450 Pioneer: 1,250
Barometric Pressure, psia	13.9
Temperature, ^{o}F (Min/Max)	-20* / 100
Design Relative Humidity	90% (assumed)
Wind Design	ASCE 7-10, 120MPH

*Note: The Thermal Oxidizer package is acceptable to -20°F with the exception of the HMI, which is guaranteed to 32°F.

4.2 Waste Stream Summary

	PIONEER					
	Waste Gas 1	**Waste Gas 2**	**Waste Gas 3**	**Waste Gas 4**	**Waste Gas 5**	**Waste Gas 6**
	Mol %	**Mol %**	**Mol %**	**Mol %**	**Mol %**	**Mol %**
Water	85.80192	85.80192	0.1649743	0.1649743	**0**	**0**
TEG	0.0001174	0.0001174	0.0001382	0.0001382	**0**	**0**
Nitrogen	0.00054	0.00054	0.0896987	0.0896987	**0**	**0**
Methane	1.3688041	1.3688041	51.344687	51.344687	**0**	**0**
CO2	0.1482647	0.1482647	0.5000099	0.5000099	**0**	**0**
Ethane	2.7699719	2.7699719	26.727424	26.727424	**0**	**0**
Propane	2.8329436	2.8329436	13.104553	13.104553	**20.986107**	**20.983331**
i-Butane	0.3045151	0.3045151	1.1240846	1.1240846	**11.165111**	**11.16968**
n-Butane	1.7903509	1.7903509	4.4060352	4.4060352	**41.265849**	**41.265083**
i-Pentane	0.4968271	0.4968271	0.6435775	0.6435775	**6.8906596**	**6.891371**
n-Pentane	1.0508567	1.0508567	1.1111151	1.1111151	**10.954713**	**10.953998**
2,3-Dimethylbutane	0.3533435	0.3533435	0.2251448	0.2251448	**2.4705339**	**2.4699713**
3-Methylpentane	0.2620526	0.2620526	0.1449929	0.1449929	**1.5553963**	**1.5556149**
Hexane	0.2724999	0.2724999	0.1442947	0.1442947	**1.7404499**	**1.7402445**
2,2-Dimethylpentane	0.0025424	0.0025424	0.0011917	0.0011917	**0.0151192**	**0.0151176**
Methylcyclopentane	0.1080608	0.1080608	0.0169657	0.0169657	**0.1282144**	**0.1282291**
Benzene	0.1038125	0.1038125	0.0027162	0.0027162	**0.0118769**	**0.0118758**
3,3-Dimethylpentane	0.0034755	0.0034755	0.0010277	0.0010277	**0.0124009**	**0.0124003**
Cyclohexane	0.131173	0.131173	0.0224721	0.0224721	**0.167149**	**0.1671086**
2-Methylhexane	0.1065749	0.1065749	0.0363433	0.0363433	**0.1272613**	**0.127264**
2,3-Dimethylpentane	0.0047007	0.0047007	0.0012513	0.0012513	**0.0152063**	**0.0152027**
3-Methylhexane	0.1157544	0.1157544	0.0319648	0.0319648	**0.4129168**	**0.4128873**
Heptane	0.2365455	0.2365455	0.0588878	0.0588878	**0.8027164**	**0.8024295**

Toluene	0.4661113	0.4661113	0.0063571	0.0063571	**0.0374895**	**0.0374861**
Octane	0.0781148	0.0781148	0.0112213	0.0112213	**0.1909147**	**0.1908976**
Ethylbenzene	0.2614509	0.2614509	0.0023632	0.0023632	**0.021013**	**0.021008**
o-Xylene	0.0583867	0.0583867	0.0003829	0.0003829	**0.002905**	**0.0029045**
2-Methylheptane	0.0569704	0.0569704	0.0108261	0.0108261	**0.1766993**	**0.1767202**
Methylcyclohexane	0.2703071	0.2703071	0.0339189	0.0339189	**0.3790713**	**0.3790206**
2,5-Dimethylhexane	0.0086627	0.0086627	0.0024037	0.0024037	**0.0391255**	**0.0391205**
1,t-3-Dimethylcyclohexane	0.0103362	0.0103362	0.0007206	0.0007206	**0.0109802**	**0.0109802**
Nonane	0.024489	0.024489	0.0018243	0.0018243	**0.043396**	**0.0433819**
n-Undecane	0.000775	0.000775	1.57E-05	1.57E-05	**5.70E-04**	**5.70E-04**
n-Decane	0.0060499	0.0060499	0.0002399	0.0002399	**0.0076207**	**0.007618**
Dodecane	0.0001128	0.0001128	1.19E-06	1.19E-06	**5.64E-05**	**5.64E-05**
Tridecane	1.54E-05	1.54E-05	9.25E-08	9.25E-08	**5.43E-06**	**5.42E-06**
Tetradecane	1.82E-06	1.82E-06	7.74E-09	7.74E-09	**5.72E-07**	**5.73E-07**
Pentadecane	4.66E-07	4.66E-07	1.65E-09	1.65E-09	**1.56E-07**	**1.56E-07**
Hexadecane	3.63E-07	3.63E-07	1.22E-09	1.22E-09	**1.24E-07**	**1.24E-07**
Heptadecane	7.27E-08	7.27E-08	2.40E-10	2.40E-10	**2.76E-08**	**2.76E-08**
Octadecane	2.96E-08	2.96E-08	8.59E-11	8.59E-11	**1.08E-08**	**1.08E-08**
Nonadecane	7.95E-09	7.95E-09	1.99E-11	1.99E-11	**2.49E-09**	**2.50E-09**
Eicosane	2.53E-09	2.53E-09	4.46E-12	4.46E-12	**9.04E-10**	**9.05E-10**
C21	2.31E-09	2.31E-09	4.13E-12	4.13E-12	**1.05E-09**	**1.05E-09**
C22	2.03E-09	2.03E-09	3.57E-12	3.57E-12	**8.08E-10**	**8.08E-10**
C23	8.64E-10	8.64E-10	1.47E-12	1.47E-12	**4.00E-10**	**4.00E-10**
C24	1.92E-11	1.92E-11	0	0	**2.17E-11**	**2.17E-11**
m-Xylene	0.1335432	0.1335432	0.0011677	0.0011677	**0.0139191**	**0.0139206**
p-Xylene	0.1275405	0.1275405	0.0012043	0.0012043	**0.0102296**	**0.0102275**
2,2,4-Trimethylpentane	0.0100727	0.0100727	0.002629	0.002629	**0.0369041**	**0.0368986**
2,4-Dimethylpentane	0.0009178	0.0009178	0.0004242	0.0004242	**0.0055755**	**0.0055764**
3-Ethylpentane	0.0196507	0.0196507	0.0046713	0.0046713	**0.057195**	**0.0571814**
2,4-Dimethylhexane	0.0104157	0.0104157	0.0025313	0.0025313	**0.0382339**	**0.0382293**
trans-1,2-Dimethylcyclohexane	0.1165761	0.1165761	0.0088281	0.0088281	**0.1352164**	**0.135206**
cis-1,2-Dimethylcyclohexane	0.0566796	0.0566796	0.0032722	0.0032722	**0.0511976**	**0.0511875**
cis-1,3-Dimethylcyclohexane	0.0171711	0.0171711	0.0014461	0.0014461	**0.0199998**	**0.0199939**
PRESSURE	0.1 psig	0.1 psig	57 psig	57 psig	**1 psig**	**1 psig**
TEMPERATURE	205 F	205 F	108 F	108 F	**100 F**	**100 F**
MW	23.5	23.5	27.6	27.6	**60.6**	**60.6**

FLOW RATE	230 lb/hr	230 lb/hr	104 lb/hr	104 lb/hr	**23 lb/hr**	**3 lb/hr**

	BLAKE RIDGE					
	Waste Gas 1	**Waste Gas 2**	**Waste Gas 3**	**Waste Gas 4**	**Waste Gas 5**	**Waste Gas 6**
	Mol %	**Mol %**	**Mol %**	**Mol %**	**Mol %**	**Mol %**
Water	90.708664	90.708664	0.2017609	0.2017609	**0**	**0**
TEG	0.0001122	0.0001122	0.0001397	0.0001397	**0**	**0**
Nitrogen	0.0004032	0.0004032	0.0852151	0.0852151	**0**	**0**
Methane	1.3278677	1.3278677	63.75814	63.75814	**0**	**0**
CO2	0.163891	0.163891	0.7111178	0.7111178	**0**	**0**
Ethane	1.7101505	1.7101505	21.237356	21.237356	**0**	**0**
Propane	1.396036	1.396036	8.3472711	8.3472711	**38.323047**	**38.323876**
i-Butane	0.2289641	0.2289641	1.0938283	1.0938283	**12.777954**	**12.779927**
n-Butane	0.7701528	0.7701528	2.4546063	2.4546063	**26.131425**	**26.134075**
i-Pentane	0.363147	0.363147	0.6120734	0.6120734	**6.9368491**	**6.9331473**
n-Pentane	0.4541709	0.4541709	0.6269606	0.6269606	**6.4849562**	**6.481844**
2,3-Dimethylbutane	0.3026362	0.3026362	0.2514102	0.2514102	**2.7623678**	**2.7629963**
3-Methylpentane	0.2249217	0.2249217	0.1619479	0.1619479	**1.7231632**	**1.7234484**
Hexane	0.2326474	0.2326474	0.1614611	0.1614611	**1.8912048**	**1.8915898**
2,2-Dimethylpentane	0.0021887	0.0021887	0.0013412	0.0013412	**0.0160914**	**0.0160933**
Methylcyclopentane	0.089903	0.089903	0.0185289	0.0185289	**0.1400683**	**0.1401048**
Benzene	0.0844365	0.0844365	0.0028887	0.0028887	**0.0131832**	**0.0131829**
3,3-Dimethylpentane	0.0029518	0.0029518	0.0011436	0.0011436	**0.0130236**	**0.0130266**
Cyclohexane	0.107881	0.107881	0.0241539	0.0241539	**0.18067**	**0.1806805**
2-Methylhexane	0.0909396	0.0909396	0.0406738	0.0406738	**0.1313767**	**0.1314031**
2,3-Dimethylpentane	0.003982	0.003982	0.0013899	0.0013899	**0.0157618**	**0.0157643**
3-Methylhexane	0.0980455	0.0980455	0.0355655	0.0355655	**0.4234141**	**0.4236583**
Heptane	0.199117	0.199117	0.0652781	0.0652781	**0.8041488**	**0.803854**
Toluene	0.3817306	0.3817306	0.0068002	0.0068002	**0.0378072**	**0.0378085**
Octane	0.0655045	0.0655045	0.0124363	0.0124363	**0.1754799**	**0.1754847**
Ethylbenzene	0.2156914	0.2156914	0.0025333	0.0025333	**0.0193993**	**0.0193989**
o-Xylene	0.0487716	0.0487716	0.0004097	0.0004097	**0.0026479**	**0.002648**
2-Methylheptane	0.0482573	0.0482573	0.0120698	0.0120698	**0.1662129**	**0.1662205**
Methylcyclohexane	0.2229197	0.2229197	0.0366772	0.0366772	**0.3825573**	**0.3825713**
2,5-Dimethylhexane	0.0073056	0.0073056	0.002683	0.002683	**0.0378094**	**0.0378049**
1,t-3-Dimethylcyclohexane	0.0085951	0.0085951	0.0007932	0.0007932	**0.0102749**	**0.0102757**
Nonane	0.0216021	0.0216021	0.0021341	0.0021341	**0.0377681**	**0.0377642**
n-Undecane	0.0007895	0.0007895	2.13E-05	2.13E-05	**4.84E-04**	**4.84E-04**
n-Decane	0.0056354	0.0056354	0.0002983	0.0002983	**0.0065143**	**0.0065136**

Dodecane	0.0001279	0.0001279	1.79E-06	1.79E-06	**4.80E-05**	**4.80E-05**
Tridecane	1.94E-05	1.94E-05	1.51E-07	1.51E-07	**4.62E-06**	**4.61E-06**
Tetradecane	2.67E-06	2.67E-06	1.38E-08	1.38E-08	**4.87E-07**	**4.86E-07**
Pentadecane	7.98E-07	7.98E-07	3.16E-09	3.16E-09	**1.32E-07**	**1.32E-07**
Hexadecane	7.03E-07	7.03E-07	2.55E-09	2.55E-09	**1.05E-07**	**1.05E-07**
Heptadecane	1.56E-07	1.56E-07	5.45E-10	5.45E-10	**2.34E-08**	**2.34E-08**
Octadecane	6.79E-08	6.79E-08	2.09E-10	2.09E-10	**9.12E-09**	**9.12E-09**
Nonadecane	1.99E-08	1.99E-08	5.22E-11	5.22E-11	**2.13E-09**	**2.12E-09**
Eicosane	6.78E-09	6.78E-09	1.24E-11	1.24E-11	**7.67E-10**	**7.68E-10**
C21	6.60E-09	6.60E-09	1.20E-11	1.20E-11	**8.88E-10**	**8.88E-10**
C22	6.16E-09	6.16E-09	1.06E-11	1.06E-11	**6.86E-10**	**6.85E-10**
C23	2.49E-09	2.49E-09	3.87E-12	3.87E-12	**3.39E-10**	**3.40E-10**
C24	4.45E-11	4.45E-11	7.76E-14	7.76E-14	**1.85E-11**	**1.85E-11**
m-Xylene	0.1106692	0.1106692	0.0012565	0.0012565	**0.0127826**	**0.0127818**
p-Xylene	0.1057971	0.1057971	0.0012974	0.0012974	**0.0094165**	**0.0094196**
2,2,4-Trimethylpentane	0.0086311	0.0086311	0.002963	0.002963	**0.0370198**	**0.037021**
2,4-Dimethylpentane	0.0007906	0.0007906	0.0004778	0.0004778	**0.0058991**	**0.0058979**
3-Ethylpentane	0.0165798	0.0165798	0.0051684	0.0051684	**0.0585258**	**0.0585323**
2,4-Dimethylhexane	0.0087772	0.0087772	0.0028154	0.0028154	**0.0371051**	**0.0370923**
trans-1,2-Dimethylcyclohexane	0.0971593	0.0971593	0.0097175	0.0097175	**0.1272388**	**0.1272405**
cis-1,2-Dimethylcyclohexane	0.0471172	0.0471172	0.0036043	0.0036043	**0.0473183**	**0.0473343**
cis-1,3-Dimethylcyclohexane	0.0143137	0.0143137	0.0015894	0.0015894	**0.0189802**	**0.0189809**
PRESSURE	0.1 psig	0.1 psig	57 psig	57 psig	**1 psig**	**1 psig**
TEMPERATURE	205 F	205 F	108 F	108 F	**100 F**	**100 F**
MW	23.7	23.7	24.6	24.6	**57.7**	**57.7**
FLOW RATE	267 lb/hr	267 lb/hr	108 lb/hr	108 lb/hr	**30 lb/hr**	**3.3 lb/hr**

Waste streams for both locations are assumed to be in vapor phase, no liquid has been considered within this design. For both locations, it has been assumed that Waste Streams 1 and 2 are together in one pipe coming to the thermal oxidizer, Waste 3 and 4 are in together in one pipe and Wastes 5 & 6 are combined into one pipe.

4.3 Utilities

Electrical Power	460V / 3 Phase / 60 Hz
Instrument Air, SCFH	2000
Maximum Fuel Gas Required, MMBtu/Hr	1

4.4 Flue Gas Summary

	PIONEER at 1800F Operating Temperature			
	Waste Gas 1, 2, 3, 4, 5 & 6	Waste Gas 1, 2, 3, 4 & 6	Waste Gas 1, 3, 5 & 6	Waste Gas 1, 3 & 6
	Mol %	Mol %	Mol %	Mol %
Carbon Dioxide	4.81	4.81	4.84	4.82
Water	15.89	16.06	15.64	15.92
Nitrogen	69.17	69.05	69.41	69.22
Oxygen	10.12	10.08	10.11	10.04
Total, lb/hr	16,972	16,079	9,858	8,976
Mol. Wt.	27.6	27.6	27.6	27.6

	BLAKE RIDGE at 1800F Operating Temperature			
	Waste Gas 1, 2, 3, 4, 5 & 6	Waste Gas 1, 2, 3, 4 & 6	Waste Gas 1, 3, 5 & 6	Waste Gas 1, 3 & 6
	Mol %	Mol %	Mol %	Mol %
Carbon Dioxide	4.76	4.75	4.78	4.75
Water	16.97	17.28	16.53	17.02
Nitrogen	68.38	68.16	68.77	68.42
Oxygen	9.89	9.81	9.92	9.80
Total, lb/hr	16,480	15,313	9,755	8,601
Mol. Wt.	27.5	27.4	27.5	27.5

4.5 System Performance

Stack Parameter	Guaranteed Values
VOC Destruction Efficiency	99.5 %

These values are understood to apply only when the system is operated in accordance with the operating conditions stipulated in the design summary and for the waste(s) stipulated in the design basis sections of this proposal.

5.0 PROCESS DESCRIPTION

The Horizontal Forced Draft Thermal Oxidizer is equipped with one (1) GB-Series Fuel Gas Burner. The system is purged using the combustion blower provided. When the purge cycle is complete, the burner pilot is ignited via electric ignition. Once the burner pilot flame is proven, the main burner flame is ignited.

The thermal oxidizer is then allowed to achieve a waste permissive temperature of 1800°F for Blake Ridge and Pioneer. Waste gas can then be introduced into the thermal oxidizer. The thermal oxidizer controlled temperature and residence time ensures that the waste gasses are destroyed using a minimum fuel quantity. The flue gases from the thermal oxidizer exit to atmosphere via the refractory lined vent stack.

6.0 EQUIPMENT DESCRIPTION—BLAKE RIDGE

6.1 Standard Horizontal Thermal Oxidizer

One (1) standard horizontal thermal oxidizer is offered. It is designed to operate at **1800°F** with excess air to ensure complete combustion of the waste gas combustible components. The thermal oxidizer has the following features:

- Nominal 5'-0" O.D. x 20'-0" overall skid length
- Includes 3'-6" O.D. Stack
- Discharge height of 20'-0" above grade
- Thermal oxidizer and Stack Shell Material: SA-36
- All Carbon Steel External Surfaces Sandblasted and Painted per Williams Above Ground Protective Coating Specification, 09 96 10C Revision 01.02
- The base portion of the thermal oxidizer shall be mounted on a structural steel skid, along with the waste gas piping, fuel metering rack, and control panel. Skid dimensions will be approximately 8' W x 20 L x 8' H.
- The stack portion of the thermal oxidizer shall be shipped loose for bolting to the base portion in the field.

6.2 Burner

One (1) Forced Draft Zeeco Burner is offered and has the following features:

- 1.0 MMBtu/hr maximum fuel gas release rating
- High Energy Electric Spark Ignition System
- A-36 Carbon Steel Construction
- 60% Al_2O_3 Burner Tile Construction
- All Carbon Steel External Surfaces Sandblasted and Painted per Williams Above Ground Protective Coating Specification, 09 96 10C Revision 01.02
- **10**:1 Fuel Gas Turndown

6.3 Refractory

The refractory will be supplied and shop installed by Zeeco. Refractory material proposed within the thermal oxidizer chamber is a hard castable lining supplied by Zeeco standard suppliers. Refractory material for the stack has been quoted with a ceramic fiber lining due to the increased stack size.

6.4 Combustion Air Fan

One (1) Combustion Air Fan is offered and has the following features:

- **4033 ACFM** at 100°F
- **5**" H_2O static pressure
- < **7.5** HP Motor

- Manufacturer's standard construction
- Manufacturer's standard paint system

6.5 Instrumentation & Controls

Instrumentation will be provided as shown on the attached P&ID by Zeeco Standard Suppliers. Some scope shown in P&ID is option scope as defined in this proposal. Zeeco's scope includes:

1. Pre-assembled fuel gas and instrument air control rack, skid mounted.
2. Instrument and piping connections from fuel rack to burner.
3. Rack mounted local control panel with BMS PLC only and provision to use the customer DCS for process control functions.
4. The BMS complies with NFPA 86; this proposal offers a SIL 2 compliant Siemens PLC.

Zeeco has considered the process control package, waste gas piping and instrumentation to be provided by others. However, these items can be provided by Zeeco upon request. **Zeeco has included an oxygen analyzer within the base scope of supply.**

7.0 EQUIPMENT DESCRIPTION--PIONEER

7.1 Standard Horizontal Thermal Oxidizer

One (1) standard horizontal thermal oxidizer is offered. It is designed to operate at 1800^{o}F with excess air to ensure complete combustion of the waste gas combustible components. The thermal oxidizer has the following features:

- Nominal 5'-0" O.D. x 20'-0" overall skid length
- Includes 3'-6" O.D. Stack
- Discharge height of 20'-0" above grade
- Thermal oxidizer and Stack Shell Material: SA-36
- All Carbon Steel External Surfaces Sandblasted and Painted per Williams Above Ground Protective Coating Specification, 09 96 10C Revision 01.02
- The base portion of the thermal oxidizer shall be mounted on a structural steel skid, along with the waste gas piping, fuel metering rack, and control panel. Skid dimensions will be approximately 8' W x 20 L x 8' H.
- The stack portion of the thermal oxidizer shall be shipped loose for bolting to the base portion in the field.

7.2 Burner

One (1) Forced Draft Burner Assembly is offered and will consist of One (1) Zeeco GB-Series Burner. The Burner is specially designed for forced draft operation and has the following features:

- 1.0 MMBtu/hr maximum fuel gas release rating
- High Energy Electric Spark Ignition System
- A-36 Carbon Steel Construction
- 60% Al_2O_3 Burner Tile Construction
- All Carbon Steel External Surfaces Sandblasted and Painted per Williams Above Ground Protective Coating Specification, 09 96 10C Revision 01.02
- **10**:1 Fuel Gas Turndown

7.3 Combustion Air Blower

- **4153 ACFM** at 100°F
- **5**" H_2O static pressure
- < **7.5** HP Motor
- Manufacturer's standard construction
- Manufacturer's standard paint system

7.4 Refractory

The refractory will be supplied and shop installed by Zeeco. Refractory material proposed within the thermal oxidizer chamber is a hard castable lining supplied by Zeeco standard suppliers. Refractory material for the stack has been quoted with a ceramic fiber lining due to the increased stack size.

7.5 Instrumentation and Controls

Zeeco's Standard Burner Management System Instrumentation and Controls scope is offered by Zeeco Standard Suppliers:

5. Pre-assembled fuel gas and instrument air control rack, skid mounted.
6. Instrument and piping connections from rack to field instruments and other field equipment by others.
7. Rack mounted local control panel with BMS PLC only and provision to use the customer DCS for process control functions.
8. The BMS complies with NFPA 86; this proposal offers a Siemens ET200S with a VFD included in the Panel.

Zeeco has considered the process control package, waste gas piping and instrumentation to be provided by others. However, these items can be provided by Zeeco upon request. **Zeeco has included an oxygen analyzer within the base scope of supply.**

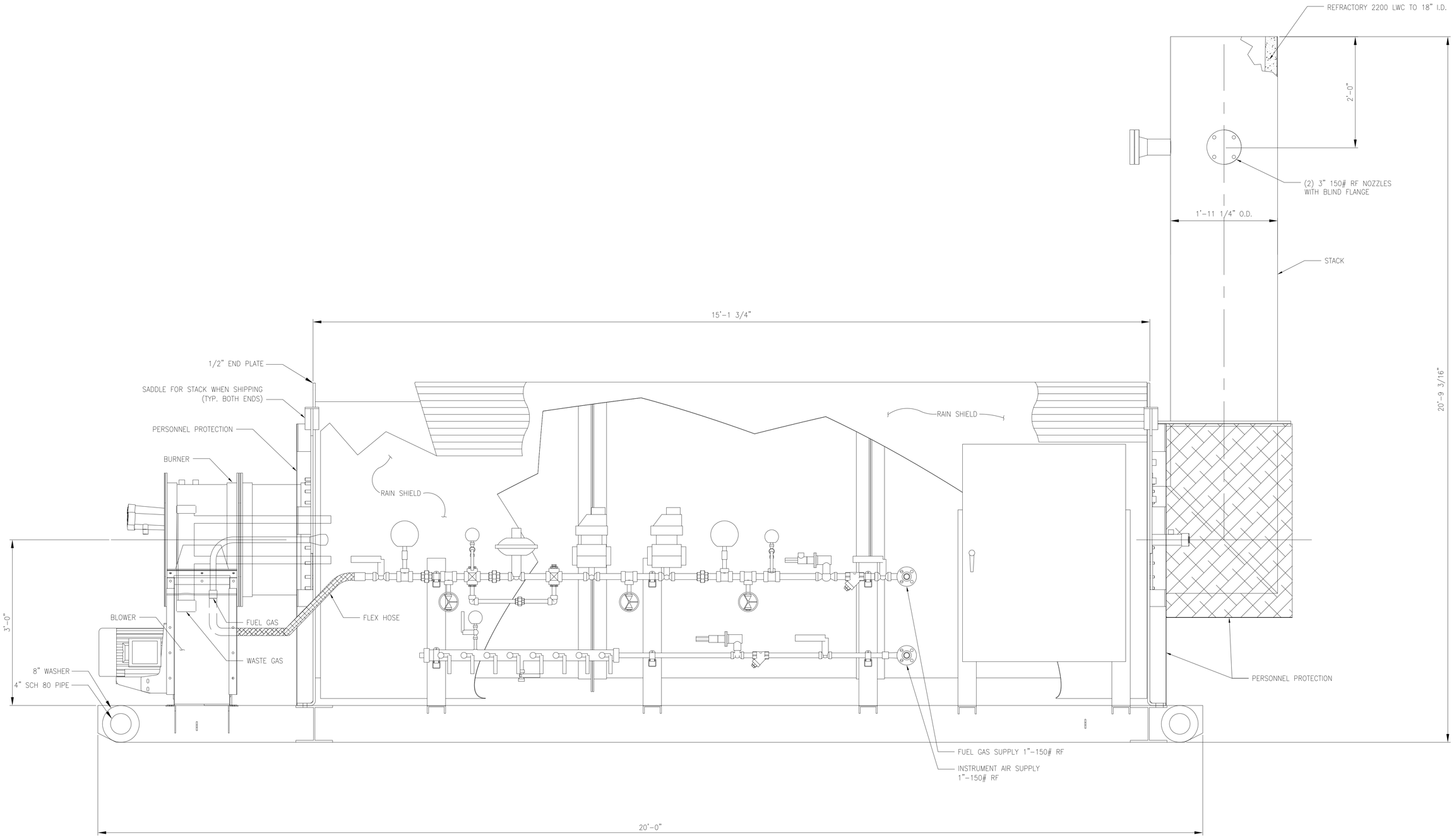
8.0 PERFORMANCE WARRANTY

Zeeco warranties the system performance stated in this proposal. These values are understood to apply only when the system is operated in accordance with the operating conditions stipulated in the **DESIGN SUMMARY** for the waste (s) stipulated in the **DESIGN BASIS** sections of this proposal.

The purchaser, at his option and cost, may conduct a performance test to determine if the performance warranties are being met. The purchaser shall provide sufficient written notice to Zeeco so that a representative of Zeeco can witness the test. Additionally, Zeeco will be given access to all operating data and laboratory analysis that would bear on the final determination of performance. All analysis of operating data will be done in accordance with generally accepted engineering practice and only published physical data will be used.

Attachment E

General Arrangement Drawing



ELEVATION VIEW

GENERAL WEIGHTS	
DESCRIPTION	WEIGHT
FOUNDATION LOAD/LIFT LOAD	16,200 LB

** PRELIMINARY DRAWING **

CUSTOMER:	
JOBSITE:	
END USER:	
P.O. NO.:	

ZEECO, INC.
22151 EAST 91st STREET
BROKEN ARROW, OK 74014
PHONE: (918) 258-8551
FAX: (918) 251-5519
www.zeeco.com
sales@zeeco.com

GENERAL ARRANGEMENT
STANDARD HORIZONTAL
INCINERATOR SYSTEM

DRAWN	DATE
SLR	07AUG14
CHK	APP
RBT	STO
SCALE	APP
NONE	STO

S.O. NO.	DWG., SUB. CAT. & SYSTEM NO.	DWG. NO.	REV. NO.
	Z-HTO - G065A - 001		A

Attachment F

Piping & Instrumentation Diagram (P&ID)

CONTINUED ON DWG. -002

REMOTE ESD — DCS
COMMON ALARM — DCS

LCP-100
LOCAL CONTROL PANEL
BMS | HMI

POWER ON/OFF — HS 100
POWER ON — XL 100
ESD — ESD 100

PAL 100 (BMS L) — PAL 100
PSL 100 — PAL 100

5mm BTU/HR
FUEL GAS SUPPLY
1"-FG
NOTE 2
1" 150#

1" BAV-101
1" STR-110
SET @ 50 PSIG
PCV 101A
1" PCV-101A
PI 101A
1/4" BAV-210
1/2" BAV-122

PALL 101A — BMS LL
PSLL 101A

BMS S XY 101A — XV 101A
1" XV-101A F.C.
1/2" BAV-122

BMS S XY 101B — XV 101B
ZSC 101B
1" XV-101B F.C.

FROM TIC-201A
BMS ZSC 101
TY 101 I/P
TV 101
1" TV-101

PI 101B
1/4" BAV-210
1/2" BAV-122

PAHH 101A — BMS HH
PSHH 101A
1" BAV-101
1"-FG
DWG. -002 MAIN FUEL GAS BURNER

FLOW	MIN	588.2 SCFH
	MAX	5882 SCFH
DESIGN	S.G.	0.6
TEMP	MIN	AMB.
	MAX	100
PRESS	MIN	65 PSIG
	NORM	160 PSIG
	MAX	250 PSIG

PI 103A
SET @ 70 PSIG
1/4" BAV-210

INST. AIR SUPPLY
3/4"-IA
NOTE 2
3/4" 150#

3/4" BAV-125
3/4" STR-210
3/4" PCV-102A
1/2" BAV-122

FLOW	MIN	1035 SCFH
	MAX	2835 SCFH
DESIGN	S.G.	1.0
TEMP	MIN	AMB
	MAX	AMB
PRESS	MIN	80 PSIG
	MAX	160 PSIG

CONTINUED ON DWG. -002

FUEL RACK/SKID

SEE DWG. -000 FOR LEGEND AND NOTES

NO.	DATE	REVISION DESCRIPTION	BY	CKD.	APP.
0	17SEP14	FOR ISSUE	JJA/TRP	AMS	MAB

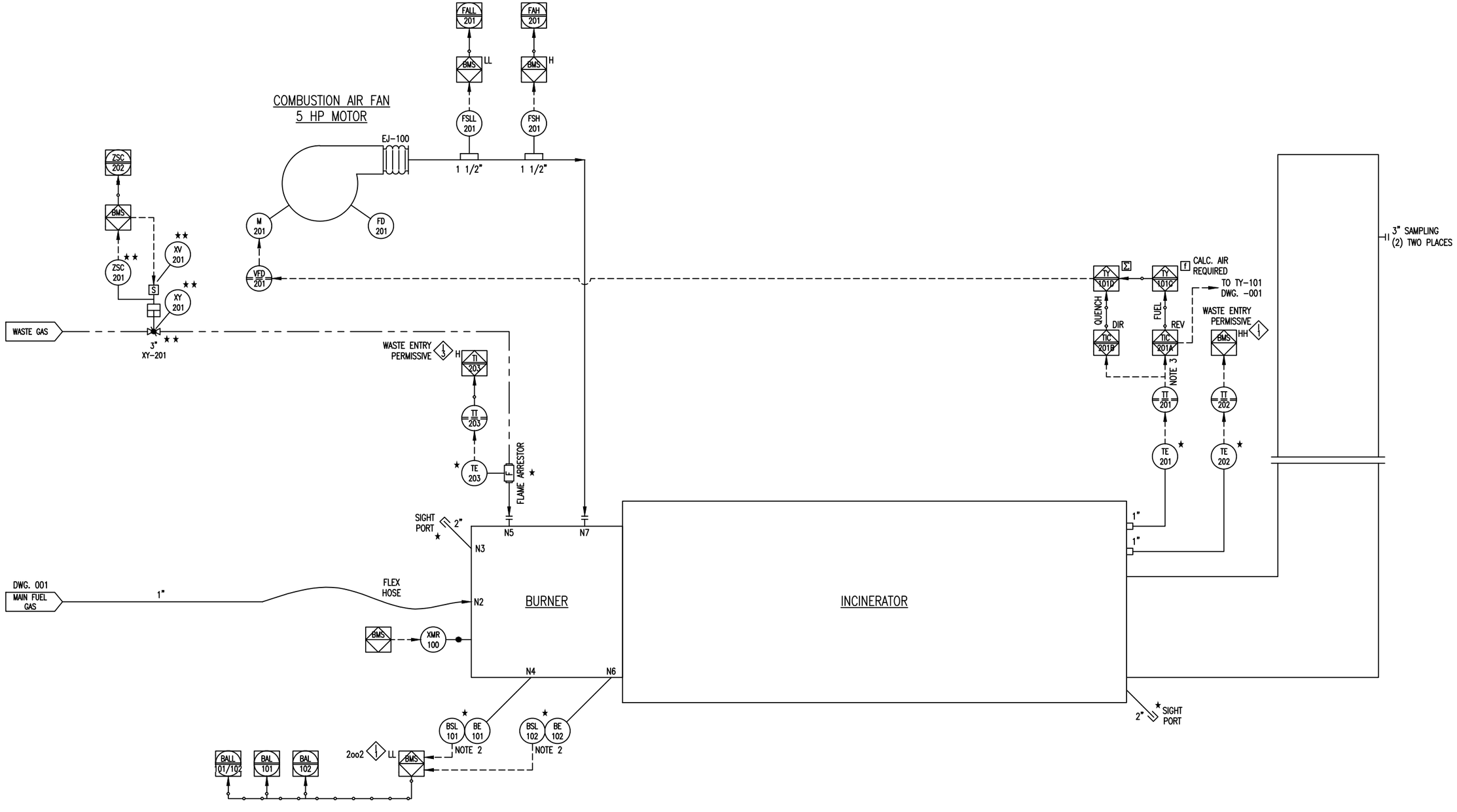
CUSTOMER:
JOBSITE:
END USER:
P.O. NO.:

ZEECO, INC.
22151 EAST 91st STREET
BROKEN ARROW, OK 74014
PHONE: (918) 258-8551
FAX: (918) 251-5519
www.zeeco.com
sales@zeeco.com

P & I DIAGRAM
INCINERATOR PACKAGE
–

DRAWN JJA/TRP	DATE 17SEP14
CHK KNV	APP STO
SCALE N.T.S.	APP STO

S.O. NO. | GROUP | DWG. SUB CAT. SYSTEM NO. | DWG. NO. | REV. NO.
-04-11001-001 | 0



SEE DWG. -000 FOR LEGEND AND NOTES

NO.	DATE	REVISION DESCRIPTION	BY	CKD.	APP.
0	17SEP14	FOR ISSUE	JJA/TRP	AMS	MAB

CUSTOMER:
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P & I DIAGRAM
INCINERATOR PACKAGE
–

DRAWN	DATE
JJA/TRP	17SEP14
CHK	APP
KNV	STO
SCALE	APP
N.T.S.	STO

S.O. NO.	GROUP	DWG. SUB CAT. SYSTEM NO.	DWG. NO.	REV. NO.
04-11001-002				0

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: D-2 - Blake Ridge CF - 125 MMscfd w/Electric Pump
File Name: D:\Projects2\wfs\OVM\Blake Ridge\Blake Ridge CF - 125 MMscfd (2MM) w.Electric Pump.ddf
Date: July 27, 2017

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Blake Ridge Extended Gas Analysis;
Elect Pump, 20 gpm
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 80.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1527
Nitrogen	0.3835
Methane	81.1920
Ethane	12.1176
Propane	3.6987
Isobutane	0.5442
n-Butane	1.0322
Isopentane	0.2614
n-Pentane	0.2447
n-Hexane	0.0689
Cyclohexane	0.0138
Other Hexanes	0.1638
Heptanes	0.0729
Methylcyclohexane	0.0147
2,2,4-Trimethylpentane	0.0015
Benzene	0.0006
Toluene	0.0018
Ethylbenzene	0.0009
Xylenes	0.0011
C8+ Heavies	0.0279

DRY GAS:

Flow Rate: 125.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 20.0 gpm

PUMP:

Glycol Pump Type: Electric/Pneumatic

FLASH TANK:

Flash Control:	Combustion device
Flash Control Efficiency:	98.00 %
Temperature:	110.0 deg. F
Pressure:	60.0 psig

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device:	Combustion Device
Destruction Efficiency:	98.0 %
Excess Oxygen:	5.0 %
Ambient Air Temperature:	50.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: D-2 - Blake Ridge CF - 125 MMscfd w/Electric Pump
File Name: D:\Projects2\wfs\OVM\Blake Ridge\Blake Ridge CF - 125 MMscfd (2MM) w.Electric Pump.ddf
Date: July 27, 2017

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Blake Ridge Extended Gas Analysis;
Elect Pump, 20 gpm
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0382	0.917	0.1674
Ethane	0.1022	2.454	0.4478
Propane	0.1191	2.859	0.5217
Isobutane	0.0402	0.965	0.1761
n-Butane	0.1163	2.792	0.5094
Isopentane	0.0370	0.889	0.1622
n-Pentane	0.0498	1.195	0.2180
n-Hexane	0.0311	0.746	0.1361
Cyclohexane	0.0350	0.840	0.1533
Other Hexanes	0.0525	1.260	0.2300
Heptanes	0.0758	1.818	0.3318
Methylcyclohexane	0.0449	1.078	0.1967
2,2,4-Trimethylpentane	0.0006	0.015	0.0027
Benzene	0.0145	0.347	0.0634
Toluene	0.0694	1.665	0.3038
Ethylbenzene	0.0475	1.141	0.2081
Xylenes	0.0788	1.892	0.3453
C8+ Heavies	0.0820	1.969	0.3594
Total Emissions	1.0351	24.841	4.5335
Total Hydrocarbon Emissions	1.0351	24.841	4.5335
Total VOC Emissions	0.8946	21.470	3.9183
Total HAP Emissions	0.2419	5.806	1.0595
Total BTEX Emissions	0.2102	5.045	0.9207

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	1.9111	45.866	8.3706
Ethane	5.1121	122.691	22.3910
Propane	5.9556	142.934	26.0854
Isobutane	2.0103	48.247	8.8051
n-Butane	5.8156	139.575	25.4725

Isopentane	1.8516	44.437	8.1098
n-Pentane	2.4890	59.737	10.9020
n-Hexane	1.5535	37.283	6.8042
Cyclohexane	1.7505	42.013	7.6674
Other Hexanes	2.6255	63.013	11.4998
Heptanes	3.7880	90.911	16.5913
Methylcyclohexane	2.2459	53.901	9.8368
2,2,4-Trimethylpentane	0.0313	0.751	0.1371
Benzene	0.7237	17.369	3.1699
Toluene	3.4683	83.239	15.1911
Ethylbenzene	2.3761	57.027	10.4074
Xylenes	3.9422	94.612	17.2668
C8+ Heavies	4.1024	98.457	17.9684
Total Emissions	51.7527	1242.064	226.6766
Total Hydrocarbon Emissions	51.7527	1242.064	226.6766
Total VOC Emissions	44.7295	1073.507	195.9150
Total HAP Emissions	12.0951	290.282	52.9764
Total BTEX Emissions	10.5103	252.247	46.0352

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.6016	14.438	2.6349
Ethane	0.4266	10.239	1.8686
Propane	0.2260	5.425	0.9900
Isobutane	0.0482	1.157	0.2112
n-Butane	0.1044	2.505	0.4571
Isopentane	0.0280	0.672	0.1227
n-Pentane	0.0295	0.709	0.1294
n-Hexane	0.0097	0.234	0.0426
Cyclohexane	0.0027	0.064	0.0118
Other Hexanes	0.0221	0.529	0.0966
Heptanes	0.0110	0.263	0.0480
Methylcyclohexane	0.0026	0.062	0.0113
2,2,4-Trimethylpentane	0.0002	0.004	0.0008
Benzene	0.0001	0.003	0.0006
Toluene	0.0004	0.010	0.0018
Ethylbenzene	0.0002	0.004	0.0007
Xylenes	0.0002	0.004	0.0008
C8+ Heavies	0.0010	0.025	0.0045
Total Emissions	1.5145	36.349	6.6337
Total Hydrocarbon Emissions	1.5145	36.349	6.6337
Total VOC Emissions	0.4863	11.672	2.1301
Total HAP Emissions	0.0108	0.260	0.0474
Total BTEX Emissions	0.0009	0.022	0.0040

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	30.0790	721.896	131.7460
Ethane	21.3316	511.958	93.4323
Propane	11.3019	271.245	49.5022
Isobutane	2.4111	57.866	10.5605
n-Butane	5.2178	125.227	22.8540

Isopentane	1.4010	33.625	6.1365
n-Pentane	1.4775	35.459	6.4713
n-Hexane	0.4867	11.680	2.1317
Cyclohexane	0.1341	3.220	0.5876
Other Hexanes	1.1029	26.469	4.8306
Heptanes	0.5482	13.156	2.4009
Methylcyclohexane	0.1295	3.108	0.5673
2,2,4-Trimethylpentane	0.0093	0.223	0.0406
Benzene	0.0072	0.173	0.0315
Toluene	0.0211	0.505	0.0923
Ethylbenzene	0.0080	0.191	0.0348
Xylenes	0.0090	0.216	0.0395
C8+ Heavies	0.0515	1.235	0.2255
Total Emissions	75.7272	1817.452	331.6850
Total Hydrocarbon Emissions	75.7272	1817.452	331.6850
Total VOC Emissions	24.3166	583.598	106.5066
Total HAP Emissions	0.5412	12.988	2.3703
Total BTEX Emissions	0.0452	1.085	0.1980

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.6398	15.355	2.8023
Ethane	0.5289	12.693	2.3165
Propane	0.3451	8.284	1.5118
Isobutane	0.0884	2.122	0.3873
n-Butane	0.2207	5.296	0.9665
Isopentane	0.0651	1.561	0.2849
n-Pentane	0.0793	1.904	0.3475
n-Hexane	0.0408	0.979	0.1787
Cyclohexane	0.0377	0.905	0.1651
Other Hexanes	0.0746	1.790	0.3266
Heptanes	0.0867	2.081	0.3798
Methylcyclohexane	0.0475	1.140	0.2081
2,2,4-Trimethylpentane	0.0008	0.019	0.0036
Benzene	0.0146	0.351	0.0640
Toluene	0.0698	1.675	0.3057
Ethylbenzene	0.0477	1.144	0.2088
Xylenes	0.0790	1.897	0.3461
C8+ Heavies	0.0831	1.994	0.3639
Total Emissions	2.5496	61.190	11.1672
Total Hydrocarbon Emissions	2.5496	61.190	11.1672
Total VOC Emissions	1.3809	33.142	6.0484
Total HAP Emissions	0.2527	6.065	1.1069
Total BTEX Emissions	0.2111	5.067	0.9247

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	140.1166	2.8023	98.00
Ethane	115.8233	2.3165	98.00
Propane	75.5876	1.5118	98.00

Isobutane	19.3656	0.3873	98.00
n-Butane	48.3264	0.9665	98.00
Isopentane	14.2463	0.2849	98.00
n-Pentane	17.3733	0.3475	98.00
n-Hexane	8.9358	0.1787	98.00
Cyclohexane	8.2549	0.1651	98.00
Other Hexanes	16.3304	0.3266	98.00
Heptanes	18.9922	0.3798	98.00
Methylcyclohexane	10.4041	0.2081	98.00
2,2,4-Trimethylpentane	0.1777	0.0036	98.00
Benzene	3.2014	0.0640	98.00
Toluene	15.2834	0.3057	98.00
Ethylbenzene	10.4422	0.2088	98.00
Xylenes	17.3062	0.3461	98.00
C8+ Heavies	18.1939	0.3639	98.00
Total Emissions	558.3616	11.1672	98.00
Total Hydrocarbon Emissions	558.3616	11.1672	98.00
Total VOC Emissions	302.4217	6.0484	98.00
Total HAP Emissions	55.3468	1.1069	98.00
Total BTEX Emissions	46.2332	0.9247	98.00

EQUIPMENT REPORTS:

COMBUSTION DEVICE

Ambient Temperature: 50.00 deg. F
Excess Oxygen: 5.00 %
Combustion Efficiency: 98.00 %
Supplemental Fuel Requirement: 2.78e-001 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Cyclohexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Methylcyclohexane	2.00%	98.00%
2,2,4-Trimethylpentane	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25
Calculated Dry Gas Dew Point:	1.42 lbs. H2O/MMSCF
Temperature:	80.0 deg. F
Pressure:	1000.0 psig
Dry Gas Flow Rate:	125.0000 MMSCF/day
Glycol Losses with Dry Gas:	1.3778 lb/hr
Wet Gas Water Content:	Saturated
Calculated Wet Gas Water Content:	32.37 lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	7.44 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	4.37%	95.63%
Carbon Dioxide	99.74%	0.26%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.95%	0.05%
Propane	99.92%	0.08%
Isobutane	99.90%	0.10%
n-Butane	99.87%	0.13%
Isopentane	99.87%	0.13%
n-Pentane	99.84%	0.16%
n-Hexane	99.75%	0.25%
Cyclohexane	98.82%	1.18%
Other Hexanes	99.81%	0.19%
Heptanes	99.57%	0.43%
Methylcyclohexane	98.80%	1.20%
2,2,4-Trimethylpentane	99.83%	0.17%
Benzene	88.64%	11.36%
Toluene	84.68%	15.32%
Ethylbenzene	81.83%	18.17%
Xylenes	75.35%	24.65%
C8+ Heavies	99.36%	0.64%

FLASH TANK

Flash Control:	Combustion device
Flash Control Efficiency:	98.00 %
Flash Temperature:	110.0 deg. F
Flash Pressure:	60.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.98%	0.02%
Carbon Dioxide	46.10%	53.90%
Nitrogen	5.81%	94.19%
Methane	5.97%	94.03%
Ethane	19.33%	80.67%
Propane	34.51%	65.49%
Isobutane	45.47%	54.53%
n-Butane	52.71%	47.29%
Isopentane	57.14%	42.86%
n-Pentane	62.94%	37.06%

n-Hexane	76.26%	23.74%
Cyclohexane	93.11%	6.89%
Other Hexanes	70.71%	29.29%
Heptanes	87.42%	12.58%
Methylcyclohexane	94.77%	5.23%
2,2,4-Trimethylpentane	77.48%	22.52%
Benzene	99.07%	0.93%
Toluene	99.44%	0.56%
Ethylbenzene	99.70%	0.30%
Xylenes	99.80%	0.20%
C8+ Heavies	98.91%	1.09%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	51.15%	48.85%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	0.87%	99.13%
n-Pentane	0.79%	99.21%
n-Hexane	0.66%	99.34%
Cyclohexane	3.44%	96.56%
Other Hexanes	1.41%	98.59%
Heptanes	0.57%	99.43%
Methylcyclohexane	4.22%	95.78%
2,2,4-Trimethylpentane	1.94%	98.06%
Benzene	5.05%	94.95%
Toluene	7.95%	92.05%
Ethylbenzene	10.44%	89.56%
Xylenes	12.95%	87.05%
C8+ Heavies	12.15%	87.85%

STREAM REPORTS:

WET GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.82e-002	1.69e+002
Carbon Dioxide	1.53e-001	9.23e+002

Nitrogen	3.83e-001	1.47e+003
Methane	8.11e+001	1.79e+005
Ethane	1.21e+001	5.00e+004
Propane	3.70e+000	2.24e+004
Isobutane	5.44e-001	4.34e+003
n-Butane	1.03e+000	8.24e+003
Isopentane	2.61e-001	2.59e+003
n-Pentane	2.45e-001	2.42e+003
n-Hexane	6.89e-002	8.15e+002
Cyclohexane	1.38e-002	1.59e+002
Other Hexanes	1.64e-001	1.94e+003
Heptanes	7.29e-002	1.00e+003
Methylcyclohexane	1.47e-002	1.98e+002
2,2,4-Trimethylpentane	1.50e-003	2.35e+001
Benzene	6.00e-004	6.44e+000
Toluene	1.80e-003	2.28e+001
Ethylbenzene	8.99e-004	1.31e+001
Xylenes	1.10e-003	1.60e+001
C8+ Heavies	2.79e-002	6.53e+002
Total Components	100.00	2.76e+005

DRY GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.98e-003	7.38e+000
Carbon Dioxide	1.52e-001	9.20e+002
Nitrogen	3.84e-001	1.47e+003
Methane	8.12e+001	1.79e+005
Ethane	1.21e+001	5.00e+004
Propane	3.70e+000	2.24e+004
Isobutane	5.44e-001	4.34e+003
n-Butane	1.03e+000	8.23e+003
Isopentane	2.61e-001	2.59e+003
n-Pentane	2.44e-001	2.42e+003
n-Hexane	6.87e-002	8.13e+002
Cyclohexane	1.36e-002	1.58e+002
Other Hexanes	1.64e-001	1.93e+003
Heptanes	7.26e-002	9.99e+002
Methylcyclohexane	1.45e-002	1.96e+002
2,2,4-Trimethylpentane	1.50e-003	2.35e+001
Benzene	5.32e-004	5.70e+000
Toluene	1.52e-003	1.93e+001
Ethylbenzene	7.37e-004	1.07e+001
Xylenes	8.29e-004	1.21e+001
C8+ Heavies	2.77e-002	6.48e+002
Total Components	100.00	2.76e+005

LEAN GLYCOL STREAM

Temperature: 80.00 deg. F

Flow Rate: 2.00e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	1.11e+004
Water	1.50e+000	1.69e+002
Carbon Dioxide	2.13e-012	2.39e-010
Nitrogen	2.80e-013	3.15e-011
Methane	9.55e-018	1.07e-015
Ethane	1.11e-007	1.25e-005
Propane	6.24e-009	7.02e-007
Isobutane	1.18e-009	1.33e-007
n-Butane	2.43e-009	2.74e-007
Isopentane	1.45e-004	1.63e-002
n-Pentane	1.77e-004	1.99e-002
n-Hexane	9.11e-005	1.03e-002
Cyclohexane	5.53e-004	6.23e-002
Other Hexanes	3.35e-004	3.77e-002
Heptanes	1.94e-004	2.18e-002
Methylcyclohexane	8.79e-004	9.90e-002
2,2,4-Trimethylpentane	5.49e-006	6.18e-004
Benzene	3.42e-004	3.85e-002
Toluene	2.66e-003	2.99e-001
Ethylbenzene	2.46e-003	2.77e-001
Xylenes	5.21e-003	5.86e-001
C8+ Heavies	5.04e-003	5.67e-001
Total Components	100.00	1.13e+004

RICH GLYCOL STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 2.06e+001 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.60e+001	1.11e+004
Water	2.86e+000	3.30e+002
Carbon Dioxide	2.07e-002	2.39e+000
Nitrogen	2.73e-003	3.16e-001
Methane	2.77e-001	3.20e+001
Ethane	2.29e-001	2.64e+001
Propane	1.49e-001	1.73e+001
Isobutane	3.83e-002	4.42e+000
n-Butane	9.55e-002	1.10e+001
Isopentane	2.83e-002	3.27e+000
n-Pentane	3.45e-002	3.99e+000
n-Hexane	1.78e-002	2.05e+000
Cyclohexane	1.69e-002	1.95e+000
Other Hexanes	3.26e-002	3.77e+000
Heptanes	3.77e-002	4.36e+000
Methylcyclohexane	2.14e-002	2.47e+000
2,2,4-Trimethylpentane	3.57e-004	4.12e-002
Benzene	6.66e-003	7.69e-001
Toluene	3.28e-002	3.79e+000
Ethylbenzene	2.30e-002	2.66e+000

Xylenes	3.93e-002	4.54e+000
C8+ Heavies	4.09e-002	4.72e+000
Total Components	100.00	1.15e+004

FLASH TANK OFF GAS STREAM

Temperature: 110.00 deg. F
Pressure: 74.70 psia
Flow Rate: 1.17e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.15e-001	6.36e-002
Carbon Dioxide	9.51e-001	1.29e+000
Nitrogen	3.44e-001	2.97e-001
Methane	6.08e+001	3.01e+001
Ethane	2.30e+001	2.13e+001
Propane	8.31e+000	1.13e+001
Isobutane	1.35e+000	2.41e+000
n-Butane	2.91e+000	5.22e+000
Isopentane	6.30e-001	1.40e+000
n-Pentane	6.64e-001	1.48e+000
n-Hexane	1.83e-001	4.87e-001
Cyclohexane	5.17e-002	1.34e-001
Other Hexanes	4.15e-001	1.10e+000
Heptanes	1.77e-001	5.48e-001
Methylcyclohexane	4.28e-002	1.30e-001
2,2,4-Trimethylpentane	2.63e-003	9.28e-003
Benzene	2.98e-003	7.19e-003
Toluene	7.41e-003	2.11e-002
Ethylbenzene	2.43e-003	7.96e-003
Xylenes	2.75e-003	9.01e-003
C8+ Heavies	9.80e-003	5.15e-002
Total Components	100.00	7.74e+001

FLASH TANK GLYCOL STREAM

Temperature: 110.00 deg. F
Flow Rate: 2.04e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.66e+001	1.11e+004
Water	2.88e+000	3.30e+002
Carbon Dioxide	9.62e-003	1.10e+000
Nitrogen	1.60e-004	1.83e-002
Methane	1.67e-002	1.91e+000
Ethane	4.46e-002	5.11e+000
Propane	5.19e-002	5.96e+000
Isobutane	1.75e-002	2.01e+000
n-Butane	5.07e-002	5.82e+000
Isopentane	1.63e-002	1.87e+000
n-Pentane	2.19e-002	2.51e+000
n-Hexane	1.36e-002	1.56e+000
Cyclohexane	1.58e-002	1.81e+000
Other Hexanes	2.32e-002	2.66e+000

Heptanes	3.32e-002	3.81e+000
Methylcyclohexane	2.04e-002	2.34e+000
2,2,4-Trimethylpentane	2.78e-004	3.19e-002
Benzene	6.64e-003	7.62e-001
Toluene	3.28e-002	3.77e+000
Ethylbenzene	2.31e-002	2.65e+000
Xylenes	3.95e-002	4.53e+000
C8+ Heavies	4.07e-002	4.67e+000
Total Components	100.00	1.15e+004

FLASH GAS EMISSIONS

Flow Rate: 4.86e+003 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.12e+001	1.41e+002
Carbon Dioxide	3.82e+001	2.15e+002
Nitrogen	8.29e-002	2.97e-001
Methane	2.93e-001	6.02e-001
Ethane	1.11e-001	4.27e-001
Propane	4.00e-002	2.26e-001
Isobutane	6.48e-003	4.82e-002
n-Butane	1.40e-002	1.04e-001
Isopentane	3.03e-003	2.80e-002
n-Pentane	3.20e-003	2.95e-002
n-Hexane	8.82e-004	9.73e-003
Cyclohexane	2.49e-004	2.68e-003
Other Hexanes	2.00e-003	2.21e-002
Heptanes	8.54e-004	1.10e-002
Methylcyclohexane	2.06e-004	2.59e-003
2,2,4-Trimethylpentane	1.27e-005	1.86e-004
Benzene	1.44e-005	1.44e-004
Toluene	3.57e-005	4.21e-004
Ethylbenzene	1.17e-005	1.59e-004
Xylenes	1.33e-005	1.80e-004
C8+ Heavies	4.72e-005	1.03e-003
Total Components	100.00	3.58e+002

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.74e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.08e+001	1.61e+002
Carbon Dioxide	2.54e-001	1.10e+000
Nitrogen	6.63e-003	1.83e-002
Methane	1.21e+000	1.91e+000
Ethane	1.72e+000	5.11e+000
Propane	1.37e+000	5.96e+000

Isobutane	3.51e-001	2.01e+000
n-Butane	1.01e+000	5.82e+000
Isopentane	2.60e-001	1.85e+000
n-Pentane	3.50e-001	2.49e+000
n-Hexane	1.83e-001	1.55e+000
Cyclohexane	2.11e-001	1.75e+000
Other Hexanes	3.09e-001	2.63e+000
Heptanes	3.83e-001	3.79e+000
Methylcyclohexane	2.32e-001	2.25e+000
2,2,4-Trimethylpentane	2.78e-003	3.13e-002
Benzene	9.40e-002	7.24e-001
Toluene	3.82e-001	3.47e+000
Ethylbenzene	2.27e-001	2.38e+000
Xylenes	3.77e-001	3.94e+000
C8+ Heavies	2.44e-001	4.10e+000
Total Components	100.00	2.14e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 6.68e+000 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	1.35e+001	3.82e-002
Ethane	1.93e+001	1.02e-001
Propane	1.54e+001	1.19e-001
Isobutane	3.93e+000	4.02e-002
n-Butane	1.14e+001	1.16e-001
Isopentane	2.92e+000	3.70e-002
n-Pentane	3.92e+000	4.98e-002
n-Hexane	2.05e+000	3.11e-002
Cyclohexane	2.36e+000	3.50e-002
Other Hexanes	3.46e+000	5.25e-002
Heptanes	4.30e+000	7.58e-002
Methylcyclohexane	2.60e+000	4.49e-002
2,2,4-Trimethylpentane	3.11e-002	6.26e-004
Benzene	1.05e+000	1.45e-002
Toluene	4.28e+000	6.94e-002
Ethylbenzene	2.54e+000	4.75e-002
Xylenes	4.22e+000	7.88e-002
C8+ Heavies	2.74e+000	8.20e-002
Total Components	100.00	1.04e+000

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: D-2 - Blake Ridge CF - 125 MMscfd w/Gas Pump (Backup)
File Name: D:\Projects2\wfs\OVM\Blake Ridge\Blake Ridge CF - 125 MMscfd (2MM) w.Gas Pump.ddf
Date: July 27, 2017

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Blake Ridge Extended Gas Analysis;
Gas Pump, 7.5 gpm
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

Gas-Assisted Kimray Pump Will Be Used as Backup to the Electric Glycol Pump. GLYCalc Run Included to Demonstrate the Electric Pump Results in Higher Emissions.

WET GAS:

Temperature: 80.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1527
Nitrogen	0.3835
Methane	81.1920
Ethane	12.1176
Propane	3.6987
Isobutane	0.5442
n-Butane	1.0322
Isopentane	0.2614
n-Pentane	0.2447
n-Hexane	0.0689
Cyclohexane	0.0138
Other Hexanes	0.1638
Heptanes	0.0729
Methylcyclohexane	0.0147
2,2,4-Trimethylpentane	0.0015
Benzene	0.0006
Toluene	0.0018
Ethylbenzene	0.0009
Xylenes	0.0011
C8+ Heavies	0.0279

DRY GAS:

Flow Rate: 125.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 7.5 gpm

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Temperature: 110.0 deg. F
Pressure: 60.0 psig

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device: Combustion Device
Destruction Efficiency: 98.0 %
Excess Oxygen: 5.0 %
Ambient Air Temperature: 50.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: D-2 - Blake Ridge CF - 125 MMscfd w/Gas Pump (Backup)
File Name: D:\Projects2\wfs\OVM\Blake Ridge\Blake Ridge CF - 125 MMscfd (2MM) w.Gas Pump.ddf
Date: July 27, 2017

Gas-Assisted Kimray Pump Will Be Used as Backup to the Electric Glycol Pump. GLYCalc Run Included to Demonstrate the Electric Pump Results in Higher Emissions.

DESCRIPTION:

Description: 125 MMscfd (2 MMBtu/hr Regen), 80 oF, 1,000 psig;
Blake Ridge Extended Gas Analysis;
Gas Pump, 7.5 gpm
Flash Tank, 110 oF, 60 psig;
Emissions Controlled by Thermal Oxidizer

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0173	0.415	0.0758
Ethane	0.0203	0.486	0.0888
Propane	0.0235	0.563	0.1028
Isobutane	0.0076	0.181	0.0331
n-Butane	0.0209	0.501	0.0914
Isopentane	0.0072	0.174	0.0317
n-Pentane	0.0094	0.227	0.0413
n-Hexane	0.0065	0.157	0.0286
Cyclohexane	0.0088	0.211	0.0385
Other Hexanes	0.0106	0.255	0.0465
Heptanes	0.0186	0.446	0.0814
Methylcyclohexane	0.0123	0.295	0.0539
2,2,4-Trimethylpentane	0.0002	0.004	0.0007
Benzene	0.0052	0.125	0.0229
Toluene	0.0259	0.621	0.1133
Ethylbenzene	0.0182	0.437	0.0798
Xylenes	0.0320	0.768	0.1402
C8+ Heavies	0.0325	0.781	0.1425
Total Emissions	0.2770	6.648	1.2132
Total Hydrocarbon Emissions	0.2770	6.648	1.2132
Total VOC Emissions	0.2394	5.746	1.0487
Total HAP Emissions	0.0880	2.112	0.3854
Total BTEX Emissions	0.0813	1.952	0.3561

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.8655	20.771	3.7907
Ethane	1.0133	24.318	4.4381
Propane	1.1732	28.158	5.1388
Isobutane	0.3778	9.067	1.6547
n-Butane	1.0439	25.053	4.5721

Isopentane	0.3624	8.697	1.5871
n-Pentane	0.4719	11.325	2.0668
n-Hexane	0.3263	7.831	1.4292
Cyclohexane	0.4395	10.549	1.9252
Other Hexanes	0.5314	12.753	2.3275
Heptanes	0.9291	22.298	4.0693
Methylcyclohexane	0.6154	14.769	2.6953
2,2,4-Trimethylpentane	0.0077	0.184	0.0336
Benzene	0.2609	6.262	1.1428
Toluene	1.2937	31.049	5.6665
Ethylbenzene	0.9104	21.851	3.9877
Xylenes	1.6006	38.414	7.0105
C8+ Heavies	1.6269	39.045	7.1257
Total Emissions	13.8497	332.393	60.6618
Total Hydrocarbon Emissions	13.8497	332.393	60.6618
Total VOC Emissions	11.9710	287.304	52.4331
Total HAP Emissions	4.3996	105.591	19.2703
Total BTEX Emissions	4.0656	97.575	17.8075

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.3137	55.529	10.1340
Ethane	0.7554	18.129	3.3086
Propane	0.3667	8.800	1.6060
Isobutane	0.0757	1.818	0.3318
n-Butane	0.1565	3.757	0.6856
Isopentane	0.0468	1.122	0.2049
n-Pentane	0.0478	1.148	0.2094
n-Hexane	0.0177	0.425	0.0776
Cyclohexane	0.0063	0.151	0.0275
Other Hexanes	0.0389	0.934	0.1705
Heptanes	0.0239	0.574	0.1047
Methylcyclohexane	0.0066	0.159	0.0290
2,2,4-Trimethylpentane	0.0004	0.010	0.0018
Benzene	0.0004	0.010	0.0019
Toluene	0.0013	0.032	0.0059
Ethylbenzene	0.0005	0.013	0.0023
Xylenes	0.0006	0.015	0.0027
C8+ Heavies	0.0038	0.091	0.0166
Total Emissions	3.8631	92.715	16.9205
Total Hydrocarbon Emissions	3.8631	92.715	16.9205
Total VOC Emissions	0.7941	19.058	3.4780
Total HAP Emissions	0.0211	0.505	0.0922
Total BTEX Emissions	0.0029	0.071	0.0129

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	115.6845	2776.427	506.6979
Ethane	37.7689	906.454	165.4279
Propane	18.3330	439.992	80.2986
Isobutane	3.7871	90.891	16.5875
n-Butane	7.8263	187.832	34.2793

Isopentane	2.3385	56.124	10.2426
n-Pentane	2.3907	57.376	10.4711
n-Hexane	0.8853	21.247	3.8776
Cyclohexane	0.3138	7.531	1.3745
Other Hexanes	1.9460	46.704	8.5234
Heptanes	1.1953	28.686	5.2352
Methylcyclohexane	0.3307	7.936	1.4483
2,2,4-Trimethylpentane	0.0205	0.491	0.0896
Benzene	0.0219	0.525	0.0957
Toluene	0.0675	1.619	0.2954
Ethylbenzene	0.0266	0.638	0.1165
Xylenes	0.0312	0.748	0.1365
C8+ Heavies	0.1893	4.543	0.8290
Total Emissions	193.1568	4635.763	846.0267
Total Hydrocarbon Emissions	193.1568	4635.763	846.0267
Total VOC Emissions	39.7034	952.881	173.9009
Total HAP Emissions	1.0528	25.268	4.6113
Total BTEX Emissions	0.1471	3.529	0.6441

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.3310	55.944	10.2098
Ethane	0.7756	18.615	3.3973
Propane	0.3901	9.363	1.7087
Isobutane	0.0833	1.999	0.3648
n-Butane	0.1774	4.258	0.7770
Isopentane	0.0540	1.296	0.2366
n-Pentane	0.0573	1.374	0.2508
n-Hexane	0.0242	0.582	0.1061
Cyclohexane	0.0151	0.362	0.0660
Other Hexanes	0.0495	1.189	0.2170
Heptanes	0.0425	1.020	0.1861
Methylcyclohexane	0.0189	0.454	0.0829
2,2,4-Trimethylpentane	0.0006	0.014	0.0025
Benzene	0.0057	0.136	0.0248
Toluene	0.0272	0.653	0.1192
Ethylbenzene	0.0187	0.450	0.0821
Xylenes	0.0326	0.783	0.1429
C8+ Heavies	0.0363	0.872	0.1591
Total Emissions	4.1401	99.363	18.1338
Total Hydrocarbon Emissions	4.1401	99.363	18.1338
Total VOC Emissions	1.0335	24.804	4.5267
Total HAP Emissions	0.1090	2.617	0.4776
Total BTEX Emissions	0.0843	2.022	0.3690

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	510.4886	10.2098	98.00
Ethane	169.8660	3.3973	98.00
Propane	85.4374	1.7087	98.00

Isobutane	18.2423	0.3648	98.00
n-Butane	38.8515	0.7770	98.00
Isopentane	11.8297	0.2366	98.00
n-Pentane	12.5379	0.2508	98.00
n-Hexane	5.3069	0.1061	98.00
Cyclohexane	3.2997	0.0660	98.00
Other Hexanes	10.8509	0.2170	98.00
Heptanes	9.3045	0.1861	98.00
Methylcyclohexane	4.1436	0.0829	98.00
2,2,4-Trimethylpentane	0.1232	0.0025	98.00
Benzene	1.2385	0.0248	98.00
Toluene	5.9619	0.1192	98.00
Ethylbenzene	4.1042	0.0821	98.00
Xylenes	7.1469	0.1429	98.00
C8+ Heavies	7.9548	0.1591	98.00
Total Emissions	906.6885	18.1338	98.00
Total Hydrocarbon Emissions	906.6885	18.1338	98.00
Total VOC Emissions	226.3339	4.5267	98.00
Total HAP Emissions	23.8817	0.4776	98.00
Total BTEX Emissions	18.4516	0.3690	98.00

EQUIPMENT REPORTS:

COMBUSTION DEVICE

Ambient Temperature: 50.00 deg. F
Excess Oxygen: 5.00 %
Combustion Efficiency: 98.00 %
Supplemental Fuel Requirement: 1.17e-001 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Cyclohexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Methylcyclohexane	2.00%	98.00%
2,2,4-Trimethylpentane	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25	
Calculated Dry Gas Dew Point:	2.33	lbs. H2O/MMSCF
Temperature:	80.0	deg. F
Pressure:	1000.0	psig
Dry Gas Flow Rate:	125.0000	MMSCF/day
Glycol Losses with Dry Gas:	1.3787	lb/hr
Wet Gas Water Content:	Saturated	
Calculated Wet Gas Water Content:	32.37	lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	2.88	gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	7.21%	92.79%
Carbon Dioxide	99.90%	0.10%
Nitrogen	99.99%	0.01%
Methane	99.99%	0.01%
Ethane	99.98%	0.02%
Propane	99.97%	0.03%
Isobutane	99.96%	0.04%
n-Butane	99.95%	0.05%
Isopentane	99.95%	0.05%
n-Pentane	99.94%	0.06%
n-Hexane	99.91%	0.09%
Cyclohexane	99.59%	0.41%
Other Hexanes	99.93%	0.07%
Heptanes	99.85%	0.15%
Methylcyclohexane	99.58%	0.42%
2,2,4-Trimethylpentane	99.94%	0.06%
Benzene	95.66%	4.34%
Toluene	94.08%	5.92%
Ethylbenzene	92.91%	7.09%
Xylenes	89.88%	10.12%
C8+ Heavies	99.78%	0.22%

FLASH TANK

Flash Control:	Combustion device	
Flash Control Efficiency:	98.00	%
Flash Temperature:	110.0	deg. F
Flash Pressure:	60.0	psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.84%	0.16%
Carbon Dioxide	9.34%	90.66%
Nitrogen	0.70%	99.30%
Methane	0.74%	99.26%
Ethane	2.61%	97.39%
Propane	6.01%	93.99%
Isobutane	9.07%	90.93%
n-Butane	11.77%	88.23%
Isopentane	13.61%	86.39%
n-Pentane	16.70%	83.30%

n-Hexane	27.15%	72.85%
Cyclohexane	59.52%	40.48%
Other Hexanes	21.88%	78.12%
Heptanes	43.94%	56.06%
Methylcyclohexane	66.28%	33.72%
2,2,4-Trimethylpentane	27.86%	72.14%
Benzene	92.65%	7.35%
Toluene	95.43%	4.57%
Ethylbenzene	97.46%	2.54%
Xylenes	98.34%	1.66%
C8+ Heavies	90.59%	9.41%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	28.83%	71.17%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	1.61%	98.39%
n-Pentane	1.51%	98.49%
n-Hexane	1.12%	98.88%
Cyclohexane	4.73%	95.27%
Other Hexanes	2.48%	97.52%
Heptanes	0.82%	99.18%
Methylcyclohexane	5.32%	94.68%
2,2,4-Trimethylpentane	2.76%	97.24%
Benzene	5.33%	94.67%
Toluene	8.21%	91.79%
Ethylbenzene	10.61%	89.39%
Xylenes	13.10%	86.90%
C8+ Heavies	10.76%	89.24%

STREAM REPORTS:

WET GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.82e-002	1.69e+002
Carbon Dioxide	1.53e-001	9.23e+002

Nitrogen	3.83e-001	1.47e+003
Methane	8.11e+001	1.79e+005
Ethane	1.21e+001	5.00e+004
Propane	3.70e+000	2.24e+004
Isobutane	5.44e-001	4.34e+003
n-Butane	1.03e+000	8.24e+003
Isopentane	2.61e-001	2.59e+003
n-Pentane	2.45e-001	2.42e+003
n-Hexane	6.89e-002	8.15e+002
Cyclohexane	1.38e-002	1.59e+002
Other Hexanes	1.64e-001	1.94e+003
Heptanes	7.29e-002	1.00e+003
Methylcyclohexane	1.47e-002	1.98e+002
2,2,4-Trimethylpentane	1.50e-003	2.35e+001
Benzene	6.00e-004	6.43e+000
Toluene	1.80e-003	2.28e+001
Ethylbenzene	8.99e-004	1.31e+001
Xylenes	1.10e-003	1.60e+001
C8+ Heavies	2.79e-002	6.52e+002
Total Components	100.00	2.76e+005

DRY GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 5.21e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.92e-003	1.22e+001
Carbon Dioxide	1.53e-001	9.22e+002
Nitrogen	3.84e-001	1.47e+003
Methane	8.12e+001	1.79e+005
Ethane	1.21e+001	5.00e+004
Propane	3.70e+000	2.24e+004
Isobutane	5.44e-001	4.34e+003
n-Butane	1.03e+000	8.23e+003
Isopentane	2.61e-001	2.59e+003
n-Pentane	2.45e-001	2.42e+003
n-Hexane	6.88e-002	8.14e+002
Cyclohexane	1.37e-002	1.59e+002
Other Hexanes	1.64e-001	1.94e+003
Heptanes	7.28e-002	1.00e+003
Methylcyclohexane	1.46e-002	1.97e+002
2,2,4-Trimethylpentane	1.50e-003	2.35e+001
Benzene	5.74e-004	6.16e+000
Toluene	1.69e-003	2.14e+001
Ethylbenzene	8.36e-004	1.22e+001
Xylenes	9.89e-004	1.44e+001
C8+ Heavies	2.78e-002	6.51e+002
Total Components	100.00	2.76e+005

LEAN GLYCOL STREAM

Temperature: 80.00 deg. F

Flow Rate: 7.50e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	4.16e+003
Water	1.50e+000	6.33e+001
Carbon Dioxide	2.10e-012	8.86e-011
Nitrogen	2.67e-013	1.13e-011
Methane	9.18e-018	3.88e-016
Ethane	1.05e-007	4.44e-006
Propane	6.13e-009	2.59e-007
Isobutane	1.15e-009	4.84e-008
n-Butane	2.37e-009	1.00e-007
Isopentane	1.40e-004	5.93e-003
n-Pentane	1.71e-004	7.23e-003
n-Hexane	8.72e-005	3.68e-003
Cyclohexane	5.17e-004	2.18e-002
Other Hexanes	3.20e-004	1.35e-002
Heptanes	1.83e-004	7.72e-003
Methylcyclohexane	8.19e-004	3.46e-002
2,2,4-Trimethylpentane	5.17e-006	2.18e-004
Benzene	3.48e-004	1.47e-002
Toluene	2.74e-003	1.16e-001
Ethylbenzene	2.56e-003	1.08e-001
Xylenes	5.72e-003	2.41e-001
C8+ Heavies	4.65e-003	1.96e-001
Total Components	100.00	4.22e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 80.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.27e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.06e+001	4.16e+003
Water	4.80e+000	2.20e+002
Carbon Dioxide	3.11e-002	1.43e+000
Nitrogen	2.13e-002	9.79e-001
Methane	2.54e+000	1.17e+002
Ethane	8.46e-001	3.88e+001
Propane	4.25e-001	1.95e+001
Isobutane	9.08e-002	4.16e+000
n-Butane	1.93e-001	8.87e+000
Isopentane	5.90e-002	2.71e+000
n-Pentane	6.26e-002	2.87e+000
n-Hexane	2.65e-002	1.22e+000
Cyclohexane	1.69e-002	7.75e-001
Other Hexanes	5.43e-002	2.49e+000
Heptanes	4.65e-002	2.13e+000
Methylcyclohexane	2.14e-002	9.81e-001
2,2,4-Trimethylpentane	6.18e-004	2.84e-002
Benzene	6.48e-003	2.97e-001
Toluene	3.22e-002	1.48e+000
Ethylbenzene	2.28e-002	1.05e+000

Xylenes	4.08e-002	1.87e+000
C8+ Heavies	4.39e-002	2.01e+000
Total Components	100.00	4.59e+003

FLASH TANK OFF GAS STREAM

Temperature: 110.00 deg. F
Pressure: 74.70 psia
Flow Rate: 3.52e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.05e-001	3.42e-001
Carbon Dioxide	3.17e-001	1.29e+000
Nitrogen	3.74e-001	9.72e-001
Methane	7.77e+001	1.16e+002
Ethane	1.35e+001	3.78e+001
Propane	4.48e+000	1.83e+001
Isobutane	7.02e-001	3.79e+000
n-Butane	1.45e+000	7.83e+000
Isopentane	3.49e-001	2.34e+000
n-Pentane	3.57e-001	2.39e+000
n-Hexane	1.11e-001	8.85e-001
Cyclohexane	4.01e-002	3.14e-001
Other Hexanes	2.43e-001	1.95e+000
Heptanes	1.28e-001	1.20e+000
Methylcyclohexane	3.63e-002	3.31e-001
2,2,4-Trimethylpentane	1.93e-003	2.05e-002
Benzene	3.01e-003	2.19e-002
Toluene	7.88e-003	6.75e-002
Ethylbenzene	2.70e-003	2.66e-002
Xylenes	3.16e-003	3.12e-002
C8+ Heavies	1.20e-002	1.89e-001
Total Components	100.00	1.96e+002

FLASH TANK GLYCOL STREAM

Temperature: 110.00 deg. F
Flow Rate: 7.84e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.47e+001	4.16e+003
Water	5.00e+000	2.20e+002
Carbon Dioxide	3.04e-003	1.33e-001
Nitrogen	1.56e-004	6.86e-003
Methane	1.97e-002	8.65e-001
Ethane	2.31e-002	1.01e+000
Propane	2.67e-002	1.17e+000
Isobutane	8.60e-003	3.78e-001
n-Butane	2.38e-002	1.04e+000
Isopentane	8.39e-003	3.68e-001
n-Pentane	1.09e-002	4.79e-001
n-Hexane	7.52e-003	3.30e-001
Cyclohexane	1.05e-002	4.61e-001
Other Hexanes	1.24e-002	5.45e-001

Heptanes	2.13e-002	9.37e-001
Methylcyclohexane	1.48e-002	6.50e-001
2,2,4-Trimethylpentane	1.80e-004	7.90e-003
Benzene	6.28e-003	2.76e-001
Toluene	3.21e-002	1.41e+000
Ethylbenzene	2.32e-002	1.02e+000
Xylenes	4.19e-002	1.84e+000
C8+ Heavies	4.15e-002	1.82e+000
Total Components	100.00	4.39e+003

FLASH GAS EMISSIONS

Flow Rate: 1.28e+004 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.30e+001	3.82e+002
Carbon Dioxide	3.63e+001	5.38e+002
Nitrogen	1.03e-001	9.72e-001
Methane	4.28e-001	2.31e+000
Ethane	7.46e-002	7.55e-001
Propane	2.47e-002	3.67e-001
Isobutane	3.87e-003	7.57e-002
n-Butane	8.00e-003	1.57e-001
Isopentane	1.92e-003	4.68e-002
n-Pentane	1.97e-003	4.78e-002
n-Hexane	6.10e-004	1.77e-002
Cyclohexane	2.21e-004	6.28e-003
Other Hexanes	1.34e-003	3.89e-002
Heptanes	7.08e-004	2.39e-002
Methylcyclohexane	2.00e-004	6.61e-003
2,2,4-Trimethylpentane	1.06e-005	4.09e-004
Benzene	1.66e-005	4.37e-004
Toluene	4.35e-005	1.35e-003
Ethylbenzene	1.49e-005	5.32e-004
Xylenes	1.74e-005	6.23e-004
C8+ Heavies	6.60e-005	3.79e-003
Total Components	100.00	9.25e+002

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.38e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.74e+001	1.56e+002
Carbon Dioxide	3.40e-002	1.33e-001
Nitrogen	2.75e-003	6.86e-003
Methane	6.05e-001	8.65e-001
Ethane	3.78e-001	1.01e+000
Propane	2.98e-001	1.17e+000

Isobutane	7.29e-002	3.78e-001
n-Butane	2.01e-001	1.04e+000
Isopentane	5.63e-002	3.62e-001
n-Pentane	7.34e-002	4.72e-001
n-Hexane	4.25e-002	3.26e-001
Cyclohexane	5.86e-002	4.40e-001
Other Hexanes	6.92e-002	5.31e-001
Heptanes	1.04e-001	9.29e-001
Methylcyclohexane	7.03e-002	6.15e-001
2,2,4-Trimethylpentane	7.54e-004	7.68e-003
Benzene	3.75e-002	2.61e-001
Toluene	1.58e-001	1.29e+000
Ethylbenzene	9.62e-002	9.10e-001
Xylenes	1.69e-001	1.60e+000
C8+ Heavies	1.07e-001	1.63e+000
Total Components	100.00	1.70e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 1.76e+000 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	2.33e+001	1.73e-002
Ethane	1.45e+001	2.03e-002
Propane	1.15e+001	2.35e-002
Isobutane	2.81e+000	7.56e-003
n-Butane	7.75e+000	2.09e-002
Isopentane	2.17e+000	7.25e-003
n-Pentane	2.82e+000	9.44e-003
n-Hexane	1.63e+000	6.53e-003
Cyclohexane	2.25e+000	8.79e-003
Other Hexanes	2.66e+000	1.06e-002
Heptanes	4.00e+000	1.86e-002
Methylcyclohexane	2.71e+000	1.23e-002
2,2,4-Trimethylpentane	2.90e-002	1.54e-004
Benzene	1.44e+000	5.22e-003
Toluene	6.06e+000	2.59e-002
Ethylbenzene	3.70e+000	1.82e-002
Xylenes	6.51e+000	3.20e-002
C8+ Heavies	4.12e+000	3.25e-002
Total Components	100.00	2.77e-001

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

Identification

User Identification:	Blake Ridge CF Stabilized Condensate Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	Total of six 400 bbl storage vessels holding stabilized condensate. Each storage vessel will receive up to 31,333 bbl stabilized condensate per year.

Tank Dimensions

Shell Height (ft):		20.00
Diameter (ft):		12.00
Liquid Height (ft) :		19.00
Avg. Liquid Height (ft):		10.00
Volume (gallons):		16,800.00
Turnovers:		78.33
Net Throughput(gal/yr):		1,316,000.00
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
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)

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

Blake Ridge CF Stabilized Condensate Tank - 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
Stabilized Condensate	All	51.94	47.06	56.81	50.33	5.4160	4.9420	5.9328	57.0924			97.27	
2,2,4-Trimethylpentane						0.4700	0.4055	0.5431	114.2300	0.0048	0.0007	114.23	Option 2: A=6.8118, B=1257.84, C=220.74
Benzene						0.9298	0.8065	1.0684	78.1100	0.0006	0.0002	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9696	0.8439	1.1105	84.1600	0.0130	0.0040	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Decane (-n)						0.0277	0.0248	0.0310	142.2900	0.1072	0.0009	142.29	Option 1: VP50 = .026411 VP60 = .033211
Ethylbenzene						0.0815	0.0682	0.0971	106.1700	0.0131	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.4785	0.4109	0.5555	100.2000	0.1900	0.0286	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						1.5451	1.3522	1.7601	86.1700	0.0571	0.0278	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Hexanes						1.5451	1.3522	1.7601	86.1700	0.0927	0.0450	86.17	Option 2: A=6.876, B=1171.17, C=224.41
iso-Butane						33.1744	30.3990	36.1806	58.1300	0.0126	0.1317	58.13	Option 1: VP50 = 31.982 VP60 = 38.144
iso-Pentane						7.9463	7.1399	8.8396	72.1500	0.0351	0.0877	72.15	Option 1: VP50 = 7.592 VP60 = 9.423
Methylcyclohexane						0.4402	0.3794	0.5089	98.1800	0.0461	0.0064	98.18	Option 2: A=6.823, B=1270.763, C=221.42
n-Butane						22.4567	20.4389	24.6593	58.1300	0.0381	0.2693	58.13	Option 1: VP50 = 21.583 VP60 = 26.098
Nonane (-n)						0.0540	0.0480	0.0608	128.2600	0.0747	0.0013	128.26	Option 1: VP50 = .051285 VP60 = .065278
n-Pentane						5.7463	5.1349	6.4279	72.1500	0.0449	0.0812	72.15	Option 1: VP50 = 5.476 VP60 = 6.873
Octane (-n)						0.1188	0.1049	0.1349	114.2300	0.2355	0.0088	114.23	Option 1: VP50 = .112388 VP60 = .145444
Propane						95.7217	88.6799	103.2639	44.1100	0.0101	0.3052	44.11	Option 1: VP50 = 92.73 VP60 = 108.19
Toluene						0.2556	0.2178	0.2987	92.1300	0.0072	0.0006	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-o)						0.0529	0.0440	0.0633	106.1700	0.0171	0.0003	106.17	Option 2: A=6.998, B=1474.679, C=213.69

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Blake Ridge CF Stabilized Condensate Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Stabilized Condensate	5,325.29	875.16	6,200.45
Propane	1,625.10	267.07	1,892.17
iso-Butane	701.60	115.30	816.90
n-Butane	1,434.02	235.67	1,669.68
iso-Pentane	467.00	76.75	543.74
n-Pentane	432.67	71.11	503.78
Hexane (-n)	147.91	24.31	172.21
Benzene	0.93	0.15	1.08
Xylene (-o)	1.51	0.25	1.76
Nonane (-n)	6.75	1.11	7.86
Decane (-n)	4.98	0.82	5.80
Cyclohexane	21.08	3.47	24.55
Hexanes	239.89	39.42	279.32
Methylcyclohexane	34.01	5.59	39.60
2,2,4-Trimethylpentane	3.79	0.62	4.41
Heptane (-n)	152.31	25.03	177.34
Toluene	3.08	0.51	3.59
Octane (-n)	46.86	7.70	54.56
Ethylbenzene	1.79	0.29	2.08

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

Identification

User Identification:	Blake Ridge Produced Water Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	400 bbl produced water storage tank

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,800.00
Turnovers:	37.50
Net Throughput(gal/yr):	630,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
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)

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

Blake Ridge Produced Water Tank - 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
Produced Water (95% Water + 5% Condensate)	All	51.94	47.06	56.81	50.33	0.2465	0.2101	0.2893	28.3522			18.75	
Gasoline (RVP 12)						5.4430	4.9447	5.9807	64.0000	0.0500	0.5080	92.00	Option 4: RVP=12, ASTM Slope=3
Water						0.1930	0.1614	0.2307	18.0000	0.9500	0.4920	18.00	Option 1: VP50 = .178073 VP60 = .255246

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Blake Ridge Produced Water Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Produced Water (95% Water + 5% Condensate)	101.34	18.57	119.92
Water	49.86	9.14	59.00
Gasoline (RVP 12)	51.48	9.44	60.92

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

Identification

User Identification:	Blake Ridge 100 bbl Methanol Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	100 bbl methanol storage tank (T-13)

Tank Dimensions

Shell Height (ft):	8.00
Diameter (ft):	9.50
Liquid Height (ft) :	8.00
Avg. Liquid Height (ft):	4.00
Volume (gallons):	4,200.00
Turnovers:	6.00
Net Throughput(gal/yr):	25,200.00
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:	Dome
Height (ft)	5.00
Radius (ft) (Dome Roof)	9.50

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)

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

Blake Ridge 100 bbl Methanol Tank - 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
Methyl alcohol	All	56.69	48.70	64.69	52.55	1.2985	1.0009	1.6690	32.0400			32.04	Option 2: A=7.897, B=1474.08, C=229.13

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Blake Ridge 100 bbl Methanol Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Methyl alcohol	24.96	104.42	129.38

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

Identification

User Identification:	Blake Ridge CF 100 bbl Lube Oil Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	100 bbl lube oil storage tank. Emission IDs: T-09, T-10, T-14 thru T-19

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	10.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	7.00
Volume (gallons):	8,820.00
Turnovers:	6.00
Net Throughput(gal/yr):	52,920.00
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:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	10.00

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)

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

Blake Ridge CF 100 bbl Lube Oil Tank - 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
Residual oil no. 6	All	56.69	48.70	64.69	52.55	0.0000	0.0000	0.0000	190.0000			387.00	Option 1: VP50 = .00003 VP60 = .00004

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Blake Ridge CF 100 bbl Lube Oil Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Residual oil no. 6	0.01	0.02	0.03

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

Identification

User Identification:	Blake Ridge 100 bbl Coolant Tank
City:	Moundsville
State:	West Virginia
Company:	Appalachia Midstream Services
Type of Tank:	Vertical Fixed Roof Tank
Description:	100 bbl Coolant Tank Emission IDs: T-11 and T-12

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	10.00
Liquid Height (ft) :	15.00
Avg. Liquid Height (ft):	7.00
Volume (gallons):	8,820.00
Turnovers:	6.00
Net Throughput(gal/yr):	52,920.00
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:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	10.00

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)

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

Blake Ridge 100 bbl Coolant Tank - 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
Ethylene Glycol	All	56.69	48.70	64.69	52.55	0.0006	0.0004	0.0010	62.0700			62.07	Option 1: VP50 = .000413 VP60 = .000725

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Blake Ridge 100 bbl Coolant Tank - Vertical Fixed Roof Tank
Moundsville, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Ethylene Glycol	0.05	0.10	0.15

ATTACHMENT V

Facility-Wide Emission Summary Sheets

G35-D General Permit Registration

ATTACHMENT V – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	NO_x		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		GHG (CO_2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64	0.37	1.64	5,409	23,693
CE-02	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64	0.37	1.64	5,409	23,693
CE-03	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64	0.37	1.64	5,409	23,693
CE-04	4.41	19.31	2.44	10.70	1.34	5.85	0.02	0.10	0.37	1.64	0.37	1.64	5,409	23,693
MT-01	0.80	3.50	2.20	9.64	0.10	0.44	0.01	2.2E-03	0.15	0.04	0.15	0.04	2,399	600
GE-01	2.00	0.50	11.22	2.81	4.77	1.19	0.04	0.17	0.08	0.33	0.08	0.33	1,346	5,896
CRP	---	---	---	---	4.17	18.24	---	---	---	---	---	---	455	1,992
SSM	---	---	---	---	---	2.44	---	---	---	---	---	---	3,043	13,327
DFT-01	---	---	---	---	0.58	2.56	---	---	---	---	---	---	18	79
DSV-01	---	---	---	---	1.07	4.70	---	---	---	---	---	---	1	5
DFT-02	---	---	---	---	0.58	2.56	---	---	---	---	---	---	18	79
DSV-02	---	---	---	---	1.07	4.70	---	---	---	---	---	---	1	5
TO-01	0.77	3.37	2.43	10.65	See Dehys/Tanks/TLO		4.6E-03	0.02	0.06	0.26	0.06	0.26	928	4,063
RBV-01	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	1.2E-03	0.01	1.2E-03	0.01	237	1,037
RBV-02	0.20	0.86	0.16	0.72	0.01	0.05	1.2E-03	0.01	1.2E-03	0.01	1.2E-03	0.01	237	1,037
FLR-01	0.51	2.24	1.62	7.08	See SSM		3.1E-03	0.01	0.04	0.17	0.04	0.17	616	2,700
T-01	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT V – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET (CONTINUED)

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	NO_x		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		GHG (CO_2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-02	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-03	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-04	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-05	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-06	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-07	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
T-08	---	---	---	---	0.01	0.06	---	---	---	---	---	---	---	---
TLO	---	---	---	---	14.59	6.04	---	---	---	---	---	---	---	---
TOTAL	**22.11**	**88.58**	**27.57**	**74.41**	**32.42**	**66.87**	**0.15**	**0.60**	**1.85**	**7.47**	**1.85**	**7.47**	**28,674**	**125,592**

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT V – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
CE-01	0.28	1.22	2.5E-03	0.01	2.3E-03	0.01	2.2E-04	9.8E-04	1.0E-03	4.5E-03	0.01	0.03	0.39	1.69
CE-02	0.28	1.22	2.5E-03	0.01	2.3E-03	0.01	2.2E-04	9.8E-04	1.0E-03	4.5E-03	0.01	0.03	0.39	1.69
CE-03	0.28	1.22	2.5E-03	0.01	2.3E-03	0.01	2.2E-04	9.8E-04	1.0E-03	4.5E-03	0.01	0.03	0.39	1.69
CE-04	0.28	1.22	2.5E-03	0.01	2.3E-03	0.01	2.2E-04	9.8E-04	1.0E-03	4.5E-03	0.01	0.03	0.39	1.69
MT-01	0.01	0.04	1.4E-04	6.0E-04	1.5E-03	0.01	3.6E-04	1.6E-03	7.3E-04	3.2E-03	---	---	0.01	0.05
GE-01	1.40	0.35	6.6E-03	1.7E-03	0.01	1.5E-03	6.0E-04	1.5E-04	2.8E-03	6.9E-04	0.02	4.2E-03	1.70	0.42
CRP	---	---	0.02	0.10	0.02	0.10	0.02	0.10	0.02	0.10	0.11	0.48	0.22	0.97
SSM	---	---	---	0.01	---	0.01	---	0.01	---	0.01	---	0.06	---	0.13
DFT-01	---	---	1.7E-04	7.6E-04	5.1E-04	2.2E-03	1.9E-04	8.4E-04	2.2E-04	9.5E-04	0.01	0.05	0.01	0.06
DSV-01	---	---	0.02	0.08	0.08	0.36	0.06	0.25	0.09	0.41	0.04	0.16	0.29	1.27
DFT-02	---	---	1.7E-04	7.6E-04	5.1E-04	2.2E-03	1.9E-04	8.4E-04	2.2E-04	9.5E-04	0.01	0.05	0.01	0.06
DSV-02	---	---	0.02	0.08	0.08	0.36	0.06	0.25	0.09	0.41	0.04	0.16	0.29	1.27
TO-01	5.8E-04	2.5E-03	See Dehys/TKS/TLO		See Dehys/TKS/TLO		See Dehys/TKS/TLO		See Dehys/TKS/TLO		See Dehys/TKS/TLO		5.9E-04	2.6E-03
RBV-01	1.5E-04	6.4E-04	4.1E-06	1.8E-05	6.7E-06	2.9E-05	---	---	---	---	3.5E-03	0.02	3.7E-03	0.02
RBV-02	1.5E-04	6.4E-04	4.1E-06	1.8E-05	6.7E-06	2.9E-05	---	---	---	---	3.5E-03	0.02	3.7E-03	0.02
FLR-01	3.8E-04	1.7E-03	See SSM		See SSM		See SSM		See SSM		See SSM		3.9E-04	1.7E-03

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT V – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET (CONTINUED)

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T-01	---	---	1.4E-04	6.2E-04	1.4E-04	6.2E-04	1.4E-04	6.2E-04	3.5E-04	1.6E-03	7.1E-04	3.1E-03	1.5E-03	0.01
T-02	---	---	1.4E-04	6.2E-04	1.4E-04	6.2E-04	1.4E-04	6.2E-04	3.5E-04	1.6E-03	7.1E-04	3.1E-03	1.5E-03	0.01
T-03	---	---	1.4E-04	6.2E-04	1.4E-04	6.2E-04	1.4E-04	6.2E-04	3.5E-04	1.6E-03	7.1E-04	3.1E-03	1.5E-03	0.01
T-04	---	---	1.4E-04	6.2E-04	1.4E-04	6.2E-04	1.4E-04	6.2E-04	3.5E-04	1.6E-03	7.1E-04	3.1E-03	1.5E-03	0.01
T-05	---	---	1.4E-04	6.2E-04	1.4E-04	6.2E-04	1.4E-04	6.2E-04	3.5E-04	1.6E-03	7.1E-04	3.1E-03	1.5E-03	0.01
T-06	---	---	1.4E-04	6.2E-04	1.4E-04	6.2E-04	1.4E-04	6.2E-04	3.5E-04	1.6E-03	7.1E-04	3.1E-03	1.5E-03	0.01
T-07	---	---	1.4E-04	6.0E-04	1.4E-04	6.0E-04	1.4E-04	6.0E-04	3.4E-04	1.5E-03	6.8E-04	3.0E-03	1.4E-03	0.01
T-08	---	---	1.4E-04	6.0E-04	1.4E-04	6.0E-04	1.4E-04	6.0E-04	3.4E-04	1.5E-03	6.8E-04	3.0E-03	1.4E-03	0.01
TLO	---	---	0.73	0.30	0.73	0.30	0.73	0.30	0.73	0.30	0.73	0.30	4.38	1.81
TOTAL	**2.52**	**5.26**	**0.80**	**0.62**	**0.94**	**1.20**	**0.87**	**0.92**	**0.95**	**1.28**	**0.99**	**1.45**	**8.48**	**12.90**

Annual emissions shall be based on 8,760 hours per year of operation for all emission units except emergency generators.
According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above.

ATTACHMENT W

Class I Legal Advertisement

G35-D General Permit Registration

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that Appalachia Midstream Services, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G35-D General Permit Registration for a new natural gas compressor station to be located approximately 7.9 Miles East-Southeast of Proctor in Wetzel County, West Virginia. The latitude and longitude coordinates are 39.6768° North and -80.6818° West.

The applicant estimates the potential to discharge the following Regulated Air Pollutants will be:

88.79	tons of nitrogen oxides per year
75.84	tons of carbon monoxide per year
75.80	tons of volatile organic compounds per year
7.49	tons of particulate matter per year
0.60	tons of sulfur dioxide per year
0.75	tons of benzene per year
1.33	tons of toluene per year
1.06	tons of ethylbenzene per year
1.41	tons of xylenes per year
5.33	tons of formaldehyde per year
14.05	tons of total hazardous air pollutants per year
126,108	tons of carbon dioxide equivalent per year

Startup of operation is planned to begin on or about the 1st day of August 2018. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the _____ day of _____, 2017.

By: Appalachia Midstream Services, LLC
Paul Hunter
Vice President, Northeast Operating Area
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh, PA 15275

******* End of Application for G35-D Class II General Permit ******