ARSENAL RESOURCES

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April 20, 2017

West Virginia – Dept. of Environmental Protection
Division of Air Quality
Beverly McKeone, NSR Manager
601 57th Street, SE
Charleston, WV 25304

Reference: **General Permit Registration Modification**
Goff West Compressor Station
G35-A107D Facility ID # 033-00187
Clarksburg, Harrison County, West Virginia

Dear Ms. McKeone:

MK Midstream Holdings, LLC is submitting this General Permit G35-D Registration Modification (1 paper copy and 2 PDF copies on a CD) for the Goff West Compressor Station facility, Facility ID # 033-00187, located in Clarksburg, Harrison County, West Virginia. This facility currently operates under a G35-D registration issued February 27, 2017 to MK Midstream Holdings LLC which includes equipment at three locations: Goff Compressor Station, Goff M&R and Cather Compression Station. Please note, MK Midstream Holdings, LLC recently changed its name (only) to Arsenal Midstream, LLC, a legal subsidiary, wholly owned by Arsenal Resources LLC. A name change will be officially completed after the West Virginia Business Registration Certificate for Arsenal Midstream, LLC is received.

The purpose of this modification is to add a seventh engine and compressor at the Goff West Compressor Station. As requested, the permit modification includes information regarding the addition of the engine and compressor. Once this modification is completed the following equipment will be located at the facility.

Engines:

- CE-1R Caterpillar G3516B LE Compressor Engine – Goff Compressor Station
- CE-2R Caterpillar G3516B LE Compressor Engine – Goff Compressor Station
- CE-5R Caterpillar G3608TALE Compressor Engine – Cather Compressor Station
- CE-6R Caterpillar G3606TALE Compressor Engine – Cather Compressor Station
- CE-7R Caterpillar G3516B LE Compressor Engine – Goff Compressor Station
- CE-8R Caterpillar G3516B LE Compressor Engine – Goff Compressor Station
- CE-9R Caterpillar G3516 B LE Compressor Engine – Goff Compressor Station

Dehydration Units:

- RSV-1 Exterran Dehydration Unit 2012, 67 mmscf/day-Goff M&R
- RBV-1 Exterran Reboiler 2012, 1.0 mm BTU/Hr -Goff M&R
- RSV-2 Exterran Dehydration Unit 2013, 67 mmscf/day-Goff M&R
- RBV-2 Exterran Reboiler Unit 2013, 1.0 mm BTU/Hr -Goff M&R

6031 Wallace Road Ext, Suite 300
Wexford, PA 15090
P: 724-940-1100
F: 800-428-0981
www.arsenalresources.com

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Tanks:

- TK-1, TEG/Produced Liquid – Goff M&R
- TK-2, Oil Catch Storage Tank – Goff Compressor Station
- TK-3, Produced Liquid – Goff Compressor Station
- TK-4, Stormwater/Leaked Oils – Cather Compressor Station
- TK-5, Stormwater/Leaked Oils – Cather Compressor Station

The combined potential emissions from the listed equipment do not exceed major facility thresholds.

Please feel free to contact me at 724-940-1112, if the WVDEP-DAQ has any questions regarding the information in this General Permit Registration Modification.

Sincerely,
Arsenal Resources LLC

Meghan M.B. Yingling
Environmental Compliance Manager

cc: Stacey Lucas, Vice President, HSE, Arsenal Resources LLC
William Veigel, Director of Production, Arsenal Resources LLC
Thomas S. Seguljic, PE, HRP Associates, Inc.

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west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
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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
X 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):
MK MIDSTREAM HOLDINGS, LLC

Federal Employer ID No. (FEIN):47-1919654

Applicant's Mailing Address: 65 PROFESSIONAL PLACE SUITE 200

City:BRIDGEPORT	State: WV	ZIP Code:26330

Facility Name: GOFF WEST COMPRESSOR STATION

Operating Site Physical Address:50 E. DAVISSON RUN RD. CLARKSBURG, HARRISON COUNTY, WV
If none available, list road, city or town and zip of facility.

City:CLARKSBURG	Zip Code:26302	County:HARRISON

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.275550
Longitude: -80.403099

SIC Code: 1311 NAICS Code: 211111	DAQ Facility ID No. (For existing facilities) 033-00187

CERTIFICATION OF INFORMATION

This G35-DGeneral 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 Meghan M.B. Yingling 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:
Name and Title: Stacey Lucas, Vice President of Health, Safety, and Environment Phone: 724-940-1118 Fax:
Email: slucas@arsenalresources.com Date: 4/20/17

If applicable:
Authorized Representative Signature:
Name and Title: Meghan M.B. Yingling, Environmental Compliance Manager Phone: 724-940-1112 Fax:
Email: myingling@arsenalresources.com Date: 4-20-17

If applicable:
Environmental Contact
Name and Title: Phone: Fax:
Email: Date:

OPERATING SITE INFORMATION
Briefly describe the proposed new operation and/or any change(s) to the facility: The purpose of this modification is to add a seventh engine (CE-9R) and compressor (COMP-9) to the Goff Compressor Station.
Directions to the facility: From I-79 South; (1.) At exit 119, take ramp right for US-50 West toward Clarksburg, Travel 7.0 miles (2.) Turn left onto WV-98/Old US 50 / Sun Valley Rd. travel 0.4 miles (3.) turn left to stay on WV-98 and ravel 0.3 miles (4.) arrive at the PDC West Compressor Station on the right.

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): X I wish to pay by credit card.Contact for payment (incl. name and email address): Thomas Seguljic tom.seguljic@hrpassociates.com X $500 (Construction, Modification, and Relocation) ☐ $300 (Class II Administrative Update) X $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] *PLEASE NOTE $4,000 FEE WAS SUBMITTED UNDER PREVIOUS WITHDRAWN PERMIT APPLICATION* [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.*	
X Responsible Official or Authorized Representative Signature (if applicable)	
X Single Source Determination Form **(must be completed in its entirety)**– Attachment A	
☐Siting Criteria Waiver (if applicable) – Attachment B	X Current Business Certificate – Attachment C
X Process Flow Diagram – Attachment D	X Process Description – Attachment E
X Plot Plan – Attachment F	X Area Map – Attachment G
X G35-D Section Applicability Form – Attachment H	X Emission Units/ERD Table – Attachment I
X 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	
X 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	
X Reciprocating Compressor Data Sheet – Attachment R	
X 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	
X Emission Calculations (please be specific and include all calculation methodologies used) – Attachment U	
X Facility-wide Emission Summary Sheet(s) – Attachment V	
X Class I Legal Advertisement – Attachment W	
X 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

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 X No ☐

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

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 X

Please see the Attached Discussion for Further Detail

Attachment A Cont.

To determine if aggregation of facilities is appropriate, the following three-prong test must be completed;

1. The sources belong to a single major industrial grouping (same two-digit major SIC code);

   The Compressor Stations and well pads are both listed as SIC Code 1311 which includes:

   Establishments primarily engaged in operating oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, competing, and equipping wells; operation of separators, emulsion breakers, distilling equipment, and field gathering lines for crude petroleum; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. This industry includes the production of oil through the mining and extraction of oil from oil sands and the production of gas and hydrocarbon liquids through gasification, liquid faction, and pyrolysis at the mine site.

2. The sources are under common control of the same person (or persons under common control);

   The sources are under common control of the same person (or persons under common control) since MK Midstream Holdings LLC is the majority owner of the Goff West Station and MK Midstream Holdings LLC employees work and manage both the well pads and Goff West Compressor Station.

3. The sources are located on one or more "contiguous or adjacent" properties

   The WVDEP has established that any operations within ¼ mile are considered contiguous or adjacent. None of Arsenal Resources' wellpads are located within ¼ mile of the Goff West Compressor Station

In summary, since the facilities are greater than ¼ mile apart, the Single source determination does not apply.

ATTACHMENT C–CURRENT BUSINESS CERTIFICATE

If the applicant is a resident of West Virginia, the applicant should provide a copy of the current Business Registration Certificate issued to them from the West Virginia Secretary of State's Office. If the applicant is not a resident of the State of West Virginia, the registrant should provide a copy of the Certificate of Authority/Authority of LLC/Registration. This information is required for all sources to operate a business in West Virginia regardless of whether it is a construction, modification, or administrative update.

If you are a new business to West Virginia and have applied to the West Virginia Secretary of State's Office for a business license, please include a copy of your application.

Please note: Under the West Virginia Bureau of Employment Programs, 96CSR1, the DAQ may not grant, issue, or renew approval of any permit, general permit registration, or Certificate to Operate to any employing unit whose account is in default with the Bureau of Employment Programs Unemployment Compensation Division.

WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION CERTIFICATE

ISSUED TO:
MK MIDSTREAM HOLDINGS, LLC
65 PROFESSIONAL PL 200
BRIDGEPORT, WV 26330-1889

BUSINESS REGISTRATION ACCOUNT NUMBER: **2306-9776**

This certificate is issued on: **02/19/2015**

This certificate is issued by
the West Virginia State Tax Commissioner
in accordance with Chapter 11, Article 12, of the West Virginia Code

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.

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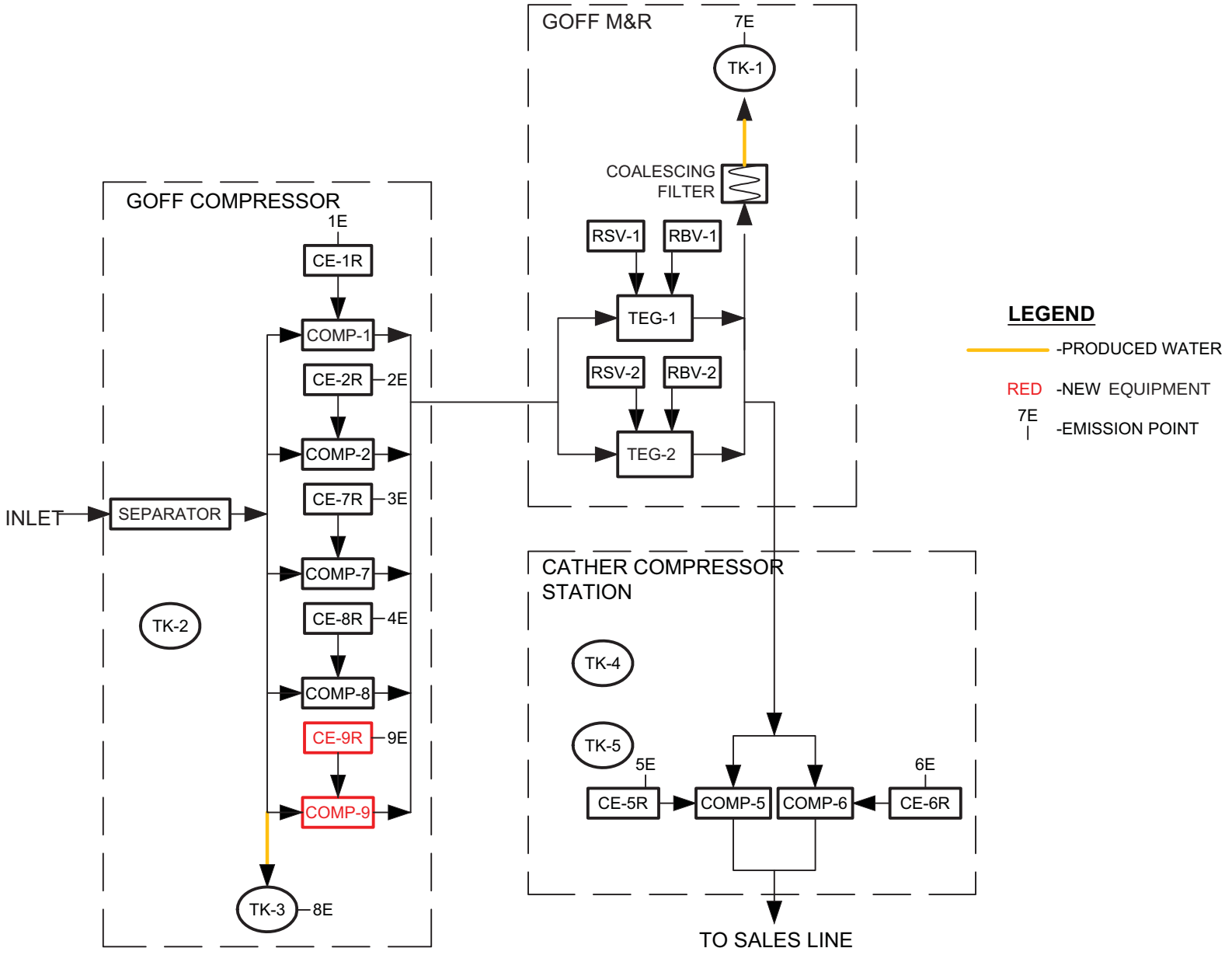
ATTACHMENT D – PROCESS FLOW DIAGRAM

Provide a diagram or schematic that supplements the process description of the operation. The process flow diagram must show all sources, components or facets of the operation in an understandable line sequence of operation. The process flow diagram should include the emission unit ID numbers, the pollution control device ID numbers, and the emission point ID numbers consistent with references in other attachments of the application. For a proposed modification, clearly identify the process areas, emission units, emission points, and/or control devices that will be modified, and specify the nature and extent of the modification.

Use the following guidelines to ensure a complete process flow diagram:

- The process flow diagram shall logically follow the entire process from beginning to end.
- Identify each emission source and air pollution control device with proper and consistent emission unit identification numbers, emission point identification numbers, and control device identification numbers.
- The process flow lines may appear different for clarity. For example, dotted lines may be used for vapor flow and solid lines used for liquid flow and arrows for direction of flow.
- The process flow lines may be color coded. For example: new or modified equipment may be red; old or existing equipment may be blue; different stages of preparation such as raw material may be green; and, finished product or refuse, another color.



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PROCESS FLOW DIAGRAM

GOFF WEST COMPRESSOR STATION

MK MIDSTREAM HOLDINGS, LLC
FACILITY ID 033-00187

SCALE:	NONE
ISSUE DATE:	04/04/2017
PROJECT NUMBER:	MOU7000.AC
SHEET NO.	ATTACHMENT D

ATTACHMENT E – PROCESS DESCRIPTION

Provide a detailed written description of the operation for which the applicant is seeking a permit. The process description is used in conjunction with the process flow diagram to provide the reviewing engineer a complete understanding of the activity at the operation. Describe in detail and order the complete process operation.

Use the following guidelines to ensure a complete Process Description:

- The process flow diagram should be prepared first and used as a guide when preparing the process description. The written description shall follow the logical order of the process flow diagram.
- All emission sources, emission points, and air pollution control devices must be included in the process description.
- When modifications are proposed, describe the modifications and the effect the changes will have on the emission sources, emission points, control devices and the potential emissions.
- Proper emission source ID numbers must be used consistently in the process description, the process flow diagram, the emissions calculations, and the emissions summary information provided.
- Include any additional information that may facilitate the reviewers understanding of the process operation.

The process description is required for all sources regardless of whether it is a construction, modification, or administrative update.

Pipeline quality natural gas (dry) is supplied to five (5) 1380 BHP (CE-1R, CE-2R, CE-7R, CE-8R and CE-9R) , one (1) 2370 BHP(CE-5R), and one (1) 1775 BHP (CE-6R) Caterpillar Internal combustion engines each equipped with Catalytic Converters.

The engines drive compressors to move the natural gas through a pipeline into two (2) 67 MMCFD Tri-Ethylene Glycol (TEG) Dehydrators (TEG-1 and TEG-2) for drying the gas to below 7.0lbs/MMSCFD of Water Content and eventually into a sales line.

Produced liquid, which is mainly water with minimal levels of VOCs, from initial separation and dehydration, is stored within tanks TK-1 and TK-3. The produced liquids are transferred from the tanks to trucks via transfer hoses for off-site treatment/disposal. In addition, stormwater collected from the pads and oil collected from the compressors is stored in tanks TK-2, TK-4 and TK-5.

There are fugitive emissions associated with piping connection, valves and controllers. These emissions occur due to potential seepage from connections, flanges and open ended lines.

This permit modification includes the addition of a seventh engine (CE-9R) and compressor (COMP-9).

ATTACHMENT F – PLOT PLAN

Provide an accurately scaled and detailed Plot Plan showing the locations of all emission units, emission points, and air pollution control devices. Show all emission units, affected facilities, enclosures, buildings and plant entrances and exits from the nearest public road(s) as appropriate. Note height, width and length of proposed or existing buildings and structures.

A scale between 1"=10' and 1"=200' should be used with the determining factor being the level of detail necessary to show operation or plant areas, affected facilities, emission unit sources, transfer points, etc. An overall small scale plot plan (e.g., 1"=300') should be submitted in addition to larger scale plot plans for process or activity areas (e.g., 1"=50') if the plant is too large to allow adequate detail on a single plot plan. Process or activity areas may be grouped for the enlargements as long as sufficient detail is shown.

Use the following guidelines to ensure a complete Plot Plan:

- Facility name
- Company name
- Company facility ID number (for existing facilities)
- Plot scale, north arrow, date drawn, and submittal date.
- Facility boundary lines
- Base elevation
- Lat/Long reference coordinates from the area map and corresponding reference point elevation
- Location of all point sources labeled with proper and consistent source identification numbers

This information is required for all sources regardless of whether it is a construction, modification, or administrative update.

NOTE:
LOCATIONS ARE APPROXIMATE AND DRAWING IS NOT FOR CONTRUCTION.

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NORTH

0 50' 100'

REVISIONS

NO.	DATE	DESCRIPTION

SCALE: 1" = 100'	DESIGNED: MEW
ISSUE DATE: 04/04/2017	DRAWN: BOB
PROJECT NUMBER: MOU7000.AC	REVIEWED: MEW
SHEET SIZE: 24"x36"	APPROVED: TSS

P.E. SEAL

GOFF WEST COMPRESSOR STATION

MK MIDSTREAM HOLDINGS, LLC
FACILITY 033-00187

PLOT PLAN

ATTACHMENT
F

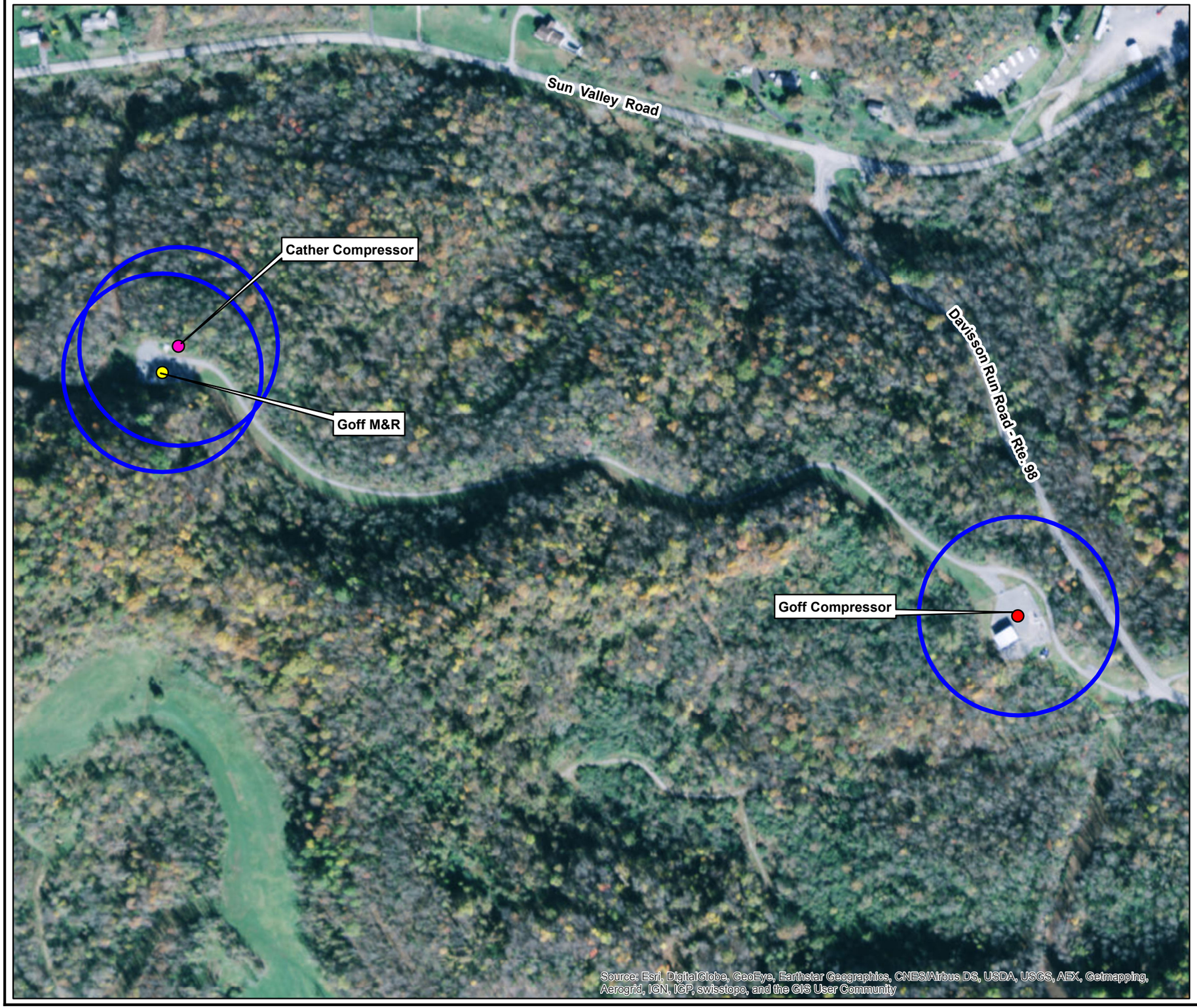
DRAWING NAME: S:\Data\M\MOUKE - MOUNTAINEER KEYSTONE\6031 WALLACE RD EXT, WEXFORD, PA\MOU7000AC\Goff Compressor\ATTACHMENT F - PLOT PLAN.dwg LAYOUT: 24 x 36 - SSM PLOT DATE: Apr 04, 2017 - 10:00am OPERATOR: BOB

ATTACHMENT G – AREA MAP

Provide an Area Map showing the current or proposed location of the operation. On this map, identify plant or operation property lines, access roads and any adjacent dwelling, business, public building, school, church, cemetery, community or institutional building or public park within a 300’ boundary circle of the collective emission units.

Please provide a 300’ boundary circle on the map surrounding the proposed emission units collectively.

This information is required for all sources regardless of whether it is a construction, modification, or administrative update.



Legend

- Goff Compressor
- Goff M-R
- Cather Compressor
- 300 foot Buffer

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North

0 150 300
Feet

Revisions						
No.						
Date						

Designed By: MEW
Drawn By: BOB
Reviewed By: TSS

Issue Date: 04/04/2017
Project No: MOU7000.AC
Sheet Size: 11x17

Area Map

GOFF West
Compressor Station

MK MIDSTREAM HOLDINGS, LLC
Facility ID 033-00187

ATTACHMENT

G

Path: S:\Data\MMOUKE - MOUNTAINEER KEYSTONE\6031 WALLACE RD EXT, WEXFORD, PA\MOU7000AC\Goff Compressor\Attachment G - Area Map.mxd

ATTACHMENT H–G35-D SECTION APPLICABILITY FORM

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	
X 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
X 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]
X Section 11.0	Reciprocating Compressor Affected Facility (NSPS, Subpart OOOO/OOOOa)[2]
X Section 12.0	Reciprocating Internal Combustion Engines, Generator Engines. Microturbine Generators
X Section 13.0	Tanker Truck Loading[3]
X Section 14.0	Glycol Dehydration Units[4]
X Section 15.0	Blowdown and Pigging Operations
X 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 11may 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 14may 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 / 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-1R	1E	Caterpillar G3516B LE Compressor Engine	2011	After 2010	1380 hp/1,400 rpm	Existing	Oxidation Catalyst	1D
CE-2R	2E	Caterpillar G3516B LE Compressor Engine	2011	After 2010	1380 hp/1,400 rpm	Existing	Oxidation Catalyst	2D
CE-7R	3E	Caterpillar G3516B LE Compressor Engine	2017	11/16/2012	1380 hp/1,400 rpm	Existing	Oxidation Catalyst	3D
CE-8R	4E	Caterpillar G3516B LE Compressor Engine	2017	3/17/2013	1380 hp/1,400 rpm	Existing	Oxidation Catalyst	4D
CE-5R	5E	Caterpillar G3608 TALE Compressor Engine	2015	4/11/2011	2370 hp/1,000 rpm	Existing	Oxidation Catalyst	5D
CE-6R	6E	Caterpillar G3606 TALE Compressor Engine	2015	12/12/2014	1775 hp/1,000 rpm	Existing	Oxidation Catalyst	6D
CE-9R	9E	Caterpillar – G3516 BLE	2017	2013	1380BHP	New	Oxidation Catalyst	7D
TEG-1	RSV-1	Exterran Dehydration Unit	2012	2012	67 mmscf.day	Existing	N/A	NA
TEG-1	RBV-1	Exterran Reboiler	2012	2012	1.0mmBtu/hr	Existing	N/A	NA
TEG-2	RSV-2	Exterran Dehydration Unit	2013	2012	67 mmscf/day	Existing	N/A	NA
TEG-2	RBV-2	Exterran Reboiler	2013	2012	1.0 mmBtu/hr	Existing	N/A	NA
TK-1	7E	TEG/Produced Liquid	2011	2011	210 bbl	Existing	N/A	NA
TK-3	8E	Produced Liquid	2016	2016	100 bbl	Existing	N/A	NA

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] 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 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: Facility-Wide

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

Is the facility subject to quarterly LDAR monitoring under 40CFR60 Subpart OOOOa? X 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 X No	9	13.3 scf/hr/component, Physical Count	X Gas ☐ Liquid ☐ Both	3.16	<0.001	498.15
Valves	☐ Yes X No	223	0.027 scf/hr/component, Valve maintenance records	X Gas ☐ Liquid ☐ Both	0.1587	<0.001	25.06
Safety Relief Valves	☐ Yes X No	24	0.040 scf/hr/component, Relief valve test records/component count	X Gas ☐ Liquid ☐ Both	0.00253	<0.001	4.00
Open Ended Lines	☐ Yes X No	5	0.061 scf/hr/component, one per tank	X Gas ☐ Liquid ☐ Both	0.0080	<0.001	1.27
Sampling Connections	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Connections(Not sampling)	☐ Yes X No	538	0.003 scf/hr/component, Drawings	X Gas ☐ Liquid ☐ Both	0.0425	<0.001	6.72
Compressors**	☐ Yes X No			☐ Gas ☐ Liquid ☐ Both			
Flanges	☐ Yes ☐ No	317	0.003 scf/hr/component, Drawings	X Gas ☐ Liquid ☐ Both	0.0251	<0.001	3.96
Other[1]	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			

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

*None required to date, will complete necessary LDAR per the requirements of Subpart OOOOa by June 3, 2017

**Compressor fugitive emissions accounted for in compressor blowdown in Attachment S

Please provide an explanation of the sources of fugitive emissions (e.g. pigging operations, equipment blowdowns, pneumatic controllers, etc.): Pigging operations and equipment blowdowns
Please indicate if there are any closed vent bypasses (include component): NA
Specify all equipment used in the closed vent system (e.g. VRU, ERD, thief hatches, tanker truck loading, etc.) NA

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-IR		CE-2R		CE-7R
Engine Manufacturer/Model		CAT G3516B		CAT G3516B		CAT G3516B
Manufacturers Rated bhp/rpm		1380/1400		1380/1400		1380/1400
Source Status[2]		ES		ES		NS
Date Installed/ Modified/Removed/Relocated[3]		2011		2011		2017
Engine Manufactured /Reconstruction Date[4]		After 2010		After 2010		11/16/12
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]		X 40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ X NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		X 40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ X NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		X 40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ X NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]		4SLB		4SLB		4SLB
APCD Type[7]		OxCat		OxCat		OxCat
Fuel Type[8]		RG		RG		RG
H_2S (gr/100 scf)		0.025		0.025		0.025
Operating bhp/rpm		1380/1400		1380/1400		1380/1400
BSFC (BTU/bhp-hr)		7301		7301		7301
Hourly Fuel Throughput		11,340 ft^3/hr gal/hr		11,340 ft^3/hr gal/hr		11,340 ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)		99.3 $MMft^3$/yr gal/yr		99.3 $MMft^3$/yr gal/yr		99.3 $MMft^3$/yr gal/yr
Fuel Usage or Hours of Operation Metered		Yes X No ☐		Yes X No ☐		Yes X 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]
OT(Stack Test/Spec Sheet)	NO_x	1.47	6.46	1.26	5.51	1.52	6.66
OT(Stack Test/Spec Sheet)	CO	0.4100	1.78	0.3000	1.31	3.70	16.19
OT(Stack Test/Spec Sheet)	VOC	0.2200	0.9600	0.1300	0.5500	1.46	6.40
OT(AP-42/Spec Sheet)	SO_2	0.0059	0.0257	0.0059	0.0257	0.0067	0.0293
OT(AP-42/Spec Sheet)	PM_{10}	0.0008	0.0034	0.0008	0.0034	0.1140	0.4980
OT(AP-42/Spec Sheet)	Formaldehyde	0.1308	0.5730	0.1308	0.5730	0.2100	0.9200
OT(AP-42/Spec Sheet)	Total HAPs	0.3244	1.42	0.3270	1.43	0.4293	1.88
OT(AP-42/Spec Sheet)	GHG (CO_2e)	1,098	4,809	1,112	4,873	1,743	7,634

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-8R	CE-5R	CE-6R
Engine Manufacturer/Model	CAT G3516B	CAT G3608TALE	CAT G3606TALE
Manufacturers Rated bhp/rpm	1380/1400	2370/1000	1775/1000
Source Status[2]	NS	ES	ES
Date Installed/ Modified/Removed/Relocated[3]	2017	2015	2015
Engine Manufactured /Reconstruction Date[4]	3/17/2013	4/11/2011	12/12/2014
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	X 40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ X NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	X 40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ X NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	X 40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ X NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]	4SLB	4SLB	4SLB
APCD Type[7]	OxCat	OxCat	OxCat
Fuel Type[8]	RG	RG	RG
H_2S (gr/100 scf)	0.025	0.025	0.025
Operating bhp/rpm	1380/1400	2370/1000	1775/1000
BSFC (BTU/bhp-hr)	7,301	6,677	6,697
Hourly Fuel Throughput	11,340 ft^3/hr gal/hr	17,940 ft^3/hr gal/hr	13,440 ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	$MMft^3$/yr 99.3 gal/yr	$MMft^3$/yr 157.1 gal/yr	$MMft^3$/yr 117.7 gal/yr
Fuel Usage or Hours of Operation Metered	Yes X No ☐	Yes X No ☐	Yes X 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]
OT(Stack Test/Spec Sheet)	NO_x	1.52	6.66	1.06	4.66	0.8600	3.78
OT(Stack Test/Spec Sheet)	CO	3.70	16.19	0.0500	0.2200	0.0600	0.2700
OT(Stack Test/Spec Sheet)	VOC	1.46	6.40	0.0800	0.3500	0.0400	0.1900
OT(AP-42/Spec Sheet)	SO_2	0.0067	0.0293	0.0082	0.0358	0.0060	0.0265
OT(AP-42/Spec Sheet)	PM_{10}	0.1140	0.4980	0.0011	0.0047	0.0008	0.0035
OT(AP-42/Spec Sheet)	Formaldehyde	0.2100	0.9200	0.6800	2.98	0.5100	2.23
OT(AP-42/Spec Sheet)	Total HAPs	0.4293	1.88	0.7970	3.49	0.5977	2.61
OT(AP-42/Spec Sheet)	GHG (CO_2e)	1,743	7,634	1,530	6,699	1,131	4,954

ATTACHMENT M – INTERNAL COMBUSTION ENGINE

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-9R					
Engine Manufacturer/Model		Caterpillar/G3516BLE					
Manufacturers Rated bhp/rpm		1380/1400					
Source Status[2]		NS					
Date Installed/ Modified/Removed/Relocated[3]		5/2017					
Engine Manufactured /Reconstruction Date[4]		7/22/2013					
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]		X 40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ X 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					
APCD Type[7]		OxCat					
Fuel Type[8]		RG					
H_2S (gr/100 scf)		0.025					
Operating bhp/rpm		1380/1400					
BSFC (BTU/bhp-hr)		7,442					
Hourly Fuel Throughput		11,256 ft^3/hr gal/hr		ft^3/hr gal/hr		ft^3/hr gal/hr	
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)		98.6 $MMft^3$/yr gal/yr		$MMft^3$/yr gal/yr		$MMft^3$/yr gal/yr	
Fuel Usage or Hours of Operation Metered		Yes X 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	1.52	6.66				
MD	CO	0.5200	2.27				
MD	VOC	0.7300	3.20				
MD	SO_2	0.0067	0.0293				
MD	PM_{10}	0.1140	0.4980				
MD	Formaldehyde	0.3144	1.38				
MD	Total HAPs	0.5227	2.29				
MD	GHG(CO_2e)	1,436	6,290				

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-9R, use extra pages as necessary)	
Air Pollution Control Device Manufacturer's Data Sheet included? Yes X No ☐	
☐NSCR ☐SCR X Oxidation Catalyst	
Provide details of process control used for proper mixing/control of reducing agent with gas stream:	
Manufacturer: DCL	Model #: DC64L2 – HSG +
Design Operating Temperature: 800°F	Design gas volume: 9000 scfm
Service life of catalyst: 3-5 Yr.	Provide manufacturer data? ☐Yes X No
Volume of gas handled: 9109 acfm at 992°F	Operating temperature range for NSCR/Ox Cat: From 600°F to 1200°F
Reducing agent used, if any: NA	Ammonia slip (ppm): NA
Pressure drop against catalyst bed (delta P): 3.5 inches of H_2O	
Provide description of warning/alarm system that protects unit when operation is not meeting design conditions: Over Temperature Warning to Shut Down Automatically	
Is temperature and pressure drop of catalyst required to be monitored per 40CFR63 Subpart ZZZZ? ☐ Yes X No	
How often is catalyst recommended or required to be replaced (hours of operation)? 26,280 – 43,800 hrs.	
How often is performance test required? X Initial ☐ Annual X 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 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
COMP-1	Ariel F35882
COMP-2	Ariel F36217

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
COMP-5	Ariel F49981
COMP-6	Ariel F49871
COMP-7	Ariel F40297
COMP-8	Ariel F43118
COMP-9	Compressor driven by CE-9R (Serial #JEF02341)

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	56	642.9	16.68	0.8369	7%	0.059
Compressor Startup	7	5000	16.68	0.81	7%	0.057
Plant Shutdown	0					
Low Pressure Pig Venting	42	69,444	16.68	67.93	7%	4.75
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	HAPemissions (ton/yr)
Compressor Blowdown	56	642.9	16.68	0.8369	<1%*	<0.008
Compressor Startup	7	5,000	16.68	0.81	<1%*	<0.0081
Plant Shutdown	0					
Low Pressure Pig Venting	42	69,444	16.88	67.93	<1%*	<0.0067
High Pressure Pig Venting						

*Laboratory Analysis included in the Blowdown and Pigging Operations Data Sheet section of Attachment U indicated each analyzed HAP was below laboratory detection limit (20 ppb)

Gas Analytical Services

CHARLESTON, WV

304-677-9926

Good

LELAP Certification #

04049

Customer	: 0034 - MK MIDSTREAM	**Date Sampled**	: 12/13/2016
Station ID	: 2601	**Date Analyzed**	: 12/19/2016
Cylinder ID	: 0280	**Effective Date**	: 01/01/2017
Producer	:	**Cyl Pressure**	: 625
Lease	: GOFF WEST	**Temp**	: 60
Area	: 190 - UNKNOWN	**Cylinder Type**	: Spot
State	: WV	**Sample By**	: HT

COMPONENT	MOL%	GPM@14.73(PSIA)
Methane	95.8791	0.000
Ethane	3.4142	0.915
Propane	0.2210	0.061
Iso-Butane	0.0133	0.004
Normal-Butane	0.0198	0.006
Neo-Pentane	0.0006	0.000
Iso-Pentane	0.0038	0.001
Normal-Pentane	0.0022	0.001
Nitrogen	0.2624	0.000
Carbon-Dioxide	0.1770	0.000
Oxygen	0.0020	0.000
BENZENE	0.0000	0.000
ETHYLBENZENE	0.0000	0.000
TOLUENE	0.0000	0.000
M-XYLENE/P-XYLENE	0.0000	0.000
C6's	0.0026	0.001
C8's	0.0004	0.000
C9's	0.0000	0.000
C7's	0.0016	0.001
C10's	0.0000	0.000
C11's	0.0000	0.000
C12's	0.0000	0.000
TOTAL	**100.0000**	**0.990**

Compressibility Factor (Z) @ 14.73 @ 60 Deg. F = 0.9979

C5+ GPM : 0.00200

Ideal Gravity: 0.5761 **Real Gravity:** 0.5771

C5+ Mole % : 0.0106

BTU @ (PSIA)	@14.65	@14.696	@14.73	@15.025
Ideal GPM	0.983	0.986	0.989	1.008
Ideal BTU Dry	1,032.69	1,035.94	1,038.33	1,059.13
Ideal BTU Sat	1,014.62	1,017.86	1,020.26	1,041.05
Real GPM	0.985	0.989	0.991	1.011
Real BTU Dry	1,034.91	1,038.16	1,040.57	1,061.46
Real BTU Sat	1,017.14	1,020.40	1,022.81	1,043.70

Comments:

Gas Analysis performed in accordance with GPA 2286

Analytical Calculations performed in accordance with GPA 2172

Sample Count : 220000003

COC :

Measurement Analyst: _____ **Ashley Free**

ATTACHMENT U–EMISSIONS CALCULATIONS

Provide detailed potential to emit (PTE) emission calculations for criteria and hazardous air pollutants (HAPs) for each emission point identified in the application. For hazardous air pollutants and volatile organic compounds (VOCs), the speciated emission calculations must be included.

Use the following guidelines to ensure complete emission calculations:

- All emission sources and fugitive emissions are included in the emission calculations, as well as all methods used to calculate the emissions.
- Proper emission point identification numbers and APCD and ERD identification numbers are used consistently in the emission calculations that are used throughout the application.
- A printout of the emission summary sheets is attached to the registration application.
- Printouts of any modeling must be included with the emission calculations. The modeling printout must show all inputs/outputs or assumptions that the modeled emissions are based upon.
- If emissions are provided from the manufacturer, the manufacturer's documentation and/or certified emissions must also be included.
- The emission calculations results must match the emissions provided on the emissions summary sheet.
- If calculations are based on a compositional analysis of the gas, attach the laboratory analysis. Include the following information: the location that the sample was taken as representative; the date the sample was taken; and, if the sample is considered representative, the reasons that it is considered representative (same gas field, same formation and depth, distance from actual site, etc.).
- Potential to emit (PTE) from the main or backup control device may be calculated based on the highest emission from a control device that could handle the stream, plus any intrinsic emission such as those from pilot flames.
- Provide any additional clarification as necessary. Additional clarification or information is especially helpful when reviewing modeling calculations to assist the engineer in understanding the basis of assumptions and/or inputs.

Please follow specific guidance provided on the emissions summary sheet when providing the calculations.

Fugitive Emission Calculations

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Fugitive Emission Calculations (See Attachment J)

Density		
Pollutant	Density (kg/m^3)	Density (lb/scf)
VOC	1.38	0.0860
CH4	0.656	0.0409

Emission Factors[1]		
Component Type	Count[5]	(scf /hr/ component)
Pumps	9	13.3
Valves	223	0.027
Safety Relief Valves	24	0.04
Open Ended Lines	5	0.061
Connections	538	0.003
Flanges	317	0.003

Emissions			
Componenty Type	VOC Emissions (tons/yr)[2,3]	Methane (tons/yr)[4]	CO2 eq (tons/yr)
Pumps	3.16	19.93	498.15
Valves	0.1587	1.00	25.06
Safety Relief Valves	0.0253	0.1598	4.00
Open Ended Lines	0.0080	0.0508	1.27
Connections	0.0425	0.2687	6.72
Flanges	0.0251	0.1583	3.96
Total	**3.41**	**21.57**	**539.15**

Emissions are calculated as follows:

Emissions = Emission Factor (scf/hr/component) * Component Count * Density (lb/scf) * 8,760 (hrs/yr) * Constituent wt%

CO2e Emissions = Methane Emissions (tons/yr) * 25 (GWP)

[1] Emission Factors for Pumps, Valves. Safety Relief Valves, and Open Ended Lines taken from 40 CFR 98 Table W-1A. Flanges emission factor assumed to be equal to Connections emission factor

Notes:

[2] VOC calculated using gas analysis average of VOCs

[3] VOC weight % approximated to be 7% of fugitive emissions based on gas analysis

[4] Methane weight % assumed to be about 93% of fugitive emissions

[5] Component counts were physiclaly counted on drawings or at the site and estimated

Engine Emission Calculations

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial JEF01233 Emission Summary
CE-1R
Criteria Pollutants (See Attachment M)

Fuel Usage		
Fuel	Units	Total
Natural Gas	ft^3	84,893,160

Emission Factors[1]	
	Engine
Pollutant	Natural Gas (lbs/ 10^6 ft^3)
Particulates	0.0794
Sulfur Dioxide	0.6056
Oxides of Nitrogen	473.00
PM-10	0.0794
VOC	71.26
Carbon Monoxide	133.61
CO2 Equiv	113,300

Emissions			
	Engine		
Pollutant	Natural Gas (lbs/yr)	Natural Gas (lbs/hr)	Natural Gas (tons/yr)
Particulates	6.74	0.0008	0.0034
Sulfur Dioxide	51.41	0.0059	0.0257
Oxides of Nitrogen	40,154	1.47	6.46
PM-10	6.74	0.0008	0.0034
VOC	6,049	0.2200	0.9600
Carbon Monoxide	11,342	0.4100	1.78
CO2 Equiv	9,618,395	1,098	4,809

Emissions are calculated as follows:

Natural Gas Usage = 9691 scfh (stack test) * 8760 hrs/yr = 84,893,160 scf/yr

Emissions = Volume of Gas (ft^3) * Emission Factor (lbs/10^6 ft^3)

[1] Natural Gas Emission Factors were taken from AP-42 Table 3.2-2 (PM, PM-10, SO2, CO2e) and the attached stack test (CO, NOx, VOC)

Notes:

- Emissions assume 8,760 hours of operation for the engine per year
- Heating value of Natural Gas assumed to be 1030 Btu/ft^3

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Emission Summary (See Attachment M)
HAPS (CE-1R)

Emissions are calculated as follows:

Emissions = Heat of Natural Gas (MMBtu) * Emission Factor (lbs/MMBtu)

[1] Natural Gas Emission Factors were taken from AP-42 Tables 3.2-2

[2] Formaldehyde is calculated using the engine specification of 0.43 g/bhp-hr and the controls have a 90% efficiency (see attached)

CE-1R - Natural Gas 4SLB HAP
MMBtu/yr
87,440

HAP Emissions		Natural Gas Engine		
		(lbs/yr)	(lbs/hr)	(tons/yr)
HAP	Natural Gas[1] (lb/MMBtu)			
1,1,2,2-Tetrachloroethane	4.00E-05	3.50	0.0004	0.0017
1,1,2-Trichloroethane	3.18E-05	2.78	0.0003	0.0014
1,3-Butadiene	2.67E-04	23.35	0.0027	0.0117
1,3-Dichloropropene	2.64E-05	2.31	0.0003	0.0012
2-Methylnaphthalene	3.32E-05	2.90	0.0003	0.0015
2,2,4-Trimethylpentane	2.50E-04	21.86	0.0025	0.0109
Acenaphthene	1.25E-06	0.1093	1.25E-05	5.46E-05
Acenaphthylene	5.53E-06	0.4835	5.52E-05	0.0002
Acetaldehyde	8.36E-03	731.00	0.0834	0.3655
Acrolein	5.14E-03	449.44	0.0513	0.2247
Benzene	4.40E-04	38.47	0.0044	0.0192
Benzo(b)fluoranthene	1.66E-07	0.0145	1.66E-06	7.26E-06
Benzo(e)pyrene	4.15E-07	0.0363	4.14E-06	1.81E-05
Benzo(g,h,i)perylene	4.14E-07	0.0362	4.13E-06	1.81E-05
Bipheyl	2.12E-04	18.54	0.0021	0.0093
Carbon Tetrachloride	3.67E-05	3.21	0.0004	0.0016
Chlorobenzene	3.04E-05	2.66	0.0003	0.0013
Chloroform	2.85E-05	2.49	0.0003	0.0012
Chrysene	6.93E-07	0.0606	6.92E-06	3.03E-05
Ethylbenzene	3.97E-05	3.47	0.0004	0.0017
Ethylene Dibromide	4.43E-05	3.87	0.0004	0.0019
Fluoranthene	1.11E-06	0.0971	1.11E-05	4.85E-05
Fluorene	5.67E-06	0.4958	5.66E-05	0.0002
Formaldehyde[2]	-	1,146	0.1308	0.5730
Methanol	2.50E-03	218.60	0.0250	0.1093
Methylene Chloride	2.00E-05	1.75	0.0002	0.0009
n-Hexane	1.11E-03	97.06	0.0111	0.0485
Naphthalene	7.44E-05	6.51	0.0007	0.0033
PAH	2.69E-05	2.35	0.0003	0.0012
Phenanthrene	1.04E-05	0.9094	0.0001	0.0005
Phenol	2.40E-05	2.10	0.0002	0.0010
Pyrene	1.36E-06	0.1189	1.36E-05	5.95E-05
Styrene	2.36E-05	2.06	0.0002	0.0010
Tetrachloroethane	2.48E-06	0.2169	2.48E-05	0.0001
Toluene	4.08E-04	35.68	0.0041	0.0178
Vinyl Chloride	1.49E-05	1.30	0.0001	0.0007
Xylene	1.84E-04	16.09	0.0018	0.0080
	Total:	**2,842**	**0.3244**	**1.42**

Emissions Test Report

Prepared for: MK Midstream
Prepared by: Tyler Frey
Test Date: December 12, 2016

Regulatory Information

Permit #:	G35-A107A
Make:	Caterpillar
Model:	G3516BLE
Unit Number:	2185
Serial Number:	JEF01233(37483hr)
Regulatory Citation	40 CFR 60 Subpart JJJJ
Target Parameter(s)	*NOx, CO, and VOCs*

Contact Information

Test Location

MK Midstream
Goff West
Harrison County, WV

Test Company

Ecotest Energy Services
142 S. Johnson Rd.
Houston, PA 15342

Primary Facility Contact
Stacey Lucas
VP of Health, Safety and Environment
MK Midstream
65 Professional Place Suite 200
Bridgeport, WV, 26330
724-940-1118

Company Contact
Tyler Frey
Compliance Specialist
Tyler@Ecotest.us
(570)428-2133

Wayne Philpot
V.P. Operations
Wayne@ecotest.us
(325)348-8070

Introduction

Ecotest Energy Services (Ecotest) has been contracted by MK Midstream, to provide emissions testing on the Caterpillar 3516ULB Spark-Ignited engine located at the Goff West location in Harrison County, WV. The purpose of this testing was to demonstrate compliance with emission limitations contained in the sites air permit, permit G35-A107A, and 40 CFR 60 subpart JJJJ. There are emissions limitations for the oxides of nitrogen (NOx), carbon monoxide (CO) and volatile organic compounds (VOC) as non-methane non-ethane hydrocarbons (NMNEHC).

Testing was conducted in accordance with an approved test protocol from the WV Source Testing Manual and the United States Environmental Protection Agency (USEPA) test methods. Testing for the engine occurred on December 12, 2016 and was conducted by Tyler Frey of Ecotest.

Summary of Test Results

Emissions Summary

Pollutant	pounds / hour		tons / year		g/BHP-hr		ppmvd at 15% O_2	
	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted
CO	0.52	0.41	2.27	1.78	2.00	0.15	270	18
NOx	1.52	1.47	6.66	6.46	1.00	0.53	82	40
VOCs	0.73	0.22	3.20	0.96	0.70	0.08	60	6

	Test Run			Average
	1st	2nd	3rd	
Test Run				
Start Time	9:33 AM	10:38 AM	11:42 AM	
End Time	10:33 AM	11:38 AM	12:43 PM	
Interval (minutes)	60	60	61	60
Ambient Conditions				
Dry Bulb / Ambient Temperature (°F)	38.0	39.0	43.0	40.0
Wet Bulb Temperature (°F)	36.0	37.0	41.0	38.0
Calculated Relative Humidity (%)	80	80	82	81
Relative Humidity (%)	81.00	81.00	83.00	81.67
Barometric Pressure ("Hg)	29.97	29.97	29.97	29.97
Elevation (feet)				
Emissions Source				
Manufacturer	Caterpillar			
Model	3516ULB			
Serial Number	JEF01192(4483hr)			
Unit ID	2185			
Manufacture/Rebuild Date				
Emissions Source Type	Engine			
Emissions Source Operational Data: Engine				
Fuel flow rate determined by:	Fuel Flow Meter			
Fuel Flow Rate (SCFH)	9673	9712	9688	9691
Calculated Fuel Flow Rate (SCFH)	N/A	N/A	N/A	N/A
BSFC (BTU/BHP/hr), LHV				N/A
Calculated $BSFC_{LHV}$ (BTU/BHP/hr)	7265	7294	7276	7278
Rich Burn / Lean Burn	Lean Burn			
Fuel Header Pressure (PSIG)				N/A
Calculated Load (%)	90.6	90.6	90.6	90.6
Current Power (BHP)	1250	1250	1250	1250
Max Rated Power (BHP)	1380			
Max Rated Speed (RPM)	1400			
Emissions Control Equipment	Catalyst			
Engine Type	Spark-Ignited			

G3516B

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1400	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8	APPLICATION:	GAS COMPRESSION
AFTERCOOLER TYPE:	SCAC	RATING LEVEL:	CONTINUOUS
AFTERCOOLER - STAGE 2 INLET (°F):	130	FUEL:	NAT GAS
AFTERCOOLER - STAGE 1 INLET (°F):	201	FUEL SYSTEM:	CAT WIDE RANGE
JACKET WATER OUTLET (°F):	210		WITH AIR FUEL RATIO CONTROL
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	7.0-40.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	80
CONTROL SYSTEM:	ADEM3	FUEL LHV (Btu/scf):	905
EXHAUST MANIFOLD:	DRY	ALTITUDE CAPABILITY AT 100°F INLET AIR TEMP. (ft):	4000
COMBUSTION:	LOW EMISSION		
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5		

RATING		NOTES	LOAD	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	1380	1035	690
ENGINE EFFICIENCY	(ISO 3046/1)	(3)	%	34.8	32.5	30.3
ENGINE EFFICIENCY	(NOMINAL)	(3)	%	34.2	31.9	29.7
ENGINE DATA						
FUEL CONSUMPTION	(ISO 3046/1)	(4)	Btu/bhp-hr	7301	7820	8399
FUEL CONSUMPTION	(NOMINAL)	(4)	Btu/bhp-hr	7443	7972	8562
AIR FLOW (77°F, 14.7 psia)	(WET)	(5) (6)	ft3/min	3126	2452	1715
AIR FLOW	(WET)	(5) (6)	lb/hr	13862	10874	7602
FUEL FLOW (60ºF, 14.7 psia)			scfm	189	152	109
COMPRESSOR OUT PRESSURE			in Hg(abs)	103.8	91.8	69.4
COMPRESSOR OUT TEMPERATURE			°F	381	354	274
AFTERCOOLER AIR OUT TEMPERATURE			°F	133	133	131
INLET MAN. PRESSURE		(7)	in Hg(abs)	94.6	76.8	54.0
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(8)	°F	146	146	143
TIMING		(9)	°BTDC	30	29	24
EXHAUST TEMPERATURE - ENGINE OUTLET		(10)	°F	992	986	1006
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(11) (6)	ft3/min	9126	7138	5065
EXHAUST GAS MASS FLOW	(WET)	(11) (6)	lb/hr	14380	11290	7900
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)		(12)(13)	g/bhp-hr	0.50	0.50	0.50
CO		(12)(14)	g/bhp-hr	2.43	2.61	2.56
THC (mol. wt. of 15.84)		(12)(14)	g/bhp-hr	4.77	5.11	5.19
NMHC (mol. wt. of 15.84)		(12)(14)	g/bhp-hr	0.72	0.77	0.78
NMNEHC (VOCs) (mol. wt. of 15.84)		(12)(14)(15)	g/bhp-hr	0.48	0.51	0.52
HCHO (Formaldehyde)		(12)(14)	g/bhp-hr	0.44	0.43	0.42
CO2		(12)(14)	g/bhp-hr	474	506	549
EXHAUST OXYGEN		(12)(16)	% DRY	9.0	8.7	8.3
LAMBDA		(12)(16)		1.68	1.64	1.60
ENERGY BALANCE DATA						
LHV INPUT		(17)	Btu/min	171179	137505	98460
HEAT REJECTION TO JACKET WATER (JW)		(18)(26)	Btu/min	23412	21533	19930
HEAT REJECTION TO ATMOSPHERE		(19)	Btu/min	6110	5092	4074
HEAT REJECTION TO LUBE OIL (OC)		(20)(26)	Btu/min	4475	3978	3363
HEAT REJECTION TO EXHAUST (LHV TO 77°F)		(21)(22)	Btu/min	62427	48810	34853
HEAT REJECTION TO EXHAUST (LHV TO 350°F)		(21)	Btu/min	41619	32383	23415
HEAT REJECTION TO A/C - STAGE 1 (1AC)		(23)(26)	Btu/min	10046	8308	2813
HEAT REJECTION TO A/C - STAGE 2 (2AC)		(24)(27)	Btu/min	5358	5063	3334
PUMP POWER		(25)	Btu/min	833	833	833

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure.) No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3.

For notes information consult page three.

CE 1R - 4R

DCL International Inc.

Mailing address: P.O. Box 90, Concord, Ontario, Canada, L4K 1B2
Toll free: 1-800-872-1968 *Phone:* 905-660-6450 *Fax:* 905-660-6435 *E-mail:* info@dcl-inc.com

To	Mark Davis	Phone	
	J-W Power	Fax	
Date	January 4, 2010	Email	mdavis@jwenergy.com

RE: EMISSIONS GUARANTEE

Mark,

We hereby guarantee that our QUICK-LID™ Model DC65A-12 catalytic converter described below:

Catalyst model	DC65
Catalyst coating	Oxidation (A coating)
Outside Diameter of catalyst substrate	30.75"
No. of catalyst substrates	1
Cell Density	300 cpsi

and sized for the following engine:

Engine model	CAT G3516 ULB
Power	1380 hp @ 1400 rpm
Fuel	Pipeline Quality Natural Gas

will perform as follows:

Emissions	After Catalyst (% destruction)
Carbon Monoxide (CO)	93%
Formaldehyde (CH_2O)	90%
Volatile Organic Compounds	80%

for a period of 1 year or 8000 hours, whichever comes first, subject to all terms and conditions contained in the attached warranty document being respected and met.

Best regards,
DCL International, Inc.

Tawnya VanGroningen

Tawnya VanGroningen
Account Manager
North American Industrial Catalyst Division

Quote#16-1558

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial JEF01237 Emission Summary
CE-2R
Criteria Pollutants (See Attachment M)

Fuel Usage		
Fuel	Units	Total
Natural Gas	ft^3	86,014,440

Emission Factors[1]	
	Engine
Pollutant	Natural Gas (lbs/ 10^6 ft^3)
Particulates	0.0794
Sulfur Dioxide	0.6056
Oxides of Nitrogen	329.57
PM-10	0.0794
VOC	17.81
Carbon Monoxide	53.44
CO2 Equiv	113,300

Emissions			
	Engine		
Pollutant	Natural Gas (lbs/yr)	Natural Gas (lbs/hr)	Natural Gas (tons/yr)
Particulates	6.83	0.0008	0.0034
Sulfur Dioxide	52.09	0.0059	0.0260
Oxides of Nitrogen	28,348	1.26	5.51
PM-10	6.83	0.0008	0.0034
VOC	1,532	0.1300	0.5500
Carbon Monoxide	4,597	0.3000	1.31
CO2 Equiv	9,745,436	1,112	4,873

Emissions are calculated as follows:

Natural Gas Usage = 9819 scfh (stack test) * 8760 hrs/yr = 86,014,440 scf/yr

Emissions = Volume of Gas (ft^3) * Emission Factor (lbs/10^6 ft^3)

[1] Natural Gas Emission Factors were taken from AP-42 Table 3.2-2 (PM, PM-10, SO2, CO2e) and the attached stack test (CO, NOx, VOC)

Notes:

- Emissions assume 8,760 hours of operation for the engine per year
- Heating value of Natural Gas assumed to be 1030 Btu/ft^3

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Emission Summary (See Attachment M)
HAPS (CE-2R)

Emissions are calculated as follows:

Emissions = Heat of Natural Gas (MMBtu) * Emission Factor (lbs/MMBtu)

[1] Natural Gas Emission Factors were taken from AP-42 Tables 3.2-2

[2] Formaldehyde is calculated using the engine specification of 0.43 g/bhp-hr and the controls have a 90% efficiency (see attached)

CE-2R - Natural Gas 4SLB HAP
MMBtu/yr
88,595

HAP Emissions		Natural Gas (1) Engine		
		(lbs/yr)	(lbs/hr)	(tons/yr)
HAP	Natural Gas[1] (lb/MMBtu)			
1,1,2,2-Tetrachloroethane	4.00E-05	3.54	0.0004	0.0018
1,1,2-Trichloroethane	3.18E-05	2.82	0.0003	0.0014
1,3-Butadiene	2.67E-04	23.65	0.0027	0.0118
1,3-Dichloropropene	2.64E-05	2.34	0.0003	0.0012
2-Methylnaphthalene	3.32E-05	2.94	0.0003	0.0015
2,2,4-Trimethylpentane	2.50E-04	22.15	0.0025	0.0111
Acenaphthene	1.25E-06	0.1107	1.26E-05	5.54E-05
Acenaphthylene	5.53E-06	0.4899	5.59E-05	0.0002
Acetaldehyde	8.36E-03	740.65	0.0845	0.3703
Acrolein	5.14E-03	455.38	0.0520	0.2277
Benzene	4.40E-04	38.98	0.0044	0.0195
Benzo(b)fluoranthene	1.66E-07	0.0147	1.68E-06	7.35E-06
Benzo(e)pyrene	4.15E-07	0.0368	4.20E-06	1.84E-05
Benzo(g,h,i)perylene	4.14E-07	0.0367	4.19E-06	1.83E-05
Bipheyl	2.12E-04	18.78	0.0021	0.0094
Carbon Tetrachloride	3.67E-05	3.25	0.0004	0.0016
Chlorobenzene	3.04E-05	2.69	0.0003	0.0013
Chloroform	2.85E-05	2.52	0.0003	0.0013
Chrysene	6.93E-07	0.0614	7.01E-06	3.07E-05
Ethylbenzene	3.97E-05	3.52	0.0004	0.0018
Ethylene Dibromide	4.43E-05	3.92	0.0004	0.0020
Fluoranthene	1.11E-06	0.0983	1.12E-05	4.92E-05
Fluorene	5.67E-06	0.5023	5.73E-05	0.0003
Formaldehyde[2]	-	1,146	0.1308	0.5730
Methanol	2.50E-03	221.49	0.0253	0.1107
Methylene Chloride	2.00E-05	1.77	0.0002	0.0009
n-Hexane	1.11E-03	98.34	0.0112	0.0492
Naphthalene	7.44E-05	6.59	0.0008	0.0033
PAH	2.69E-05	2.38	0.0003	0.0012
Phenanthrene	1.04E-05	0.9214	0.0001	0.0005
Phenol	2.40E-05	2.13	0.0002	0.0011
Pyrene	1.36E-06	0.1205	1.38E-05	6.02E-05
Styrene	2.36E-05	2.09	0.0002	0.0010
Tetrachloroethane	2.48E-06	0.2197	2.51E-05	0.0001
Toluene	4.08E-04	36.15	0.0041	0.0181
Vinyl Chloride	1.49E-05	1.32	0.0002	0.0007
Xylene	1.84E-04	16.30	0.0019	0.0082
	Total:	**2,864**	**0.3270**	**1.43**

Emissions Test Report

Prepared for: MK Midstream
Prepared by: Steve LaRue
Test Date: December 12, 2016

Regulatory Information

Permit #:	G35-A107A
Make:	Caterpillar
Model:	3516
Unit Number:	2177
Serial Number:	JEF01237(39727-HR)
Regulatory Citation	40 CFR 60 Subpart JJJJ
Target Parameter(s)	*NOx, CO, and VOCs*

Contact Information

Test Location

MK Midstream
Goff West
Harrison County, WV

Test Company

Ecotest Energy Services
142 S. Johnson Rd.
Houston, PA 15342

Primary Facility Contact
Stacey Lucas
VP of Health, Safety and Environment
MK Midstream
65 Professional Place Suite 200
Bridgeport, WV, 26330
724-940-1118

Company Contact
Tyler Frey
Compliance Specialist
Tyler@Ecotest.us
(570)428-2133

Wayne Philpot
V.P. Operations
Wayne@ecotest.us
(325)348-8070

Introduction

Ecotest Energy Services (Ecotest) has been contracted by MK Midstream, to provide emissions testing on the Caterpillar 3516 Spark-Ignited engine located at the Goff West location in Harrison County, WV. The purpose of this testing was to demonstrate compliance with emission limitations contained in the sites air permit, permit G35-A107A, and 40 CFR 60 subpart JJJJ. There are emissions limitations for the oxides of nitrogen (NOx), carbon monoxide (CO) and volatile organic compounds (VOC) as non-methane non-ethane hydrocarbons (NMNEHC).

Testing was conducted in accordance with an approved test protocol from the WV Source Testing Manual and the United States Environmental Protection Agency (USEPA) test methods. Testing for the engine occurred on December 12, 2016 and was conducted by Steve LaRue of Ecotest.

Summary of Test Results

Emissions Summary

Pollutant	pounds / hour		tons / year		g/BHP-hr		ppmvd at 15% O_2	
	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted
CO	0.52	0.30	2.27	1.31	2.00	0.11	270	13
NOx	1.52	1.26	6.66	5.51	1.00	0.46	82	34
VOCs	0.73	0.13	3.20	0.55	0.70	0.05	60	4

	Test Run			Average
	1st	2nd	3rd	
Test Run				
Start Time	8:39 AM	9:43 AM	10:47 AM	
End Time	9:40 AM	10:44 AM	11:48 AM	
Interval (minutes)	61	61	61	61
Ambient Conditions				
Dry Bulb / Ambient Temperature (°F)	39.0	41.0	43.0	41.0
Wet Bulb Temperature (°F)	37.0	38.0	41.0	38.7
Calculated Relative Humidity (%)	80	73	82	79
Relative Humidity (%)	79.00	78.00	79.00	78.67
Barometric Pressure ("Hg)	29.92	29.92	29.92	29.92
Elevation (feet)				
Emissions Source				
Manufacturer	Caterpillar			
Model	3516			
Serial Number	JEF01237(39727-HR)			
Unit ID	2177			
Manufacture/Rebuild Date				
Emissions Source Type	Engine			
Emissions Source Operational Data: Engine				
Fuel flow rate determined by:	Fuel Flow Meter			
Fuel Flow Rate (SCFH)	9815	9822	9819	9819
Calculated Fuel Flow Rate (SCFH)	N/A	N/A	N/A	N/A
BSFC (BTU/BHP/hr), LHV				N/A
Calculated $BSFC_{LHV}$ (BTU/BHP/hr)	7372	7377	7375	7374
Rich Burn / Lean Burn	Lean Burn			
Fuel Header Pressure (PSIG)				N/A
Calculated Load (%)	90.6	90.6	90.6	90.6
Current Power (BHP)	1250	1250	1250	1250
Max Rated Power (BHP)	1380			
Max Rated Speed (RPM)	1400			
Emissions Control Equipment	Catalyst			
Engine Type	Spark-Ignited			

G3516B

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1400	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8	APPLICATION:	GAS COMPRESSION
AFTERCOOLER TYPE:	SCAC	RATING LEVEL:	CONTINUOUS
AFTERCOOLER - STAGE 2 INLET (°F):	130	FUEL:	NAT GAS
AFTERCOOLER - STAGE 1 INLET (°F):	201	FUEL SYSTEM:	CAT WIDE RANGE
JACKET WATER OUTLET (°F):	210		WITH AIR FUEL RATIO CONTROL
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	7.0-40.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	80
CONTROL SYSTEM:	ADEM3	FUEL LHV (Btu/scf):	905
EXHAUST MANIFOLD:	DRY	ALTITUDE CAPABILITY AT 100°F INLET AIR TEMP. (ft):	4000
COMBUSTION:	LOW EMISSION		
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5		

RATING		NOTES	LOAD	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	1380	1035	690
ENGINE EFFICIENCY	(ISO 3046/1)	(3)	%	34.8	32.5	30.3
ENGINE EFFICIENCY	(NOMINAL)	(3)	%	34.2	31.9	29.7
ENGINE DATA						
FUEL CONSUMPTION	(ISO 3046/1)	(4)	Btu/bhp-hr	7301	7820	8399
FUEL CONSUMPTION	(NOMINAL)	(4)	Btu/bhp-hr	7443	7972	8562
AIR FLOW (77°F, 14.7 psia)	(WET)	(5) (6)	ft3/min	3126	2452	1715
AIR FLOW	(WET)	(5) (6)	lb/hr	13862	10874	7602
FUEL FLOW (60ºF, 14.7 psia)			scfm	189	152	109
COMPRESSOR OUT PRESSURE			in Hg(abs)	103.8	91.8	69.4
COMPRESSOR OUT TEMPERATURE			°F	381	354	274
AFTERCOOLER AIR OUT TEMPERATURE			°F	133	133	131
INLET MAN. PRESSURE		(7)	in Hg(abs)	94.6	76.8	54.0
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(8)	°F	146	146	143
TIMING		(9)	°BTDC	30	29	24
EXHAUST TEMPERATURE - ENGINE OUTLET		(10)	°F	992	986	1006
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(11) (6)	ft3/min	9126	7138	5065
EXHAUST GAS MASS FLOW	(WET)	(11) (6)	lb/hr	14380	11290	7900
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)		(12)(13)	g/bhp-hr	0.50	0.50	0.50
CO		(12)(14)	g/bhp-hr	2.43	2.61	2.56
THC (mol. wt. of 15.84)		(12)(14)	g/bhp-hr	4.77	5.11	5.19
NMHC (mol. wt. of 15.84)		(12)(14)	g/bhp-hr	0.72	0.77	0.78
NMNEHC (VOCs) (mol. wt. of 15.84)		(12)(14)(15)	g/bhp-hr	0.48	0.51	0.52
HCHO (Formaldehyde)		(12)(14)	g/bhp-hr	0.44	0.43	0.42
CO2		(12)(14)	g/bhp-hr	474	506	549
EXHAUST OXYGEN		(12)(16)	% DRY	9.0	8.7	8.3
LAMBDA		(12)(16)		1.68	1.64	1.60
ENERGY BALANCE DATA						
LHV INPUT		(17)	Btu/min	171179	137505	98460
HEAT REJECTION TO JACKET WATER (JW)		(18)(26)	Btu/min	23412	21533	19930
HEAT REJECTION TO ATMOSPHERE		(19)	Btu/min	6110	5092	4074
HEAT REJECTION TO LUBE OIL (OC)		(20)(26)	Btu/min	4475	3978	3363
HEAT REJECTION TO EXHAUST (LHV TO 77°F)		(21)(22)	Btu/min	62427	48810	34853
HEAT REJECTION TO EXHAUST (LHV TO 350°F)		(21)	Btu/min	41619	32383	23415
HEAT REJECTION TO A/C - STAGE 1 (1AC)		(23)(26)	Btu/min	10046	8308	2813
HEAT REJECTION TO A/C - STAGE 2 (2AC)		(24)(27)	Btu/min	5358	5063	3334
PUMP POWER		(25)	Btu/min	833	833	833

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure.) No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3.

For notes information consult page three.

CE 1R - 4R

DCL International Inc.

Mailing address: P.O. Box 90, Concord, Ontario, Canada, L4K 1B2
Toll free: 1-800-872-1968 *Phone:* 905-660-6450 *Fax:* 905-660-6435 *E-mail:* info@dcl-inc.com

To	Mark Davis	Phone	
	J-W Power	Fax	
Date	January 4, 2010	Email	mdavis@jwenergy.com

RE: EMISSIONS GUARANTEE

Mark,

We hereby guarantee that our QUICK-LID™ Model DC65A-12 catalytic converter described below:

Catalyst model	DC65
Catalyst coating	Oxidation (A coating)
Outside Diameter of catalyst substrate	30.75"
No. of catalyst substrates	1
Cell Density	300 cpsi

and sized for the following engine:

Engine model	CAT G3516 ULB
Power	1380 hp @ 1400 rpm
Fuel	Pipeline Quality Natural Gas

will perform as follows:

Emissions	After Catalyst (% destruction)
Carbon Monoxide (CO)	93%
Formaldehyde (CH_2O)	90%
Volatile Organic Compounds	80%

for a period of 1 year or 8000 hours, whichever comes first, subject to all terms and conditions contained in the attached warranty document being respected and met.

Best regards,
DCL International, Inc.

Tawnya VanGroningen

Tawnya VanGroningen
Account Manager
North American Industrial Catalyst Division

Quote#16-1558

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial BEN01121 Emission Summary
CE-5R
Criteria Pollutants (See Attachment M)

Fuel Usage		
Fuel	Units	Total
Natural Gas	ft^3	118,260,000

Emission Factors[1]	
	Engine
Pollutant	Natural Gas (lbs/ 10^6 ft^3)
Particulates	0.0794
Sulfur Dioxide	0.6056
Oxides of Nitrogen	195.96
PM-10	0.0794
VOC	17.81
Carbon Monoxide	8.91
CO2 Equiv	113,300

Emissions			
	Engine		
Pollutant	Natural Gas (lbs/yr)	Natural Gas (lbs/hr)	Natural Gas (tons/yr)
Particulates	9.39	0.0011	0.0047
Sulfur Dioxide	71.62	0.0082	0.0358
Oxides of Nitrogen	23,174	1.06	4.66
PM-10	9.39	0.0011	0.0047
VOC	2,107	0.0800	0.3500
Carbon Monoxide	1,053	0.0500	0.2200
CO2 Equiv	13,398,858	1,530	6,699

Emissions are calculated as follows:

Natural Gas Usage = 13500 scfh (stack test) * 8760 hrs/yr = 118,260,000 scf/

Emissions = Volume of Gas (ft^3) * Emission Factor (lbs/10^6 ft^3)

[1] Natural Gas Emission Factors were taken from AP-42 Table 3.2-2 (PM, PM-10, SO2, CO2e) and the attached stack test (CO, NOx, VOC)

Notes:

- Emissions assume 8,760 hours of operation for the engine per year
- Heating value of Natural Gas assumed to be 1030 Btu/ft^3

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Emission Summary (See Attachment M)
HAPS (CE-5R)

Emissions are calculated as follows:

Emissions = Heat of Natural Gas (MMBtu) * Emission Factor (lbs/MMBtu)

[1] Natural Gas Emission Factors were taken from AP-42 Tables 3.2-2 and Formaldehyde emissions (lb/hr & tpy) were taken from the spec sheet

CE-5R - Natural Gas 4SLB HAP
MMBtu
121,808

HAP Emissions		Natural Gas 4SLB		
		(lbs/yr)	(lbs/hr)	(tons/yr)
HAP	Natural Gas[1] (lb/MMBtu)			
1,1,2,2-Tetrachloroethane	4.00E-05	4.87	0.0006	0.0024
1,1,2-Trichloroethane	3.18E-05	3.87	0.0004	0.0019
1,3-Butadiene	2.67E-04	32.52	0.0037	0.0163
1,3-Dichloropropene	2.64E-05	3.22	0.0004	0.0016
2-Methylnaphthalene	3.32E-05	4.04	0.0005	0.0020
2,2,4-Trimethylpentane	2.50E-04	30.45	0.0035	0.0152
Acenaphthene	1.25E-06	0.1523	1.74E-05	7.61E-05
Acenaphthylene	5.53E-06	0.6736	7.69E-05	0.0003
Acetaldehyde	8.36E-03	1,018	0.1162	0.5092
Acrolein	5.14E-03	626.09	0.0715	0.3130
Benzene	4.40E-04	53.60	0.0061	0.0268
Benzo(b)fluoranthene	1.66E-07	0.0202	2.31E-06	1.01E-05
Benzo(e)pyrene	4.15E-07	0.0506	5.77E-06	2.53E-05
Benzo(g,h,i)perylene	4.14E-07	0.0504	5.76E-06	2.52E-05
Bipheyl	2.12E-04	25.82	0.0029	0.0129
Carbon Tetrachloride	3.67E-05	4.47	0.0005	0.0022
Chlorobenzene	3.04E-05	3.70	0.0004	0.0019
Chloroform	2.85E-05	3.47	0.0004	0.0017
Chrysene	6.93E-07	0.0844	9.64E-06	4.22E-05
Ethylbenzene	3.97E-05	4.84	0.0006	0.0024
Ethylene Dibromide	4.43E-05	5.40	0.0006	0.0027
Fluoranthene	1.11E-06	0.1352	1.54E-05	6.76E-05
Fluorene	5.67E-06	0.6907	7.88E-05	0.0003
Formaldehyde	-	5,957	0.6800	2.98
Methanol	2.50E-03	304.52	0.0348	0.1523
Methylene Chloride	2.00E-05	2.44	0.0003	0.0012
n-Hexane	1.11E-03	135.21	0.0154	0.0676
Naphthalene	7.44E-05	9.06	0.0010	0.0045
PAH	2.69E-05	3.28	0.0004	0.0016
Phenanthrene	1.04E-05	1.27	0.0001	0.0006
Phenol	2.40E-05	2.92	0.0003	0.0015
Pyrene	1.36E-06	0.1657	1.89E-05	8.28E-05
Styrene	2.36E-05	2.87	0.0003	0.0014
Tetrachloroethane	2.48E-06	0.3021	3.45E-05	0.0002
Toluene	4.08E-04	49.70	0.0057	0.0248
Vinyl Chloride	1.49E-05	1.81	0.0002	0.0009
Xylene	1.84E-04	22.41	0.0026	0.0112
	Total:	**8,319**	**0.9497**	**4.16**

Emissions Test Report

Prepared for: MK Midstream Holdings, LLC
Prepared by: Steve LaRue
Test Date: May 4, 2016

Regulatory Information

Permit #:	G35-A107B
Make:	Caterpillar
Model:	3608
Unit Number:	2657
Serial Number:	BEN01121 (Run Hr-2805)
Regulatory Citation	40 CFR 60 Subpart JJJJ
Target Parameter(s)	*NOx, CO, and VOCs*

Contact Information

Test Location

MK Midstream Holdings, LLC
Cather CS
Harrison County, WV

Test Company

Ecotest Energy Services
142 S. Johnson Rd.
Houston, PA 15342

Primary Facility Contact
Dave Sweeley
MK Midstream Holdings, LLC
65 Professional Place Suite 200
Bridgeport, WV, 26330
724-759-9822
dsweeley@mkmidstream.com

Company Contact
Tyler Frey
Compliance Specialist
(570)428-2133
Tyler@Ecotest.us
(570)428-2133

Wayne Philpot
V.P. Operations
Wayne@ecotest.us
(325)348-8070

Introduction

Ecotest Energy Services (Ecotest) has been contracted by MK Midstream, to provide emissions testing on the Caterpillar, 3608 Spark-Ignited engine located at the Cather location in Harrison County, WV. The purpose of this testing was to demonstrate compliance with emission limitations contained in the sites air permit, permit G35-A107B, and 40 CFR 60 subpart JJJJ. There are emissions limitations for the oxides of nitrogen (NOx), carbon monoxide (CO) and volatile organic compounds (VOC) as non-methane non ethane hydrocarbons (NMNEHC).

Testing was conducted in accordance with an approved test protocol from the WV Source Testing Manual and the United States Environmental Protection Agency (USEPA) test methods. Testing for the engine occurred on May 4, 2016 and was conducted by Steve LaRue of Ecotest.

Summary of Test Results

Emissions Summary

Pollutant	pounds / hour		tons / year		g/BHP-hr		ppmvd at 15% O_2	
	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted
CO	1.00	0.05	4.39	0.22	2.00	0.01	270	2
NOx	2.61	1.06	11.44	4.66	1.00	0.22	82	21
VOCs	1.65	0.08	7.21	0.35	0.70	0.02	60	2

	Test Run			Average
	1st	2nd	3rd	
Test Run				
Start Time	3:11 PM	4:16 PM	5:21 PM	
End Time	4:12 PM	5:17 PM	6:21 PM	
Interval (minutes)	61	61	60	61
Ambient Conditions				
Dry Bulb / Ambient Temperature (°F)				N/A
Wet Bulb Temperature (°F)				N/A
Calculated Relative Humidity (%)	N/A	N/A	N/A	N/A
Relative Humidity (%)				N/A
Barometric Pressure ("Hg)				N/A
Elevation (feet)				
Emissions Source				
Manufacturer	Caterpillar			
Model	3608			
Serial Number	BEN01121 (Run Hr-28			
Unit ID	2657			
Manufacture/Rebuild Date				
Emissions Source Type	Engine			
Emissions Source Operational Data: Engine				
Fuel flow rate determined by:	Fuel Flow Meter			
Fuel Flow Rate (SCFH)	13500	13500	13500	13500
Calculated Fuel Flow Rate (SCFH)	N/A	N/A	N/A	N/A
BSFC (BTU/BHP/hr), LHV				N/A
Calculated $BSFC_{LHV}$ (BTU/BHP/hr)	5796	5796	5796	5796
Rich Burn / Lean Burn	Lean Burn			
Fuel Header Pressure (PSIG)				N/A
Calculated Load (%)	90.7	90.7	90.7	90.7
Current Power (BHP)	2150	2150	2150	2150
Max Rated Power (BHP)	2370			
Max Rated Speed (RPM)	1000			
Emissions Control Equipment	Catalyst			
Engine Type	Spark-Ignited			

CE-5R

USA COMPRESSION

Mk Cathers #2 Quote USA Unit 2368 Caterpillar G3608TALE Engine Emissions

Date of Manufacture	*April 11, 2011*	Engine Serial Number	BEN00694	Date Modified/Reconstructed	Not Any
Driver Rated HP	2370	Rated Speed in RPM	1000	Combustion Type	Spark Ignited 4 Stroke
Number of Cylinders	8	Compression Ratio	9:1	Combustion Setting	Ultra Lean Burn
Total Displacement, in^3	10350	Fuel Delivery Method	Fuel Injection	Combustion Air Treatment	T.C./Aftercooled

Raw Engine Emissions (customer supplied fuel gas with little to no H2S)

Fuel Consumption *6840 LHV BTU/bhp-hr or 7589 HHV BTU/bhp-hr*
Altitude *1200 ft*
Maximum Air Inlet Temp *90 F*

	g/bhp-hr [1]	lb/MMBTU [2]	lb/hr	TPY
Nitrogen Oxides (NOx)	0.5		2.61	11.44
Carbon Monoxide (CO)	2.74		14.32	62.70
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	0.63		3.29	14.42
Formaldehyde (CH2O)	0.26		1.36	5.95
Particulate Matter (PM) Filterable+Condensable		9.99E-03	1.80E-01	7.87E-01
Sulfur Dioxide (SO2)		5.88E-04	1.06E-02	4.63E-02

	g/bhp-hr [1]	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	440	2299	9133
Methane (CH4)	5.36	28.01	111.26

[1] g/bhp-hr are based on Caterpillar Specifications (GERP) with customer supplied fuel gas, 1200 ft elevation, and 90 F Max Air Inlet Temperature. Note that g/bhp-hr values are based on 100% Load Operation. For air permitting, it is recommended to use a 20% safety margin for CO, VOC and other organic compounds to allow for variation in operating parameters and fuel gas quality.

[2] Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2).

Catalytic Converter Emissions

Catalytic Converter Make and Model: *Emit, ELX6200Z-2022F*
Element Type: *Oxidation*
Number of Elements in Housing: *3*
Air/Fuel Ratio Control *Caterpillar ADEM3*

	% Reduction	lb/hr	TPY
Nitrogen Oxides (NOx)	0	**2.61**	**11.44**
Carbon Monoxide (CO)	93	**1.00**	**4.39**
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	50	**1.65**	**7.21**
Formaldehyde (CH2O)	50	**0.68**	**2.98**
Particulate Matter (PM)	0	**1.80E-01**	**7.87E-01**
Sulfur Dioxide (SO2)	0	**1.06E-02**	**4.63E-02**

	% Reduction	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	0	**2299**	**9133**
Methane (CH4)	0	**28.01**	**111.26**

2585 Heartland Drive
Sheridan, WY 82801
Office: | Direct: +1 (307) 675.5310
kdunham@emittechnologies.com

Prepared For:
Chris Magee
USA COMPRESSION

QUOTE: QUO-16705-Z2F9

INFORMATION PROVIDED BY CATERPILLAR

Engine:	G3608
Horsepower:	2370
RPM:	1000
Compression Ratio:	9.2
Exhaust Flow Rate:	16228 CFM
Exhaust Temperature:	858 °F
Reference:	DM8606-06-001
Fuel:	Natural Gas
Annual Operating Hours:	8760

Uncontrolled Emissions

	g/bhp-hr	Lb/Hr	Tons/Year
NOx:	0.50	2.61	11.44
CO:	2.74	14.32	62.71
THC:	6.30	32.92	144.18
NMHC	0.94	4.91	21.51
NMNEHC:	0.63	3.29	14.42
HCHO:	0.26	1.36	5.95
O2:	12.00 %		

POST CATALYST EMISSIONS

	% Reduction	g/bhp-hr	Lb/Hr	Tons/Year
NOx:	Unaffected by Oxidation Catalyst			
CO:	>93 %	<0.19	<1.00	<4.39
VOC:	>50 %	<0.32	<1.65	<7.21
HCHO:	>50 %	<0.13	<0.68	<2.98

CONTROL EQUIPMENT

Catalyst Housing

Model:	ELX-6200-2022F-6CE0-362
Manufacturer:	EMIT Technologies, Inc
Element Size:	Rectangle 36" x 15" x 3.5"
Housing Type:	6 Element Capacity
Catalyst Installation:	Accessible Housing
Construction:	3/16" Carbon Steel
Sample Ports:	9 (0.5" NPT)
Inlet Connections:	20" Flat Face Flange
Outlet Connections:	22" Flat Face Flange
Configuration:	End In / Side Out
Silencer:	Integrated
Silencer Grade:	Hospital Enhanced
Insertion Loss:	35-50 dBA

Catalyst Element

Model:	RT-3615-Z
Catalyst Type:	Oxidation, Standard Precious Group Metals
Substrate Type:	BRAZED
Manufacturer:	EMIT Technologies, Inc
Element Quantity:	3
Element Size:	Rectangle 36" x 15" x 3.5"

CE-5R

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial 4ZS02061 Emission Summary
CE-6R
Criteria Pollutants (See Attachment M)

Fuel Usage		
Fuel	Units	Total
Natural Gas	ft^3	87,451,080

Emission Factors[1]	
	Engine
Pollutant	Natural Gas (lbs/ 10^6 ft^3)
Particulates	0.0794
Sulfur Dioxide	0.6056
Oxides of Nitrogen	338.47
PM-10	0.0794
VOC	44.54
Carbon Monoxide	62.35
CO2 Equiv	113,300

Emissions			
	Engine		
Pollutant	Natural Gas (lbs/yr)	Natural Gas (lbs/hr)	Natural Gas (tons/yr)
Particulates	6.94	0.0008	0.0035
Sulfur Dioxide	52.96	0.0060	0.0265
Oxides of Nitrogen	29,600	0.8600	3.78
PM-10	6.94	0.0008	0.0035
VOC	3,895	0.0400	0.1900
Carbon Monoxide	5,453	0.0600	0.2700
CO2 Equiv	9,908,207	1,131	4,954

Emissions are calculated as follows:

Natural Gas Usage = 9983 scfh (stack test) * 8760 hrs/yr = 87,451,080 scf/yr

Emissions = Volume of Gas (ft^3) * Emission Factor (lbs/10^6 ft^3)

[1] Natural Gas Emission Factors were taken from AP-42 Table 3.2-2 (PM, PM-10, SO2, CO2e) and the attached stack test (CO, NOx, VOC)

Notes:

- Emissions assume 8,760 hours of operation for the engine per year
- Heating value of Natural Gas assumed to be 1030 Btu/ft^3

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Emission Summary (See Attachment M)
HAPS (CE-6R)

Emissions are calculated as follows:

Emissions = Heat of Natural Gas (MMBtu) * Emission Factor (lbs/MMBtu)

[1] Natural Gas Emission Factors were taken from AP-42 Tables 3.2-2 and Formaldehyde emissions (lb/hr & tpy) were taken from the spec sheet

CE-6R - Natural Gas 4SLB HAP
MMBtu
90,075

HAP Emissions		Natural Gas 4SLB		
		(lbs/yr)	(lbs/hr)	(tons/yr)
HAP	Natural Gas[1] (lb/MMBtu)			
1,1,2,2-Tetrachloroethane	4.00E-05	3.60	0.0004	0.0018
1,1,2-Trichloroethane	3.18E-05	2.86	0.0003	0.0014
1,3-Butadiene	2.67E-04	24.05	0.0027	0.0120
1,3-Dichloropropene	2.64E-05	2.38	0.0003	0.0012
2-Methylnaphthalene	3.32E-05	2.99	0.0003	0.0015
2,2,4-Trimethylpentane	2.50E-04	22.52	0.0026	0.0113
Acenaphthene	1.25E-06	0.1126	1.29E-05	5.63E-05
Acenaphthylene	5.53E-06	0.4981	5.69E-05	0.0002
Acetaldehyde	8.36E-03	753.02	0.0860	0.3765
Acrolein	5.14E-03	462.98	0.0529	0.2315
Benzene	4.40E-04	39.63	0.0045	0.0198
Benzo(b)fluoranthene	1.66E-07	0.0150	1.71E-06	7.48E-06
Benzo(e)pyrene	4.15E-07	0.0374	4.27E-06	1.87E-05
Benzo(g,h,i)perylene	4.14E-07	0.0373	4.26E-06	1.86E-05
Bipheyl	2.12E-04	19.10	0.0022	0.0095
Carbon Tetrachloride	3.67E-05	3.31	0.0004	0.0017
Chlorobenzene	3.04E-05	2.74	0.0003	0.0014
Chloroform	2.85E-05	2.57	0.0003	0.0013
Chrysene	6.93E-07	0.0624	7.13E-06	3.12E-05
Ethylbenzene	3.97E-05	3.58	0.0004	0.0018
Ethylene Dibromide	4.43E-05	3.99	0.0005	0.0020
Fluoranthene	1.11E-06	0.1000	1.14E-05	5.00E-05
Fluorene	5.67E-06	0.5107	5.83E-05	0.0003
Formaldehyde	-	4,468	0.5100	2.23
Methanol	2.50E-03	225.19	0.0257	0.1126
Methylene Chloride	2.00E-05	1.80	0.0002	0.0009
n-Hexane	1.11E-03	99.98	0.0114	0.0500
Naphthalene	7.44E-05	6.70	0.0008	0.0034
PAH	2.69E-05	2.42	0.0003	0.0012
Phenanthrene	1.04E-05	0.9368	0.0001	0.0005
Phenol	2.40E-05	2.16	0.0002	0.0011
Pyrene	1.36E-06	0.1225	1.40E-05	6.13E-05
Styrene	2.36E-05	2.13	0.0002	0.0011
Tetrachloroethane	2.48E-06	0.2234	2.55E-05	0.0001
Toluene	4.08E-04	36.75	0.0042	0.0184
Vinyl Chloride	1.49E-05	1.34	0.0002	0.0007
Xylene	1.84E-04	16.57	0.0019	0.0083
	Total:	**6,215**	**0.7094**	**3.10**

Emissions Test Report

Prepared for: MK Midstream Holdings, LLC
Prepared by: Steve LaRue
Test Date: May 4, 2016

Regulatory Information

Permit #:	G35-A107B
Make:	Caterpillar
Model:	3606
Unit Number:	2669
Serial Number:	4ZS02061 (Run Hr- 2307)
Regulatory Citation	40 CFR 60 Subpart JJJJ
Target Parameter(s)	*NOx, CO, and VOCs*

Contact Information

Test Location

MK Midstream Holdings, LLC
Cather CS
Harrison County, WV

Test Company

Ecotest Energy Services
142 S. Johnson Rd.
Houston, PA 15342

Primary Facility Contact
Dave Sweeley
MK Midstream Holdings, LLC
65 Professional Place Suite 200
Bridgeport, WV, 26330
724-759-9822
dsweeley@mkmidstream.com

Company Contact
Tyler Frey
Compliance Specialist
(570)428-2133
Tyler@Ecotest.us
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Wayne Philpot
V.P. Operations
Wayne@ecotest.us
(325)348-8070

Introduction

Ecotest Energy Services (Ecotest) has been contracted by MK Midstream, to provide emissions testing on the Caterpillar, 3606 Spark-Ignited engine located at the Cather location in Harrison County, WV. The purpose of this testing was to demonstrate compliance with emission limitations contained in the sites air permit, permit G35-A107B, and 40 CFR 60 subpart JJJJ. There are emissions limitations for the oxides of nitrogen (NOx), carbon monoxide (CO) and volatile organic compounds (VOC) as non-methane non ethane hydrocarbons (NMNEHC).

Testing was conducted in accordance with an approved test protocol from the TX Source Testing Manual and the United States Environmental Protection Agency (USEPA) test methods. Testing for the engine occurred on May 4, 2016 and was conducted by Steve LaRue of Ecotest.

Summary of Test Results

Emissions Summary

Pollutant	pounds / hour		tons / year		g/BHP-hr		ppmvd at 15% O_2	
	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted	Permitted	Emitted
CO	0.75	0.06	3.29	0.27	2.00	0.02	270	3
NOx	1.96	0.86	8.57	3.78	1.00	0.24	82	23
VOCs	1.23	0.04	5.40	0.19	0.70	0.01	60	1

	Test Run			Average
	1st	2nd	3rd	
Test Run				
Start Time	11:19 AM	12:24 PM	1:29 PM	
End Time	12:20 PM	1:25 PM	2:29 PM	
Interval (minutes)	61	61	60	61
Ambient Conditions				
Dry Bulb / Ambient Temperature (°F)				N/A
Wet Bulb Temperature (°F)				N/A
Calculated Relative Humidity (%)	N/A	N/A	N/A	N/A
Relative Humidity (%)				N/A
Barometric Pressure ("Hg)				N/A
Elevation (feet)				
Emissions Source				
Manufacturer	Caterpillar			
Model	3606			
Serial Number	4ZS02061 (Run Hr- 23			
Unit ID	2669			
Manufacture/Rebuild Date				
Emissions Source Type	Engine			
Emissions Source Operational Data: Engine				
Fuel flow rate determined by:	Fuel Flow Meter			
Fuel Flow Rate (SCFH)	9960	9986	10003	9983
Calculated Fuel Flow Rate (SCFH)	N/A	N/A	N/A	N/A
BSFC (BTU/BHP/hr), LHV				N/A
Calculated $BSFC_{LHV}$ (BTU/BHP/hr)	5746	5761	5771	5759
Rich Burn / Lean Burn	Lean Burn			
Fuel Header Pressure (PSIG)				N/A
Calculated Load (%)	90.1	90.1	90.1	90.1
Current Power (BHP)	1600	1600	1600	1600
Max Rated Power (BHP)	1775			
Max Rated Speed (RPM)	1000			
Emissions Control Equipment	Catalyst			
Engine Type	Spark-Ignited			

CE-6R

USA COMPRESSION

USA Compression Units 2669 Caterpillar G3606TALE Engine Emissions

Date of Manufacture	December 12, 2014	Engine Serial Number	4ZS02061	Date Modified/Reconstructed	Not Any
Driver Rated HP	1775	Rated Speed in RPM	1000	Combustion Type	Spark Ignited 4 Stroke
Number of Cylinders	6	Compression Ratio	9:1	Combustion Setting	Ultra Lean Burn
Total Displacement, in^3	7762	Fuel Delivery Method	Fuel Injection	Combustion Air Treatment	T.C./Aftercooled

Raw Engine Emissions (Customer Supplied Fuel Gas with little to no H2S)

Fuel Consumption 6860 *LHV BTU/bhp-hr or* 7611 *HHV BTU/bhp-hr*
Altitude 1200 *ft*
Maximum Air Inlet Temp 90 *F*

	g/bhp-hr [1]	lb/MMBTU [2]	lb/hr	TPY
Nitrogen Oxides (NOx)	0.5		1.96	8.57
Carbon Monoxide (CO)	2.74		10.72	46.96
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	0.63		2.47	10.80
Formaldehyde (CH2O)	0.26		1.02	4.46
Particulate Matter (PM) Filterable+Condensable		9.99E-03	1.35E-01	5.91E-01
Sulfur Dioxide (SO2)		5.88E-04	7.94E-03	3.48E-02

	g/bhp-hr [1]	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	441	1726	6856
Methane (CH4)	2.66	10.41	41.35

[1] g/bhp-hr are based on Caterpillar Specifications (GERP) Customer supplied fuel gas, 1200 ft elevation, and 90 F Max Air Inlet Temperature. Note that g/bhp-hr values are based on 100% Load Operation. For air permitting, it is recommended to use a 20% safety margin for CO, VOC and other organic compounds to allow for variation in operating parameters and fuel gas quality.

[2] Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2).

Catalytic Converter Emissions

Catalytic Converter Make amd Model: *DCL, DC64-L2*
Element Type: *DC-24.23" Round*
Number of Elements in Housing: *2*
Air/Fuel Ratio Control *Caterpillar ADEM A3, Burn Time*

	% Reduction	lb/hr	TPY
Nitrogen Oxides (NOx)	0	**1.96**	**8.57**
Carbon Monoxide (CO)	93	**0.75**	**3.29**
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	50	**1.23**	**5.40**
Formaldehyde (CH2O)	50	**0.51**	**2.23**
Particulate Matter (PM)	0	**1.35E-01**	**5.91E-01**
Sulfur Dioxide (SO2)	0	**7.94E-03**	**3.48E-02**

	% Reduction	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	0	**1726**	**6856**
Methane (CH4)	0	**10.41**	**41.35**

CE-GR

DCL America Inc.

1610 Woodstead Ct, Suite 245, The Woodlands, Texas 77380 USA
Tel: 877-965-8989 *Fax:* 281-605-5858 info@dcl-inc.com www.dcl-inc.com

GLOBAL LEADER IN EMISSION CONTROL SOLUTIONS

To:	Chris Magee	**Phone:**	
Company:	USA Compression	**Email**	
Date:	September 21, 2015	**No. Pages:**	1

Dear Chris,

We hereby guarantee that our Model DC64L2 specified below with two (2) elements installed as described below, and sized for the following engine:

Engine Data	
Engine Model	Caterpillar G3606
Power	1775HP
Fuel	High Methane NG
Exhaust Flow Rate	12, 211 acfm
Exhaust Temperature	847°F

Catalyst Data	
Catalyst Model	DC64L2
Type	Oxidation- A
# of Elements	2
Cell Density	300 cpsi
Approx Dimensions	See attached drawing
Approx Pressure Drop	4.1" w.c

will perform as follows:

Exhaust Component	Engine Output (g-bhp/hr)	Converter Output % reduction
CO	2.74	93%
VOC	0.63	50%
CH20	0.26	50%

for a period of 1 year or 8000 hours, whichever comes first, subject to all terms and conditions contained in the attached warranty document being respected and met.

Best Regards,

On behalf of DCL America Inc.

Lisa Barber

416-788-8021
lbarber@dcl-inc.com

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial JEF02001 Emission Summary
CE-7R
Criteria Pollutants (See Attachment M)

Fuel Usage		
Fuel	Units	Total
Natural Gas	ft^3	96,184,800

Emission Factors[1]	
	Engine
Pollutant	Natural Gas (lbs/ 10^6 ft^3)
Particulates	33.38
Sulfur Dioxide	1.96
Oxides of Nitrogen	446.22
PM-10	33.38
VOC	214.19
Carbon Monoxide	1,089
CO2 Equiv	158,745

Emissions			
	Engine		
Pollutant	Natural Gas (lbs/yr)	Natural Gas (lbs/hr)	Natural Gas (tons/yr)
Particulates	996.00	0.1140	0.4980
Sulfur Dioxide	58.60	0.0067	0.0293
Oxides of Nitrogen	13,320	1.52	6.66
PM-10	996.00	0.1140	0.4980
VOC	6,400	0.7300	3.20
Carbon Monoxide	32,380	3.70	16.19
CO2 Equiv	15,268,872	1,743	7,634

Notes:

[1] Fuel Usage taken from the Engine Specification Sheet (183 scfm * 525600 min/yr = 96,184,800 mmscf)

[2] Natural Gas Emission Factors were taken from the Engine Emission

[3] Emissions are taken from the Engine Emission Specification Sheet (See attached)

- Emissions assume 8,760 hours of operation for the engine per year

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Emission Summary (See Attachment M)
HAPS (CE-7R)

Emissions are calculated as follows:

Emissions = Heat of Natural Gas (MMBtu) * Emission Factor (lbs/MMBtu)

[1] Natural Gas Emission Factors were taken from AP-42 Tables 3.2-2 and Formaldehyde emissions (lb/hr & tpy) were taken from the spec sheet

CE-7R - Natural Gas 4SLB HAP
MMBtu
99,070

HAP Emissions		Natural Gas		
		Engine		
		(lbs/yr)	(lbs/hr)	(tons/yr)
HAP	Natural Gas[1] (lb/MMBtu)			
1,1,2,2-Tetrachloroethane	4.00E-05	3.96	0.0005	0.0020
1,1,2-Trichloroethane	3.18E-05	3.15	0.0004	0.0016
1,3-Butadiene	2.67E-04	26.45	0.0030	0.0132
1,3-Dichloropropene	2.64E-05	2.62	0.0003	0.0013
2-Methylnaphthalene	3.32E-05	3.29	0.0004	0.0016
2,2,4-Trimethylpentane	2.50E-04	24.77	0.0028	0.0124
Acenaphthene	1.25E-06	0.1238	1.41E-05	6.19E-05
Acenaphthylene	5.53E-06	0.5479	6.25E-05	0.0003
Acetaldehyde	8.36E-03	828.23	0.0945	0.4141
Acrolein	5.14E-03	509.22	0.0581	0.2546
Benzene	4.40E-04	43.59	0.0050	0.0218
Benzo(b)fluoranthene	1.66E-07	0.0164	1.88E-06	8.22E-06
Benzo(e)pyrene	4.15E-07	0.0411	4.69E-06	2.06E-05
Benzo(g,h,i)perylene	4.14E-07	0.0410	4.68E-06	2.05E-05
Bipheyl	2.12E-04	21.00	0.0024	0.0105
Carbon Tetrachloride	3.67E-05	3.64	0.0004	0.0018
Chlorobenzene	3.04E-05	3.01	0.0003	0.0015
Chloroform	2.85E-05	2.82	0.0003	0.0014
Chrysene	6.93E-07	0.0687	7.84E-06	3.43E-05
Ethylbenzene	3.97E-05	3.93	0.0004	0.0020
Ethylene Dibromide	4.43E-05	4.39	0.0005	0.0022
Fluoranthene	1.11E-06	0.1100	1.26E-05	5.50E-05
Fluorene	5.67E-06	0.5617	6.41E-05	0.0003
Formaldehyde	-	1,840	0.2100	0.9200
Methanol	2.50E-03	247.68	0.0283	0.1238
Methylene Chloride	2.00E-05	1.98	0.0002	0.0010
n-Hexane	1.11E-03	109.97	0.0126	0.0550
Naphthalene	7.44E-05	7.37	0.0008	0.0037
PAH	2.69E-05	2.66	0.0003	0.0013
Phenanthrene	1.04E-05	1.03	0.0001	0.0005
Phenol	2.40E-05	2.38	0.0003	0.0012
Pyrene	1.36E-06	0.1347	1.54E-05	6.74E-05
Styrene	2.36E-05	2.34	0.0003	0.0012
Tetrachloroethane	2.48E-06	0.2457	2.80E-05	0.0001
Toluene	4.08E-04	40.42	0.0046	0.0202
Vinyl Chloride	1.49E-05	1.48	0.0002	0.0007
Xylene	1.84E-04	18.23	0.0021	0.0091
Total:		**3,761**	**0.4293**	**1.88**

USA COMPRESSION

USA Compression Unit 2408 Caterpillar G3516BLE Engine Emissions

Date of Manufacture	11/16/2012	Engine Serial Number	JEF02001	Date Modified/Reconstructed	Not Any
Driver Rated HP	1380	Rated Speed in RPM	1400	Combustion Type	Spark Ignited 4 Stroke
Number of Cylinders	16	Compression Ratio	8:1	Combustion Setting	Ultra Lean Burn
Total Displacement (in^3)	4211	Fuel Delivery Method	Carburetor	Combustion Air Treatment	T.C./Aftercooled

Raw Engine Emissions (905 LHV BTU/SCF Fuel Gas with little to no H2S)

Fuel Consumption *7442 LHV BTU/bhp-hr or 8255 HHV BTU/bhp-hr*
Altitude *1200 ft*
Maximum Air Inlet Temp *90 F*

	g/bhp-hr [1]	lb/MMBTU [2]	lb/hr	TPY
Nitrogen Oxides (NOx)	0.5		1.52	6.66
Carbon Monoxide (CO)	2.43		7.39	32.38
Volatile Organic Compounds (VOC or NMNEHC)	0.48		1.46	6.40
Formaldehyde (CH2O)	0.43		1.31	5.73
Particulate Matter (PM) Filterable+Condensable		9.99E-03	1.14E-01	4.98E-01
Sulfur Dioxide (SO2)		5.88E-04	6.70E-03	2.93E-02

	g/bhp-hr [1]	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	472	1436	5705
Methane (CH4)	4.04	12.29	48.83

[1] g/bhp-hr are based on Caterpillar Specifications (GERP) customer supplied fuel gas, 1200 ft elevation, and 90 F Max Air Inlet Temperature. Note that g/bhp-hr values are based on 100% Load Operation. For Air Permitting, it is recommended to add a safety margin to CO, VOC, and Formaldehyde to account for variations in fuel gas composition and load.

[2] Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2).

Catalytic Converter Emissions

Catalytic Converter Make amd Model: *EMIT ELX-5000Z-1616F*
Element Type: *EMIT RE-3615Z*
Number of Elements in Housing: *2*
Air/Fuel Ratio Control *Caterpillar ADEM3, NOx Feedback*

	% Reduction	**g/bhp-hr**	**lb/hr**	**TPY**
Nitrogen Oxides (NOx)	0	0.5	**1.52**	**6.66**
Carbon Monoxide (CO)	50	1.22	**3.70**	**16.19**
Volatile Organic Compounds (VOC or NMNEHC)	50	0.24	**0.73**	**3.20**
Formaldehyde (CH2O)	50	0.22	**0.65**	**2.86**
Particulate Matter (PM)	0	0.037396376	**1.14E-01**	**4.98E-01**
Sulfur Dioxide (SO2)	0	0.002201747	**6.70E-03**	**2.93E-02**

	% Reduction	**lb/hr**	**Metric Tonne/yr**
Carbon Dioxide (CO2)	0	**1436**	**5705**
Methane (CH4)	0	**12.29**	**48.83**

2555 Heartland Drive
Sheridan, WY 82801
Office: 307.673.0883 | Direct: 307.675.5073
cparisi@emittechnologies.com

Prepared For:

Chris Magee

USA COMPRESSION

QUOTE: QUO-13825-F8N1

APPLICATION INFORMATION

DRIVER

Make:	CATERPILLAR
Model:	G3516B
Horsepower:	1380
RPM:	1400
Compression Ratio:	8.0
Exhaust Flow Rate:	9042 CFM
Exhaust Temperature:	982 ˚F
Reference:	DM8800-07
Fuel:	Natural Gas
Annual Operating Hours:	8760

UNCONTROLLED EMISSIONS DATA

	g/bhp-hr	Lb/hr	Tons/Year
NO_x:	0.50	1.52	6.66
CO:	2.43	7.39	32.38
THC:	475.00	14.45	63.30
NMHC:	0.71	2.16	9.46
NMNEHC	0.48	1.46	6.40
HCHO	0.43	1.31	5.73
Oxygen:	0.30%		

POST CATALYST EMISSIONS

	g/bhp-hr	Lb/hr	Tons/Year
NO_x:	Unaffected by Oxidation Catalyst		
CO:	<1.22	<3.70	<16.19
HCHO:	<0.07	<0.21	<0.92

CONTROL EQUIPMENT

Catalyst Housing

Model:	ELX-5000Z-1616F-30CEE-361
Manufacturer:	EMIT Technologies, Inc
Element Size:	Rectangle, 36" x 15" x 3.5"
Housing Type:	3 Element Capacity
Catalyst Installation:	Accessible Housing
Construction:	10 gauge Carbon Steel
Sample Ports:	6 (0.5" NPT)
Inlet Connections:	16" Flat Face Flange
Outlet Connections:	16" Flat Face Flange
Configuration:	End In / End Out
Silencer:	Integrated
Silencer Grade:	Hospital Enhanced
Insertion Loss:	35-50 dBA

Catalyst Element

Model:	RT-3615-Z
Catalyst Type:	Oxidation, Standard Precious Group Metals
Substrate Type:	BRAZED
Element Size:	Rectangle, 36" x 15" x 3.5"
Element Quantity:	2

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial JEF02167 Emission Summary
CE-8R
Criteria Pollutants (See Attachment M)

Fuel Usage		
Fuel	Units	Total
Natural Gas	ft^3	96,184,800

Emission Factors[1]	
	Engine
Pollutant	Natural Gas (lbs/ 10^6 ft^3)
Particulates	33.38
Sulfur Dioxide	1.96
Oxides of Nitrogen	446.22
PM-10	33.38
VOC	214.19
Carbon Monoxide	1,089
CO2 Equiv	158,745

Emissions			
	Engine		
Pollutant	Natural Gas (lbs/yr)	Natural Gas (lbs/hr)	Natural Gas (tons/yr)
Particulates	996.00	0.1140	0.4980
Sulfur Dioxide	58.60	0.0067	0.0293
Oxides of Nitrogen	13,320	1.52	6.66
PM-10	996.00	0.1140	0.4980
VOC	6,400	0.7300	3.20
Carbon Monoxide	32,380	3.70	16.19
CO2 Equiv	15,268,872	1,743	7,634

Notes

[1] Fuel Usage taken from the Engine Specification Sheet (183 scfm * 525600 min/yr = 96,184,800 mmscf)

[2] Natural Gas Emission Factors were taken from the Engine Emission Specification Sheet (See attached)

[3] Emissions are taken from the Engine Emission Specification Sheet (See
- Emissions assume 8,760 hours of operation for the engine per year

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Emission Summary (See Attachment M)
HAPS (CE-8R)

Emissions are calculated as follows:

Emissions = Heat of Natural Gas (MMBtu) * Emission Factor (lbs/MMBtu)

[1] Natural Gas Emission Factors were taken from AP-42 Tables 3.2-2 and Formaldehyde emissions (lb/hr & tpy) were taken from the spec sheet

CE-8R - Natural Gas 4SLB HAP
MMBtu
99,070

HAP Emissions		Natural Gas		
		Engine		
		(lbs/yr)	(lbs/hr)	(tons/yr)
HAP	Natural Gas[1] (lb/MMBtu)			
1,1,2,2-Tetrachloroethane	4.00E-05	3.96	0.0005	0.0020
1,1,2-Trichloroethane	3.18E-05	3.15	0.0004	0.0016
1,3-Butadiene	2.67E-04	26.45	0.0030	0.0132
1,3-Dichloropropene	2.64E-05	2.62	0.0003	0.0013
2-Methylnaphthalene	3.32E-05	3.29	0.0004	0.0016
2,2,4-Trimethylpentane	2.50E-04	24.77	0.0028	0.0124
Acenaphthene	1.25E-06	0.1238	1.41E-05	6.19E-05
Acenaphthylene	5.53E-06	0.5479	6.25E-05	0.0003
Acetaldehyde	8.36E-03	828.23	0.0945	0.4141
Acrolein	5.14E-03	509.22	0.0581	0.2546
Benzene	4.40E-04	43.59	0.0050	0.0218
Benzo(b)fluoranthene	1.66E-07	0.0164	1.88E-06	8.22E-06
Benzo(e)pyrene	4.15E-07	0.0411	4.69E-06	2.06E-05
Benzo(g,h,i)perylene	4.14E-07	0.0410	4.68E-06	2.05E-05
Bipheyl	2.12E-04	21.00	0.0024	0.0105
Carbon Tetrachloride	3.67E-05	3.64	0.0004	0.0018
Chlorobenzene	3.04E-05	3.01	0.0003	0.0015
Chloroform	2.85E-05	2.82	0.0003	0.0014
Chrysene	6.93E-07	0.0687	7.84E-06	3.43E-05
Ethylbenzene	3.97E-05	3.93	0.0004	0.0020
Ethylene Dibromide	4.43E-05	4.39	0.0005	0.0022
Fluoranthene	1.11E-06	0.1100	1.26E-05	5.50E-05
Fluorene	5.67E-06	0.5617	6.41E-05	0.0003
Formaldehyde	-	1,840	0.2100	0.9200
Methanol	2.50E-03	247.68	0.0283	0.1238
Methylene Chloride	2.00E-05	1.98	0.0002	0.0010
n-Hexane	1.11E-03	109.97	0.0126	0.0550
Naphthalene	7.44E-05	7.37	0.0008	0.0037
PAH	2.69E-05	2.66	0.0003	0.0013
Phenanthrene	1.04E-05	1.03	0.0001	0.0005
Phenol	2.40E-05	2.38	0.0003	0.0012
Pyrene	1.36E-06	0.1347	1.54E-05	6.74E-05
Styrene	2.36E-05	2.34	0.0003	0.0012
Tetrachloroethane	2.48E-06	0.2457	2.80E-05	0.0001
Toluene	4.08E-04	40.42	0.0046	0.0202
Vinyl Chloride	1.49E-05	1.48	0.0002	0.0007
Xylene	1.84E-04	18.23	0.0021	0.0091
Total:		**3,761**	**0.4293**	**1.88**

USA COMPRESSION

2439 Caterpillar G3516BLE Engine Emissions

Date of Manufacture	3/17/2013	Engine Serial Number	JEF02167	Date Modified/Reconstructed	Not Any
Driver Rated HP	1380	Rated Speed in RPM	1400	Combustion Type	Spark Ignited 4 Stroke
Number of Cylinders	16	Compression Ratio	8:1	Combustion Setting	Ultra Lean Burn
Total Displacement (in^3)	4230	Fuel Delivery Method	Carburetor	Combustion Air Treatment	T.C./Aftercooled

With Customer Supplied Fuel Gas Analysis

Fuel Consumption *7442 LHV BTU/bhp-hr or 8255 HHV BTU/bhp-hr*
Altitude *1200 ft*
Maximum Air Inlet Temp *90 F*

	g/bhp-hr [1]	lb/MMBTU [2]	lb/hr	TPY
Nitrogen Oxides (NOx)	0.5		1.52	6.66
Carbon Monoxide (CO)	2.43		7.39	32.38
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	0.48		1.46	6.40
Formaldehyde (CH2O)	0.43		1.31	5.73
Particulate Matter (PM) Filterable+Condensable		9.99E-03	1.14E-01	4.98E-01
Sulfur Dioxide (SO2)		5.88E-04	6.70E-03	2.93E-02

	g/bhp-hr [1]	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	472	1436	5705
Methane (CH4)	4.04	12.29	48.83

[1] g/bhp-hr are based on Caterpillar Specifications (GERP) with customer supplied fuel gas, 1200 ft elevation, and 90 F Max Air Inlet Temperature. Note that g/bhp-hr values are based on 100% Load Operation. For Air Permitting, it is recommended to add a safety margin to CO, VOC, and Formaldehyde to account for variations in fuel gas composition and load.

[2] Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2).

Catalytic Converter Emissions

Catalytic Converter Make and Model: *DCL, DC64L2-HSG+*
Element Type: *DC64, 24.23" round A-Coat*
Number of Elements in Housing: *2*
Air/Fuel Ratio Control *Caterpillar ADEM3, NOx Feedback*

	% Reduction	**lb/hr**	**TPY**
Nitrogen Oxides (NOx)	0	**1.52**	**6.66**
Carbon Monoxide (CO)	50	**3.70**	**16.19**
Volatile Organic Compounds (VOC or NMNEHC)	50	**0.73**	**3.20**
Formaldehyde (CH2O)	50	**0.65**	**2.86**
Particulate Matter (PM)	0	**1.14E-01**	**4.98E-01**
Sulfur Dioxide (SO2)	0	**6.70E-03**	**2.93E-02**

	% Reduction	**lb/hr**	**Metric Tonne/yr**
Carbon Dioxide (CO2)	0	**1436**	**5705**
Methane (CH4)	0	**12.29**	**48.83**

2555 Heartland Drive
Sheridan, WY 82801
Office: 307.673.0883 | Direct: 307.675.5073
cparisi@emittechnologies.com

Prepared For:

Chris Magee

USA COMPRESSION

QUOTE: QUO-13825-F8N1

APPLICATION INFORMATION

DRIVER

Make:	CATERPILLAR
Model:	G3516B
Horsepower:	1380
RPM:	1400
Compression Ratio:	8.0
Exhaust Flow Rate:	9042 CFM
Exhaust Temperature:	982 ˚F
Reference:	DM8800-07
Fuel:	Natural Gas
Annual Operating Hours:	8760

UNCONTROLLED EMISSIONS DATA

	g/bhp-hr	Lb/hr	Tons/Year
NO_x:	0.50	1.52	6.66
CO:	2.43	7.39	32.38
THC:	475.00	14.45	63.30
NMHC:	0.71	2.16	9.46
NMNEHC	0.48	1.46	6.40
HCHO	0.43	1.31	5.73
Oxygen:	0.30%		

POST CATALYST EMISSIONS

	g/bhp-hr	Lb/hr	Tons/Year
NO_x:	Unaffected by Oxidation Catalyst		
CO:	<1.22	<3.70	<16.19
HCHO:	<0.07	<0.21	<0.92

CONTROL EQUIPMENT

Catalyst Housing

Model:	ELX-5000Z-1616F-30CEE-361
Manufacturer:	EMIT Technologies, Inc
Element Size:	Rectangle, 36" x 15" x 3.5"
Housing Type:	3 Element Capacity
Catalyst Installation:	Accessible Housing
Construction:	10 gauge Carbon Steel
Sample Ports:	6 (0.5" NPT)
Inlet Connections:	16" Flat Face Flange
Outlet Connections:	16" Flat Face Flange
Configuration:	End In / End Out
Silencer:	Integrated
Silencer Grade:	Hospital Enhanced
Insertion Loss:	35-50 dBA

Catalyst Element

Model:	RT-3615-Z
Catalyst Type:	Oxidation, Standard Precious Group Metals
Substrate Type:	BRAZED
Element Size:	Rectangle, 36" x 15" x 3.5"
Element Quantity:	2

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial JEF02341 Emission Summary
Criteria Pollutants CE-9R (See Attachment M)

Fuel Usage[1]		
Fuel	Units	Total
Natural Gas	ft^3	96,886,450

Emission Factors[2]	
	Engine
Pollutant	Natural Gas (lbs/ 10^6 ft^3)
Particulates	10.29
Sulfur Dioxide	0.6056
Oxides of Nitrogen	446.22
PM-10	10.29
VOC	428.37
Carbon Monoxide	2,169
CO2 Equiv	421,234

Emissions[3]			
	Engine		
Pollutant	Natural Gas (lbs/yr)	Natural Gas (lbs/hr)	Natural Gas (tons/yr)
Particulates	996.00	0.1140	0.4980
Sulfur Dioxide	58.60	0.0067	0.0293
Oxides of Nitrogen	13,320	1.52	6.66
PM-10	996.00	0.1140	0.4980
VOC	6,400	0.7300	3.20
Carbon Monoxide	4,540	0.5200	2.27
CO2 Equiv	12,579,360	1,436	6,290

Notes:

[1] Fuel Usage taken from the Engine Specification Sheet (183 scfm * 525600 min/yr = 96,184,800 mmscf)

[2] Natural Gas Emission Factors were taken from the Engine Emission Specification Sheet (See attached)

[3] Emissions are taken from the Engine Emission Specification Sheet (See attached)

- Emissions assume 8,760 hours of operation for the engine per year

MK Midstream Holdings - Goff West Compressor Station
Facility ID# 033-00187
Engine Serial JEF02341 Emission Summary
HAPS CE-9R (See Attachment M)

Emissions are calculated as follows:

Emissions = Heat of Natural Gas (MMBtu) * Emission Factor (lbs/MMBtu)

- Natural Gas Emission Factors were taken from AP-42 Tables 3.2-2
- Formaldehyde emissions taken from the Engine Emission Specification Sheet (See attached)

CE-9R - Natural Gas 4SLB HAP
MMBtu/yr
94,065

HAP Emissions		Natural Gas Engine Emissions		
		(lbs/yr)	(lbs/hr)	(tons/yr)
HAP	Natural Gas (lb/MMBtu)			
1,1,2,2-Tetrachloroethane	4.00E-05	3.76	0.0004	0.0019
1,1,2-Trichloroethane	3.18E-05	2.99	0.0003	0.0015
1,3-Butadiene	2.67E-04	25.12	0.0029	0.0126
1,3-Dichloropropene	2.64E-05	2.48	0.0003	0.0012
2-Methylnaphthalene	3.32E-05	3.12	0.0004	0.0016
2,2,4-Trimethylpentane	2.50E-04	23.52	0.0027	0.0118
Acenaphthene	1.25E-06	0.1176	1.34E-05	5.88E-05
Acenaphthylene	5.53E-06	0.5202	5.94E-05	0.0003
Acetaldehyde	8.36E-03	786.38	0.0898	0.3932
Acrolein	5.14E-03	483.49	0.0552	0.2417
Benzene	4.40E-04	41.39	0.0047	0.0207
Benzo(b)fluoranthene	1.66E-07	0.0156	1.78E-06	7.81E-06
Benzo(e)pyrene	4.15E-07	0.0390	4.46E-06	1.95E-05
Benzo(g,h,i)perylene	4.14E-07	0.0389	4.45E-06	1.95E-05
Bipheyl	2.12E-04	19.94	0.0023	0.0100
Carbon Tetrachloride	3.67E-05	3.45	0.0004	0.0017
Chlorobenzene	3.04E-05	2.86	0.0003	0.0014
Chloroform	2.85E-05	2.68	0.0003	0.0013
Chrysene	6.93E-07	0.0652	7.44E-06	3.26E-05
Ethylbenzene	3.97E-05	3.73	0.0004	0.0019
Ethylene Dibromide	4.43E-05	4.17	0.0005	0.0021
Fluoranthene	1.11E-06	0.1044	1.19E-05	5.22E-05
Fluorene	5.67E-06	0.5333	6.09E-05	0.0003
Formaldehyde	-	2,754	0.3144	1.38
Methanol	2.50E-03	235.16	0.0268	0.1176
Methylene Chloride	2.00E-05	1.88	0.0002	0.0009
n-Hexane	1.11E-03	104.41	0.0119	0.0522
Naphthalene	7.44E-05	7.00	0.0008	0.0035
PAH	2.69E-05	2.53	0.0003	0.0013
Phenanthrene	1.04E-05	0.9783	0.0001	0.0005
Phenol	2.40E-05	2.26	0.0003	0.0011
Pyrene	1.36E-06	0.1279	1.46E-05	6.40E-05
Styrene	2.36E-05	2.22	0.0003	0.0011
Tetrachloroethane	2.48E-06	0.2333	2.66E-05	0.0001
Toluene	4.08E-04	38.38	0.0044	0.0192
Vinyl Chloride	1.49E-05	1.40	0.0002	0.0007
Xylene	1.84E-04	17.31	0.0020	0.0087
	Total:	**4,579**	**0.5227**	**2.29**

USA COMPRESSION

2477 Caterpillar G3516BLE Engine Emissions

Date of Manufacture	7/22/2013	Engine Serial Number	JEF02341	Date Modified/Reconstructed	Not Any
Driver Rated HP	1380	Rated Speed in RPM	1400	Combustion Type	Spark Ignited 4 Stroke
Number of Cylinders	16	Compression Ratio	8:1	Combustion Setting	Ultra Lean Burn
Total Displacement (in^3)	4230	Fuel Delivery Method	Carburetor	Combustion Air Treatment	T.C./Aftercooled

With Customer Supplied Fuel Gas Analysis

Fuel Consumption *7442 LHV BTU/bhp-hr or 8255 HHV BTU/bhp-hr*
Altitude *1200 ft*
Maximum Air Inlet Temp *90 F*

	g/bhp-hr [1]	lb/MMBTU [2]	lb/hr	TPY
Nitrogen Oxides (NOx)	0.5		1.52	6.66
Carbon Monoxide (CO)	2.43		7.39	32.38
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	0.48		1.46	6.40
Formaldehyde (CH2O)	0.43		1.31	5.73
Particulate Matter (PM) Filterable+Condensable		9.99E-03	1.14E-01	4.98E-01
Sulfur Dioxide (SO2)		5.88E-04	6.70E-03	2.93E-02

	g/bhp-hr [1]	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	472	1436	5705
Methane (CH4)	4.04	12.29	48.83

[1] g/bhp-hr are based on Caterpillar Specifications (GERP) with customer supplied fuel gas, 1200 ft elevation, and 90 F Max Air Inlet Temperature. Note that g/bhp-hr values are based on 100% Load Operation. For Air Permitting, it is recommended to add a safety margin to CO, VOC, and Formaldehyde to account for variations in fuel gas composition and load.

[2] Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2).

Catalytic Converter Emissions

Catalytic Converter Make and Model: *DCL, DC64L2-HSG+*
Element Type: *DC64, 24.23" round A-Coat*
Number of Elements in Housing: *2*
Air/Fuel Ratio Control *Caterpillar ADEM3, NOx Feedback*

	% Reduction	**lb/hr**	**TPY**
Nitrogen Oxides (NOx)	0	**1.52**	**6.66**
Carbon Monoxide (CO)	93	**0.52**	**2.27**
Volatile Organic Compounds (VOC or NMNEHC)	50	**0.73**	**3.20**
Formaldehyde (CH2O)	76	**0.31**	**1.38**
Particulate Matter (PM)	0	**1.14E-01**	**4.98E-01**
Sulfur Dioxide (SO2)	0	**6.70E-03**	**2.93E-02**

	% Reduction	**lb/hr**	**Metric Tonne/yr**
Carbon Dioxide (CO2)	0	**1436**	**5705**
Methane (CH4)	0	**12.29**	**48.83**

DCL America Inc.

1610 Woodstead Ct, Suite 245, The Woodlands, Texas 77380 USA
Tel: 877-965-8989 *Fax:* 281-605-5858 info@dcl-inc.com www.dcl-inc.com

GLOBAL LEADER IN EMISSION CONTROL SOLUTIONS

To:	Chris Magee	**Phone:**	
Company:	USA Compression	**Email**	
Date:	November 18, 2014	**No. Pages:**	1

Dear Chris,

We hereby guarantee that our Model DC64A specified below with two (2) elements installed as described below, and sized for the following engine:

Engine Data	
Engine Model	Caterpillar G3516B
Power	1380HP
Fuel	PQNG
Exhaust Flow Rate	9109 acfm
Exhaust Temperature	992 °F

Catalyst Data	
Catalyst Model	DC64A
Type	Oxidation- A
# of Elements	2
Cell Density	300 cpsi
Approx Dimensions	See attached drawing
Approx Pressure Drop	3.4" w.c

will perform as follows:

Exhaust Component	Converter Output (% Reduction)
CO	93%
VOC	50%
Formaldehyde (HCHO)	76%

for a period of 1 year or 8000 hours, whichever comes first, subject to all terms and conditions contained in the attached warranty document being respected and met.

Best Regards,

On behalf of DCL America Inc.

Lisa Barber
416-788-8021
lbarber@dcl-inc.com

G3516B

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Goff CS

CATERPILLAR®

ENGINE SPEED (rpm):	1400	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	CAT WIDE RANGE WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 2 INLET (°F):	130		
AFTERCOOLER - STAGE 1 INLET (°F):	201	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	210	FUEL:	GOFF 1-5-17
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	7.0-40.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	89.3
CONTROL SYSTEM:	ADEM3	FUEL LHV (Btu/scf):	936
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	1200
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	90
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5	STANDARD RATED POWER:	1380 bhp@1400rpm
SET POINT TIMING:	30		

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	1380	1380	1035	690
INLET AIR TEMPERATURE			°F	90	90	90	90
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(3)	Btu/bhp-hr	7442	7442	7971	8561
FUEL CONSUMPTION (HHV)		(3)	Btu/bhp-hr	8255	8255	8841	9496
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(4)(5)	ft3/min	3202	3202	2511	1756
AIR FLOW	(WET)	(4)(5)	lb/hr	13860	13860	10873	7601
FUEL FLOW (60ºF, 14.7 psia)			scfm	183	183	147	105
INLET MANIFOLD PRESSURE		(6)	in Hg(abs)	94.6	94.6	76.8	54.0
EXHAUST TEMPERATURE - ENGINE OUTLET		(7)	°F	982	982	968	977
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(8)(5)	ft3/min	9042	9042	7032	4954
EXHAUST GAS MASS FLOW	(WET)	(8)(5)	lb/hr	14340	14340	11258	7877
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(9)(10)	g/bhp-hr	0.50	0.50	0.50	0.50
CO		(9)(10)	g/bhp-hr	2.43	2.43	2.60	2.55
THC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	4.75	4.75	5.09	5.17
NMHC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	0.71	0.71	0.76	0.78
NMNEHC (VOCs) (mol. wt. of 15.84)		(9)(10)(11)	g/bhp-hr	0.48	0.48	0.51	0.52
HCHO (Formaldehyde)		(9)(10)	g/bhp-hr	0.43	0.43	0.43	0.42
CO2		(9)(10)	g/bhp-hr	472	472	504	548
EXHAUST OXYGEN		(9)(12)	% DRY	9.0	9.0	8.7	8.3
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(13)	Btu/min	24285	24285	22640	21093
HEAT REJ. TO ATMOSPHERE		(13)	Btu/min	6110	6110	5092	4074
HEAT REJ. TO LUBE OIL (OC)		(13)	Btu/min	4475	4475	3978	3363
HEAT REJ. TO A/C - STAGE 1 (1AC)		(13)(14)	Btu/min	11577	11577	9642	3428
HEAT REJ. TO A/C - STAGE 2 (2AC)		(13)(14)	Btu/min	5517	5517	5202	3396

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC+1AC)	(14)(15)	Btu/min	44239
TOTAL AFTERCOOLER CIRCUIT (2AC)	(14)(15)	Btu/min	5793
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.

Blowdown and Pigging Operation Emission Calculations

MK Midstream Holdings – Goff West Compressor Station
Facility ID# 033-00187
Blowdown and Pigging Operation Emissions (See Attachment S)

Compressor Blowdown

Assumptions:

- 642.9 scf/event summed from factors on page 137 of Background Technical Support Document – Petroleum and Natural Gas Industry (https://www.epa.gov/sites/production/files/2015-05/documents/background-tsd-posted-4-12-10-epa-hq-oar-2009-0923-0027.pdf)
- Events occur 56 times per year

$$\left(642.9\frac{scf}{event}\right)\left(\frac{28.32\ L}{scf}\right)\left(\frac{gmol}{22.4\ L}\right)\left(\frac{lbmol}{453.592\ gmol}\right)\left(\frac{16.68\ lb}{lbmol}\right) = 29.89\frac{lbs\ natural\ gas}{event}$$

$$\left(29.89\frac{lbs\ natural\ gas}{event}\right)\left(56\frac{events}{year}\right) = 1673.83\frac{lbs\ natural\ gas}{year} = 0.8369\frac{tons\ natural\ gas}{year}$$

$$\left(0.8369\frac{tons\ natural\ gas}{year}\right)(7\%\ wt\ VOC) = 0.059\frac{tons\ VOC}{year}$$

Low Pressure Pig Venting

Assumptions:

- 10 mmscf/day of gas flow
- Each event takes 10 minutes
- Events occurs 42 times per year

$$\left(10{,}000{,}000\frac{scf}{day}\right)\left(\frac{day}{1440\ \text{min}}\right)\left(\frac{10\ min}{event}\right) = 69{,}444\frac{scf}{event}$$

$$\left(69{,}444\frac{scf}{event}\right)\left(\frac{28.32\ L}{scf}\right)\left(\frac{gmol}{22.4\ L}\right)\left(\frac{lbmol}{453.592\ gmol}\right)\left(\frac{16.68\ lb}{lbmol}\right) = 3{,}235\ \frac{lbs\ natural\ gas}{event}$$

$$\left(3{,}235\frac{lbs\ natural\ gas}{event}\right)\left(\frac{42\ events}{year}\right) = 135{,}870\frac{lbs\ natural\ gas}{year} = 67.93\frac{tons\ natural\ gas}{year}$$

$$\left(67.93\frac{tons\ natural\ gas}{year}\right)(7\%\ wt\ VOC) = 4.75\frac{tons\ VOC}{year}$$

Compressor Startup

Assumptions:

- 5,000 scf/event taken from Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry footnote (e) from pdf page 297 (Table 5-23) (http://www.api.org/~/media/files/ehs/climate-change/2009_ghg_compendium.ashx)
- Events occur 7 times per year

$$\left(5{,}000\,\frac{scf}{event}\right)\left(\frac{28.32\ L}{scf}\right)\left(\frac{gmol}{22.4\ L}\right)\left(\frac{lbmol}{453.592\ gmol}\right)\left(\frac{16.68\ lb}{lbmol}\right) = 232.46\ \frac{lbs\ natural\ gas}{event}$$

$$\left(232.46\,\frac{lbs\ natural\ gas}{event}\right)\left(\frac{7\ events}{year}\right) = 1{,}627\,\frac{lbs\ natural\ gas}{year} = 0.81\,\frac{tons\ natural\ gas}{year}$$

$$\left(0.81\,\frac{tons\ natural\ gas}{year}\right)(7\%\ wt\ VOC) = 0.057\,\frac{tons\ VOC}{year}$$

Gas Analytical Services

CHARLESTON, WV

304-677-9926

Good

LELAP Certification #

04049

Customer	: 0034 - MK MIDSTREAM	**Date Sampled**	: 12/13/2016
Station ID	: 2601	**Date Analyzed**	: 12/19/2016
Cylinder ID	: 0280	**Effective Date**	: 01/01/2017
Producer	:	**Cyl Pressure**	: 625
Lease	: GOFF WEST	**Temp**	: 60
Area	: 190 - UNKNOWN	**Cylinder Type**	: Spot
State	: WV	**Sample By**	: HT

COMPONENT	MOL%	GPM@14.73(PSIA)
Methane	95.8791	0.000
Ethane	3.4142	0.915
Propane	0.2210	0.061
Iso-Butane	0.0133	0.004
Normal-Butane	0.0198	0.006
Neo-Pentane	0.0006	0.000
Iso-Pentane	0.0038	0.001
Normal-Pentane	0.0022	0.001
Nitrogen	0.2624	0.000
Carbon-Dioxide	0.1770	0.000
Oxygen	0.0020	0.000
BENZENE	0.0000	0.000
ETHYLBENZENE	0.0000	0.000
TOLUENE	0.0000	0.000
M-XYLENE/P-XYLENE	0.0000	0.000
C6's	0.0026	0.001
C8's	0.0004	0.000
C9's	0.0000	0.000
C7's	0.0016	0.001
C10's	0.0000	0.000
C11's	0.0000	0.000
C12's	0.0000	0.000
TOTAL	**100.0000**	**0.990**

Compressibility Factor (Z) @ 14.73 @ 60 Deg. F = 0.9979

C5+ GPM : 0.00200

Ideal Gravity: 0.5761 **Real Gravity:** 0.5771

C5+ Mole % : 0.0106

BTU @ (PSIA)	@14.65	@14.696	@14.73	@15.025
Ideal GPM	0.983	0.986	0.989	1.008
Ideal BTU Dry	1,032.69	1,035.94	1,038.33	1,059.13
Ideal BTU Sat	1,014.62	1,017.86	1,020.26	1,041.05
Real GPM	0.985	0.989	0.991	1.011
Real BTU Dry	1,034.91	1,038.16	1,040.57	1,061.46
Real BTU Sat	1,017.14	1,020.40	1,022.81	1,043.70

Comments:

Gas Analysis performed in accordance with GPA 2286

Analytical Calculations performed in accordance with GPA 2172

Sample Count : 220000003

COC :

Measurement Analyst: _____ **Ashley Free**

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
1E (CE-1R)	1.47	6.46	0.4100	1.78	0.2200	0.9600	0.0059	0.0257	0.0008	0.0034	0.0008	0.0034	1,098	4,809
2E (CE-2R)	1.26	5.51	0.3000	1.31	0.1300	0.5500	0.0059	0.0257	0.0008	0.0034	0.0008	0.0034	1,112	4,873
5E (CE-5R)	1.06	4.66	0.0500	0.2200	0.0800	0.3500	0.0082	0.0358	0.0011	0.0047	0.0011	0.0047	1,530	6,699
6E (CE-6R)	0.8600	3.78	0.0600	0.2700	0.0400	0.1900	0.0060	0.0265	0.0008	0.0035	0.0008	0.0035	1,131	4,954
3E (CE-7R)	1.52	6.66	3.70	16.19	1.46	6.40	0.0067	0.0293	0.1140	0.4980	0.1140	0.4980	1,743	7,634
4E (CE-8R)	1.52	6.66	3.70	16.19	1.46	6.40	0.0067	0.0293	0.1140	0.4980	0.1140	0.4980	1,743	7,634
RSV-1 (TEG-1)	NA	NA	NA	NA	0.6737	2.96	NA	NA	NA	NA	NA	NA	210	920
RBV-1 (TEG-1)	0.0971	0.4252	0.0816	0.3572	0.0053	0.0234	0.0060	0.0026	0.0074	0.0323	0.0074	0.0323	116	510
RSV-2 (TEG-2)	NA	NA	NA	NA	0.6737	2.95	NA	NA	NA	NA	NA	NA	1,033	4,522
RBV-2 (TEG-2)	0.0971	0.4252	0.0816	0.3572	0.0053	0.0234	0.0060	0.0026	0.0074	0.0323	0.0074	0.0323	116	510
7E (TK-1)	NA	NA	NA	NA	0.0161	0.0703	NA	NA	NA	NA	NA	NA	0.4369	1.91
8E (TK-3)	NA	NA	NA	NA	0.0013	0.0058	NA	NA	NA	NA	NA	NA	0.3745	1.64
LO-1	NA	NA	NA	NA	<0.0174	<0.0761	NA	NA	NA	NA	NA	NA	<0.8114	<3.55
9E (CE-9R)	1.52	6.66	0.52	2.27	0.73	3.20	0.0067	0.0293	0.1140	0.4980	0.1140	0.4980	1,436	6,290
TOTAL	9.40	41.24	8.90	38.94	5.51	24.16	0.0581	0.2068	0.3603	1.57	0.3603	1.57	11,270	49,362

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
1E (CE-1R)	0.1308	0.5730	0.0044	0.0192	0.0041	0.0178	0.0004	0.0017	0.0018	0.0080	0.0111	0.0485	0.3244	1.42
2E (CE-2R)	0.1308	0.5730	0.0044	0.0195	0.0041	0.0181	0.0004	0.0018	0.0019	0.0082	0.0112	0.0492	0.3270	1.43
5E (CE-5R)	0.6800	2.98	0.0061	0.0268	0.0057	0.0248	0.0006	0.0024	0.0026	0.0112	0.0154	0.0676	0.9497	4.16
6E (CE-6R)	0.5100	2.23	0.0045	0.0198	0.0042	0.0184	0.0004	0.0018	0.0019	0.0083	0.0114	0.0500	0.7094	3.10
3E (CE-7R)	0.2100	0.9200	0.0050	0.0218	0.0046	0.0202	0.0004	0.0020	0.0021	0.0091	0.0126	0.0550	0.4293	1.88
4E (CE-8R)	0.2100	0.9200	0.0050	0.0218	0.0046	0.0202	0.0004	0.0020	0.0021	0.0091	0.0126	0.0550	0.4293	1.88
RSV-1 (TEG-1)	NA	NA	0.0006	0.0026	0.0011	0.0048	0.0018	0.0081	0.0027	0.0119	0.0208	0.0909	0.0063	0.0274
RBV-1 (TEG-1)	7.28E-5	0.0003	2.04E-6	8.93E-6	3.30E-6	1.45E-5	NA	NA	NA	NA	0.0017	0.0077	0.0018	0.0080
RSV-2 (TEG-2)	NA	NA	0.0006	0.0026	0.0011	0.0048	0.0018	0.0081	0.0027	0.0119	0.0208	0.0909	0.0063	0.0274
RBV-2 (TEG-2)	7.28E-5	0.0003	2.04E-6	8.93E-6	3.30E-6	1.45E-5	NA	NA	NA	NA	0.0017	0.0077	0.0018	0.0080
7E (TK-1)	NA	NA	NA	NA	0.0002	0.0008	NA	NA	NA	NA	NA	NA	0.0004	0.0016
8E (TK-3)	NA	NA	0.0001	0.0005	0.0001	0.0005	4.81E-6	2.10E-5	3.36E-5	0.0001	NA	NA	0.0005	0.0023
LO-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0010	0.0044
9E (CE-9R)	0.3144	1.38	0.0047	0.0207	0.0044	0.0192	0.0004	0.0019	0.0020	0.0087	0.0119	0.0522	0.5227	2.29
TOTAL	2.19	9.58	0.0354	0.1553	0.0342	0.1496	0.0066	0.0298	0.0198	0.0865	0.1312	0.5747	3.71	16.24

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

Publication of a proper Class I legal advertisement is a requirement of the G35-D registration process. In the event the applicant's legal advertisement fails to follow the requirements of 45CSR13, Section 8 or the requirements of Chapter 59, Article 3, of the West Virginia Code, the application will be considered incomplete and no further review of the application will occur until this is corrected.

The applicant, utilizing the format for the Class I legal advertisement example provided on the following page, shall have the legal advertisement appear a minimum of one (1) day in the newspaper most commonly read in the area where the facility exists or will be constructed. The notice must be published no earlier than five (5) working days of receipt by this office of your application. The original affidavit of publication must be received by this office no later than the last day of the public comment period.

The advertisement shall contain, at a minimum, the name of the applicant, the type and location of the source, the type and amount of air pollutants that will be discharged (include fugitive emissions separately), the nature of the permit being sought, the proposed start-up date for the source, and a contact telephone number for more information.

The location of the source should be as specific as possible starting with: 1.) the street address of the source; 2.) the nearest street or road; 3.) the nearest town or unincorporated area, 4.) the county, and 5.) latitude and longitude coordinates in decimal format.

Types and amounts of pollutants discharged must include all regulated pollutants (Nitrogen Oxides, Carbon Monoxide, Particulate Matter-2.5, Particulate Matter-10, Volatile Organic Compounds, Sulfur Dioxide, Formaldehyde, Benzene, Toluene, Ethylbenzene, Xylenes, Hexane, Total Hazardous Air Pollutants) and their potential to emit or the permit level being sought in units of tons per year.

In the event the 30th day is a Saturday, Sunday, or legal holiday, the comment period will be extended until 5:00 p.m. on the following regularly scheduled business day.

A list of qualified newspapers that are eligible to publish legal ads may be found:

http://www.sos.wv.gov/elections/resource/Documents/Qualified%20Newspapers.pdf

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that MK Midstream Holdings, LLC (dba Arsenal Midstream LLC) has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G35-D (General Permit Modification), for a natural gas compressor and/or dehydration facility located on Davisson Run Road, Clarksburg, in Harrison County, West Virginia. The latitude and longitude coordinates are: 39.27550 and -80.403099.

The applicant estimates the increased potential to discharge the following Regulated Air Pollutants will be:

- NOx – 9.53 Tons per year;
- CO – 2.50 Tons per year;
- VOC – 4.34 Tons per year;
- SO2 – 0.0979 Tons per year;
- PM/PM-10 – 1.33 Tons per year;
- Total HAPS – 8.16 Tons per year.

Startup of operation is planned to begin on or about May 1, 2017. 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 14th day of April, 2017.

By: Arsenal Resources, LLC
Meghan M.B. Yingling
Environmental Compliance Manager
65 Professional Place, Suite 200
Bridgeport, WV 26330