

November 21, 2016

Ms. Bev McKeone
Program Manager – NSR Permitting Section
West Virginia Department of Environmental Protection
Division of Air Quality
601 57th Street SE
Charleston, WV 25304

**Subject: Modification to Permit No. R13-1814F
MarkWest Energy Appalachia, LLC.
Kenova Natural Gas Liquids Extraction Facility**

Dear Ms. McKeone:

MarkWest Energy Appalachia, LLC (MarkWest) is submitting this R-13 permit modification for its existing natural gas liquids extraction facility located in Wayne County, West Virginia (Kenova Facility). This station currently operates under R13 permit R13-1814F and consists of various equipment including, but not limited to, two (2) Caterpillar G3612 compressor engines (3,550 hp each) each equipped with an oxidation catalyst, one (1) emergency flare (100,400 lb/hr), one (1) heater (3 MMBtu/hr), emergency generator, and a truck loadout area. As part of this application, MarkWest is proposing the following:

- Replace one (1) existing Caterpillar G3612 natural gas fired compressor engine (rated 3,500 HP) with one (1) new natural gas fired Caterpillar G3612LE compressor engine (rated 3,550 HP).

The new 3,550 hp compressor engine was manufactured after July 1, 2007 and is therefore subject to New Source Performance Standards for spark-ignition engines (NSPS Subpart JJJJ). As such, the unit will comply with emission standards under this rule. Attachment D contains a detailed discussion on regulatory applicability.

The R-13 permit application and required supporting documents are enclosed as outlined below:

- R-13 Application Form
- Attachment A: Current Business Certificate
- Attachment B: Map/Directions to Site
- Attachment C: Project Schedule
- Attachment D: Regulatory Discussion
- Attachment E: Plot Plan
- Attachment F: Process Flow Diagram
- Attachment G: Process Description
- Attachment I: Emissions Unit Table
- Attachment J: Emission Points Data Summary Sheet
- Attachment K: Fugitive Emissions Data Unit Summary Sheet

- Attachment L: Emissions Unit Data Sheet
- Attachment M: Air Pollution Control Device Sheet
- Attachment N: Supporting Emission Calculations
- Attachment O: Monitoring, Recordkeeping, Reporting, and Testing Plan
- Attachment P: Affidavit of Publication
- Application Fee

Please feel free to contact me at (606) 932-8216 or Jennifer.Osborne@markwest.com if you have any questions regarding this application.

Sincerely,



Jennifer Osborne
Sr. Environmental Coordinator
MarkWest Energy Appalachia, LLC



WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

**APPLICATION FOR NSR PERMIT
AND
TITLE V PERMIT REVISION
(OPTIONAL)**

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

- CONSTRUCTION MODIFICATION RELOCATION
 CLASS I ADMINISTRATIVE UPDATE TEMPORARY
 CLASS II ADMINISTRATIVE UPDATE AFTER-THE-FACT

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

- ADMINISTRATIVE AMENDMENT MINOR MODIFICATION
 SIGNIFICANT MODIFICATION

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant (as registered with the WV Secretary of State's Office): MarkWest Energy Appalachia, LLC.		2. Federal Employer ID No. (FEIN): 841352233	
3. Name of facility (if different from above): Kenova Natural Gas Liquids Extraction Facility		4. The applicant is the: <input type="checkbox"/> OWNER <input type="checkbox"/> OPERATOR <input checked="" type="checkbox"/> BOTH	
5A. Applicant's mailing address: 1515 Arapahoe St. Tower 1, Suite 1600 Denver, CO 80202		5B. Facility's present physical address: 50 Big Sandy Road Kenova, WV 25311	
6. West Virginia Business Registration. Is the applicant a resident of the State of West Virginia? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <ul style="list-style-type: none"> - If YES, provide a copy of the Certificate of Incorporation/Organization/Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A. - If NO, provide a copy of the Certificate of Authority/Authority of L.L.C./Registration (one page) including any name change amendments or other Business Certificate as Attachment A. 			
7. If applicant is a subsidiary corporation, please provide the name of parent corporation: MPLX LP			
8. Does the applicant own, lease, have an option to buy or otherwise have control of the <i>proposed site</i> ? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <ul style="list-style-type: none"> - If YES, please explain: MarkWest owns the property and the facility. - If NO, you are not eligible for a permit for this source. 			
9. Type of plant or facility (stationary source) to be constructed, modified, relocated, administratively updated or temporarily permitted (e.g., coal preparation plant, primary crusher, etc.): Natural Gas Liquids Extraction Facility		10. North American Industry Classification System (NAICS) code for the facility: 211112	
11A. DAQ Plant ID No. (for existing facilities only): 099 - 00053		11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): R13-1814F	

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

<p>12A.</p> <ul style="list-style-type: none"> For Modifications, Administrative Updates or Temporary permits at an existing facility, please provide directions to the <i>present location</i> of the facility from the nearest state road; For Construction or Relocation permits, please provide directions to the <i>proposed new site location</i> from the nearest state road. Include a MAP as Attachment B. <p>Travel west from Kenova on US-60, turn south on 21st street, turn west on Chester street, turn south on 23rd street/Big Sandy road</p>		
<p>12.B. New site address (if applicable): N/A</p>	<p>12C. Nearest city or town: Kenova</p>	<p>12D. County: Wayne</p>
<p>12.E. UTM Northing (KM): 4248.386</p>	<p>12F. UTM Easting (KM): 360.966</p>	<p>12G. UTM Zone: 17</p>
<p>13. Briefly describe the proposed change(s) at the facility: MarkWest is proposing to install a new compressor engine to replace the existing compressor engine at the Station.</p>		
<p>14A. Provide the date of anticipated installation or change: TBD If this is an After-The-Fact permit application, provide the date upon which the proposed change did happen: / /</p>		<p>14B. Date of anticipated Start-Up if a permit is granted: ASAP</p>
<p>14C. Provide a Schedule of the planned Installation of/Change to and Start-Up of each of the units proposed in this permit application as Attachment C (if more than one unit is involved).</p>		
<p>15. Provide maximum projected Operating Schedule of activity/activities outlined in this application: Hours Per Day 24 Days Per Week 7 Weeks Per Year 52</p>		
<p>16. Is demolition or physical renovation at an existing facility involved? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>		
<p>17. Risk Management Plans. If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your Risk Management Plan (RMP) to U. S. EPA Region III.</p>		
<p>18. Regulatory Discussion. List all Federal and State air pollution control regulations that you believe are applicable to the proposed process (<i>if known</i>). A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance (<i>if known</i>). Provide this information as Attachment D.</p>		
<p>Section II. Additional attachments and supporting documents.</p>		
<p>19. Include a check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR22 and 45CSR13).</p>		
<p>20. Include a Table of Contents as the first page of your application package.</p>		
<p>21. Provide a Plot Plan, e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as Attachment E (Refer to Plot Plan Guidance) .</p> <ul style="list-style-type: none"> Indicate the location of the nearest occupied structure (e.g. church, school, business, residence). 		
<p>22. Provide a Detailed Process Flow Diagram(s) showing each proposed or modified emissions unit, emission point and control device as Attachment F.</p>		
<p>23. Provide a Process Description as Attachment G.</p> <ul style="list-style-type: none"> Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable). 		
<p>All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.</p>		

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H**.
 – For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I**.

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J**.

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K**.

28. Check all applicable **Emissions Unit Data Sheets** listed below:

<input type="checkbox"/> Bulk Liquid Transfer Operations	<input type="checkbox"/> Haul Road Emissions	<input type="checkbox"/> Quarry
<input type="checkbox"/> Chemical Processes	<input type="checkbox"/> Hot Mix Asphalt Plant	<input type="checkbox"/> Solid Materials Sizing, Handling and Storage Facilities
<input type="checkbox"/> Concrete Batch Plant	<input type="checkbox"/> Incinerator	<input type="checkbox"/> Storage Tanks
<input type="checkbox"/> Grey Iron and Steel Foundry	<input type="checkbox"/> Indirect Heat Exchanger	
<input checked="" type="checkbox"/> General Emission Unit, specify Compressor Engine		

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L**.

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

<input type="checkbox"/> Absorption Systems	<input type="checkbox"/> Baghouse	<input type="checkbox"/> Flare
<input type="checkbox"/> Adsorption Systems	<input type="checkbox"/> Condenser	<input type="checkbox"/> Mechanical Collector
<input type="checkbox"/> Afterburner	<input type="checkbox"/> Electrostatic Precipitator	<input type="checkbox"/> Wet Collecting System
<input checked="" type="checkbox"/> Other Collectors, specify: Oxidation Catalyst		

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M**.

30. Provide all **Supporting Emissions Calculations** as **Attachment N**, or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O**.
 ➤ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and **Example Legal Advertisement** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?
 YES NO
 ➤ If **YES**, identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's **"Precautionary Notice – Claims of Confidentiality"** guidance found in the **General Instructions** as **Attachment Q**.

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

<input type="checkbox"/> Authority of Corporation or Other Business Entity	<input type="checkbox"/> Authority of Partnership
<input type="checkbox"/> Authority of Governmental Agency	<input type="checkbox"/> Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R**.

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.


35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned **Responsible Official** / **Authorized Representative**, hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

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

SIGNATURE  DATE: 11-21-16
(Please use blue ink) (Please use blue ink)

35B. Printed name of signee: Leanne Meyer 35C. Title: VP EH&S and Operational Support Services

35D. E-mail: lme@er@markwest.com 36E. Phone: 303-925-9299 36F. FAX:

36A. Printed name of contact person (if different from above): Jennifer Osborne 36B. Title: Sr. Environmental Coordinator

36C. E-mail: Jennifer.Osborne@markwest.com 36D. Phone: (606) 932-8216 36E. FAX:

- PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:**
- | | |
|--|--|
| <input checked="" type="checkbox"/> Attachment A: Business Certificate | <input checked="" type="checkbox"/> Attachment K: Fugitive Emissions Data Summary Sheet |
| <input checked="" type="checkbox"/> Attachment B: Map(s) | <input checked="" type="checkbox"/> Attachment L: Emissions Unit Data Sheet(s) |
| <input checked="" type="checkbox"/> Attachment C: Installation and Start Up Schedule | <input checked="" type="checkbox"/> Attachment M: Air Pollution Control Device Sheet(s) |
| <input checked="" type="checkbox"/> Attachment D: Regulatory Discussion | <input checked="" type="checkbox"/> Attachment N: Supporting Emissions Calculations |
| <input checked="" type="checkbox"/> Attachment E: Plot Plan | <input checked="" type="checkbox"/> Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans |
| <input checked="" type="checkbox"/> Attachment F: Detailed Process Flow Diagram(s) | <input checked="" type="checkbox"/> Attachment P: Public Notice |
| <input checked="" type="checkbox"/> Attachment G: Process Description | <input type="checkbox"/> Attachment Q: Business Confidential Claims |
| <input type="checkbox"/> Attachment H: Material Safety Data Sheets (MSDS) | <input type="checkbox"/> Attachment R: Authority Forms |
| <input checked="" type="checkbox"/> Attachment I: Emission Units Table | <input type="checkbox"/> Attachment S: Title V Permit Revision Information |
| <input checked="" type="checkbox"/> Attachment J: Emission Points Data Summary Sheet | <input checked="" type="checkbox"/> Application Fee |
- Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.*

- FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:**
- Forward 1 copy of the application to the Title V Permitting Group and:
 - For Title V Administrative Amendments:
 - NSR permit writer should notify Title V permit writer of draft permit,
 - For Title V Minor Modifications:
 - Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,
 - NSR permit writer should notify Title V permit writer of draft permit.
 - For Title V Significant Modifications processed in parallel with NSR Permit revision:
 - NSR permit writer should notify a Title V permit writer of draft permit,
 - Public notice should reference both 45CSR13 and Title V permits,
 - EPA has 45 day review period of a draft permit.

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

ATTACHMENT A

Business Certificate

**WEST VIRGINIA
STATE TAX DEPARTMENT
BUSINESS REGISTRATION
CERTIFICATE**

ISSUED TO:
**MARKWEST ENERGY APPALACHIA L L C
2010 BIG SANDY RD
KENOVA, WV 25530-9669**

BUSINESS REGISTRATION ACCOUNT NUMBER: 1030-2948

This certificate is issued on: 06/28/2011

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

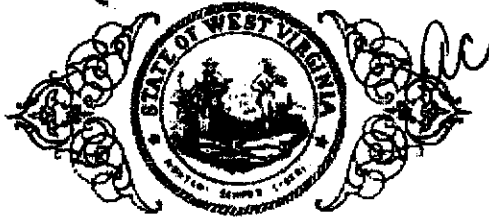
*The person or organization identified on this certificate is registered
to conduct business in the State of West Virginia at the location above.*

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.**

State of West Virginia



Certificate

I, Joe Manchin III, Secretary of State of the State of West Virginia, hereby certify that

MARKWEST ENERGY APPALACHIA, L.L.C.

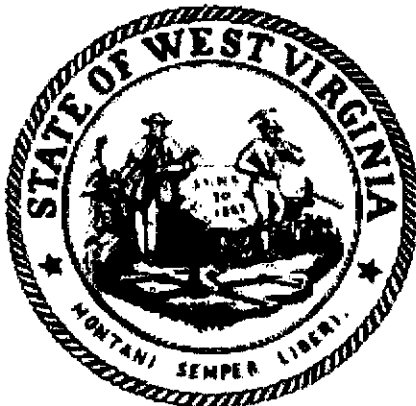
Control Number: 47255

a limited liability company, organized under the laws of the State of Delaware has filed its "Application for Certificate of Authority" in my office according to the provisions of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a foreign limited liability company from its effective date of April 16, 2002 until a certificate of cancellation is filed with our office.

Therefore, I hereby issue this

CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY

to the limited liability company authorizing it to transact business in West Virginia



Given under my hand and the Great Seal of the State of West Virginia on this day of April 16, 2002

A handwritten signature in cursive script, appearing to read "Joe Manchin III".

Secretary of State

ATTACHMENT B

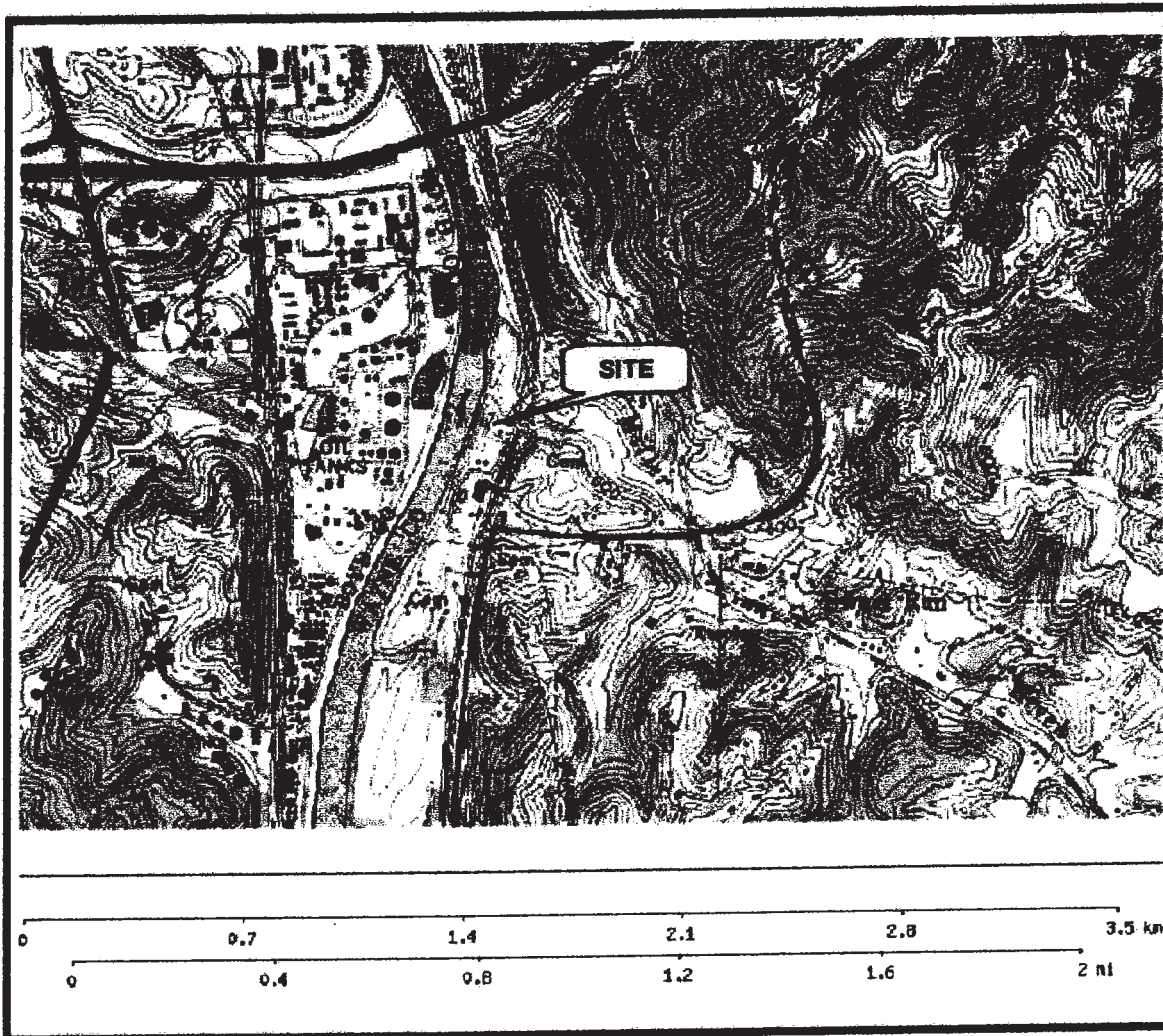
Map

ATTACHMENT B: AREA MAP



Figure 1 - Map of Kenova Station Location

UTM Northing (KM): 4,248.386
UTM Easting (KM): 360.966
Elevation: ~561 ft



Travel West from Kenova on US-60
 Turn south on 21st Street
 Turn west on Chester Street
 Turn south on 23d St/Big Sandy Road

SOURCE:
 USGS 7.5-MINUTE TOPOGRAPHIC QUADRANGLE
 OF BURNAUGH (KY, WV) DATED 1992. AND
 CATLETTSBURG (KY, WV, OH) DATED 1983



MARKWEST ENERGY APPALACHIA L.L.C.		
Kenova NGL Plant - Air Permit R13-1814B		
TITLE: SITE LOCUS MAP		
DESIGN: MLS	SCALE: AS SHOWN	FIGURE NO.: 1
APPROVED: PT	DATE: Mar 23, 2004	
DRAWN: WMM	FILE NO.: LOCUS MAP	

ATTACHMENT C

Installation and Start Up Schedule

ATTACHMENT C

Schedule of Planned Installation and Start-Up

Unit	Installation Schedule	Startup Schedule
New Engine (S2A)- Installing New Engine	As soon as possible	As soon as possible

ATTACHMENT D

Regulatory Discussion

ATTACHMENT D - REGULATORY APPLICABILITY

This section documents the applicability determinations made for Federal and State air quality regulations. The monitoring, recordkeeping, reporting, and testing plan is presented in Attachment O. In this section, applicability or non-applicability of the following regulatory programs is addressed:

- > Prevention of Significant Deterioration (PSD) permitting;
- > Title V of the 1990 Clean Air Act Amendments;
- > New Source Performance Standards (NSPS);
- > National Emission Standards for Hazardous Air Pollutants (NESHAP); and
- > West Virginia State Implementation Plan (SIP) regulations.

This review is presented to supplement and/or add clarification to the information provided in the WVDEP R13 permit application forms, which fulfill the requirement to include citations and descriptions of applicable statutory and administrative code requirements.

In addition to providing a summary of applicable requirements, this section of the application also provides non applicability determinations for certain regulations, allowing the WVDEP to confirm that identified regulations are not applicable to the Kenova facility. Note that explanations of non-applicability are limited to those regulations for which there may be some question of applicability specific to the operations at the Kenova facility. Regulations that are categorically non-applicable are not discussed (e.g., NSPS Subpart J, Standards of Performance for Petroleum Refineries).

Prevention of Significant Deterioration (PSD) Source Classification

Federal construction permitting programs regulate new and modified sources of attainment pollutants under Prevention of Significant Deterioration (PSD) and new and modified sources of non-attainment pollutants under Non-Attainment New Source Review (NNSR). PSD and NNSR regulations apply when a major source makes a change, such as installing new equipment or modifying existing equipment, and a significant increase in emissions results from the change. The Kenova facility is currently not a major source with respect to the PSD program since its potential emissions are below all the NNSR/PSD thresholds. Emissions from the proposed project do not exceed major source thresholds and the facility will remain a minor source after the project. As such, NNSR/PSD permitting is not triggered by this construction activity. MarkWest will monitor future construction activities at the site closely and will compare any future increase in emissions with the NSR/PSD thresholds to ensure these activities will not trigger this program.

Title V Operating Permit Program

Title 40 of the Code of Federal Regulations Part 70 (40 CFR 70) establishes the federal Title V operating permit program. West Virginia has incorporated the provisions of this federal program in its Title V operating permit program in West Virginia Code of State Regulations (CSR) 45-30. The major source thresholds with respect to the West Virginia Title V operating permit program regulations are 10 tons per year (tpy) of a single HAP, 25 tpy of any combination of HAP, and 100 tpy of all other regulated pollutants. After the proposed project, potential emissions for all pollutants will not exceed major source thresholds for Title V. Therefore, the Kenova facility will continue to be a minor source with respect to the Title V Program.

New Source Performance Standards

New Source Performance Standards (NSPS), located in 40 CFR 60, require new, modified, or reconstructed sources to control emissions to the level achievable by the best demonstrated technology as specified in the applicable

provisions. Moreover, any source subject to an NSPS is also subject to the general provisions of NSPS Subpart A, except where expressly noted. The following is a summary of applicability and non-applicability determinations for NSPS regulations of relevance to the Kenova facility.

NSPS Subparts IIII- Stationary Compression Ignition Internal Combustion Engine

This Subpart applies to manufacturers, owners, and operators of stationary compression ignition internal combustion engine (CI ICE) that have been constructed, reconstructed, or modified after various dates, the earliest of which is July 11, 2005. The proposed compressor engine at the Kenova facility is a spark-ignition IC engine, and therefore the requirements of this subpart do not apply.

NSPS Subparts JJJJ- Stationary Spark Ignition Internal Combustion Engine

New Source Performance Standards 40 CFR Part 60 Subpart JJJJ (NSPS JJJJ) affects owners and operators of stationary spark ignition internal combustion engines (SI ICE) that commence construction, reconstruction or modification after June 12, 2006. Applicability dates are based on the date the engine was ordered by the operator. The proposed engine at the Kenova facility will be a CAT G3612LE engine, 4-stroke, lean burn spark ignition RICE (rated at 3,550hp) manufactured after July 1, 2007. The engine will be equipped with an oxidation catalyst which is guaranteed by the manufacturer to achieve a 95% reduction in CO, 90% reduction in formaldehyde emissions, and a 75% reduction in VOC emissions. The engine is subject to the emission standards per Table 1 of NSPS JJJJ non-emergency use engine and will be in compliance with the NSPS JJJJ limits.

It should be noted that 40 CFR §60.4243(b)(1) allows for compliance with this subpart to be demonstrated by purchasing an engine certified by the manufacturer according to specified procedures and then operating the engine in accordance with the manufacturer's emission-related written instructions. However, while the proposed engine at the Kenova facility will be equipped with control technology to achieve the emissions limits specified in Table 1 of NSPS JJJJ, certification is not available from the engine manufacturer. Therefore, MarkWest will demonstrate compliance with this subpart for the non-certified engine at the Kenova facility in accordance with 40 CFR 60.4243(b)(2)(ii) which requires MarkWest to keep a maintenance plan and records of conducted maintenance and to maintain and operate the engine, to the extent practicable, in a manner consistent with good air pollution control practices for minimizing emissions. Additionally, MarkWest will be required to conduct an initial performance test and subsequent compliance testing every 8,760 hours or three years, whichever comes first, to demonstrate continued compliance. Testing will be conducted in accordance with 40 CFR §60.4244.

Records of all notifications submitted to comply with this subpart, maintenance conducted on the engine, and performance testing will be maintained in accordance with 40 CFR §60.4245(a). Initial notification of construction commencement will be submitted as required in 40 CFR §60.7(a)(1) and §60.4245(c), and performance testing results will be reported as required in 40 CFR §60.4245(d).

Subpart OOOO—Crude Oil and Natural Gas Production, Transmission, and Distribution

Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, applies to affected facilities that commenced construction, reconstruction, or modification after August 23, 2011 and or before September 18, 2015. The proposed project does not include any equipment within this range of dates. Therefore, this subpart is not applicable.

NSPS Subpart OOOOa—Crude Oil and Natural Gas Production, Transmission, and Distribution

Subpart OOOOa, Standards of Standards of Performance for Crude Oil and Natural Gas Facilities, applies to affected facilities that commenced construction, reconstruction, or modification after September 18, 2015. The regulation was published final in the Federal Register on June 3, 2016. The rule includes provisions for the following facilities:

- > Hydraulically fractured wells;

- > Centrifugal compressors located between the wellhead and the point of custody transfer to the natural gas distribution segment;
- > Reciprocating compressors located between the wellhead and the point of custody transfer to the natural gas distribution segment;
- > Continuous bleed natural gas-driven pneumatic controllers with a bleed rate of > 6 scfh located in the production, gathering, processing, or transmission and storage segments (excluding natural gas processing plants);
- > Continuous bleed natural gas-driven pneumatic controllers located at natural gas processing plants;
- > Pneumatic pumps located in the production and processing segments;
- > Storage vessels located in the production, gathering, processing, or transmission and storage segments;
- > The collection of fugitive emissions components at a well site;
- > The collection of fugitive emissions components at a compressor station; and
- > Sweetening units located onshore that process natural gas produced from either onshore or offshore wells.

Based on the rule, the following paragraphs describe the applicability to the proposed project.

The proposed project will not replace the existing compressor, which was installed at prior to the applicability date. Therefore, the compressor is not subject to this subpart.

The Kenova facility does not meet the definition of compressor station under Subpart 0000a as it is located at a natural gas processing plant:

Compressor station means any permanent combination of one or more compressors that move natural gas at increased pressure through gathering or transmission pipelines, or into or out of storage. This includes, but is not limited to, gathering and boosting stations and transmission compressor stations. The combination of one or more compressors located at a well site, or located at an onshore natural gas processing plant, is not a compressor station for purposes of § 60.5397a.

Therefore, the fugitive monitoring under Subpart 0000a is not applicable. Additionally, the proposed project does not include the construction, modification, or reconstruction of any of the remaining affected facilities as the project is limited to an engine replacement.

Non-Applicability of All Other NSPS

NSPS are developed for particular industrial source categories. Other than NSPS developed for natural gas processing plants (Subpart 0000 & Subpart 0000a) and associated equipment (Subpart JJJJ), the applicability of a particular NSPS to the Kenova facility can be readily ascertained based on the industrial source category covered. All other NSPS are categorically not applicable to the proposed project.

National Emission Standards for Hazardous Air Pollutants (NESHAP)

Regulatory requirements for facilities subject to NESHAP standards, otherwise known Maximum Available Control Technology (MACT) Standards for source categories, are contained in 40 CFR Part 63. 40 CFR Part 61 NESHAP standards are defined for specific pollutants while Part 63 NESHAPs are defined for source categories where allowable emission limits are established on the basis of a MACT determination for a particular major source. A major source of HAP is defined as having potential emissions in excess of 25 tpy for total HAP and/or potential emissions in excess of 10 tpy for any individual HAP. Part 63 NESHAPs apply to sources in specifically regulated industrial source categories (CAA Section 112(d)) or on a case-by-case basis (Section 112(g)) for facilities not regulated as a specific industrial source type. Based on the proposed project at the Kenova facility, potential HAP emissions will remain below the major source thresholds and therefore the facility will continue to be an area source of HAP. The potential applicability of specific MACT standards to the Kenova facility is discussed below.

40 CFR 63 Subpart ZZZZ - Stationary Reciprocating Internal Combustion Engine (RICE)

The proposed CAT G3612LE compressor engine at the Kenova facility will be classified as a new spark ignition engine at an area source of HAP. Per 40 CFR §63.6590(c), meeting the requirements of 40 CFR part 60 Subpart JJJJ satisfies the requirements under this NESHAP. As such, by complying with all applicable requirements of 40 CFR Part 60 Subpart JJJJ, the Kenova facility will be complying with 40 CFR 63 Subpart ZZZZ.

West Virginia SIP Regulations

The Kenova facility is potentially subject to regulations contained in the West Virginia Code of State Regulations, Chapter 45 (Code of State Regulations). The Code of State Regulations fall under two main categories, those regulations that are generally applicable (e.g., permitting requirements), and those that have specific applicability (e.g., PM standards for manufacturing equipment).

45 CSR 4: To Prevent and Control the Discharge of Air Pollutants into the Air Which Causes or Contributes to an Objectionable Odor

According to 45 CSR 4-3:

No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.

The Kenova facility is generally subject to this requirement. However, due to the nature of the process at the Kenova facility, production of objectionable odor from the compressor station during normal operation is unlikely.

45 CSR 16: Standards of Performance for New Stationary Sources

45 CSR 16-1 incorporates the federal Clean Air Act (CAA) standards of performance for new stationary sources set forth in 40 CFR Part 60 by reference. As such, by complying with all applicable requirements of 40 CFR Part 60 at the Kenova facility, MarkWest will be complying with 45 CSR 16.

45 CSR 17: To Prevent and Control Particulate Matter Air Pollution from Materials Handling, Preparation, Storage and Other Sources of Fugitive Particulate Matter

According to 45 CSR 17-3.1:

No person shall cause, suffer, allow or permit fugitive particulate matter to be discharged beyond the boundary lines of the property lines of the property on which the discharge originates or at any public or residential location, which causes or contributes to statutory air pollution.

Due to the nature of the activities at the Kenova facility, it is unlikely that fugitive particulate matter emissions will be emitted under normal operating conditions. However, MarkWest will take measures to ensure any fugitive particulate matter emissions will not cross the property boundary should any such emissions occur.

45 CSR 34: Emissions Standards for Hazardous Air Pollutants

45 CSR 34-1 incorporates the federal Clean Air Act (CAA) national emissions standards for hazardous air pollutants (NESHAPs) as set forth in 40 CFR Parts 61 and 63 by reference. As such, by complying with all applicable requirements of 40 CFR Parts 61 and 63 at the Kenova facility, MarkWest will be complying with 45 CSR 34.

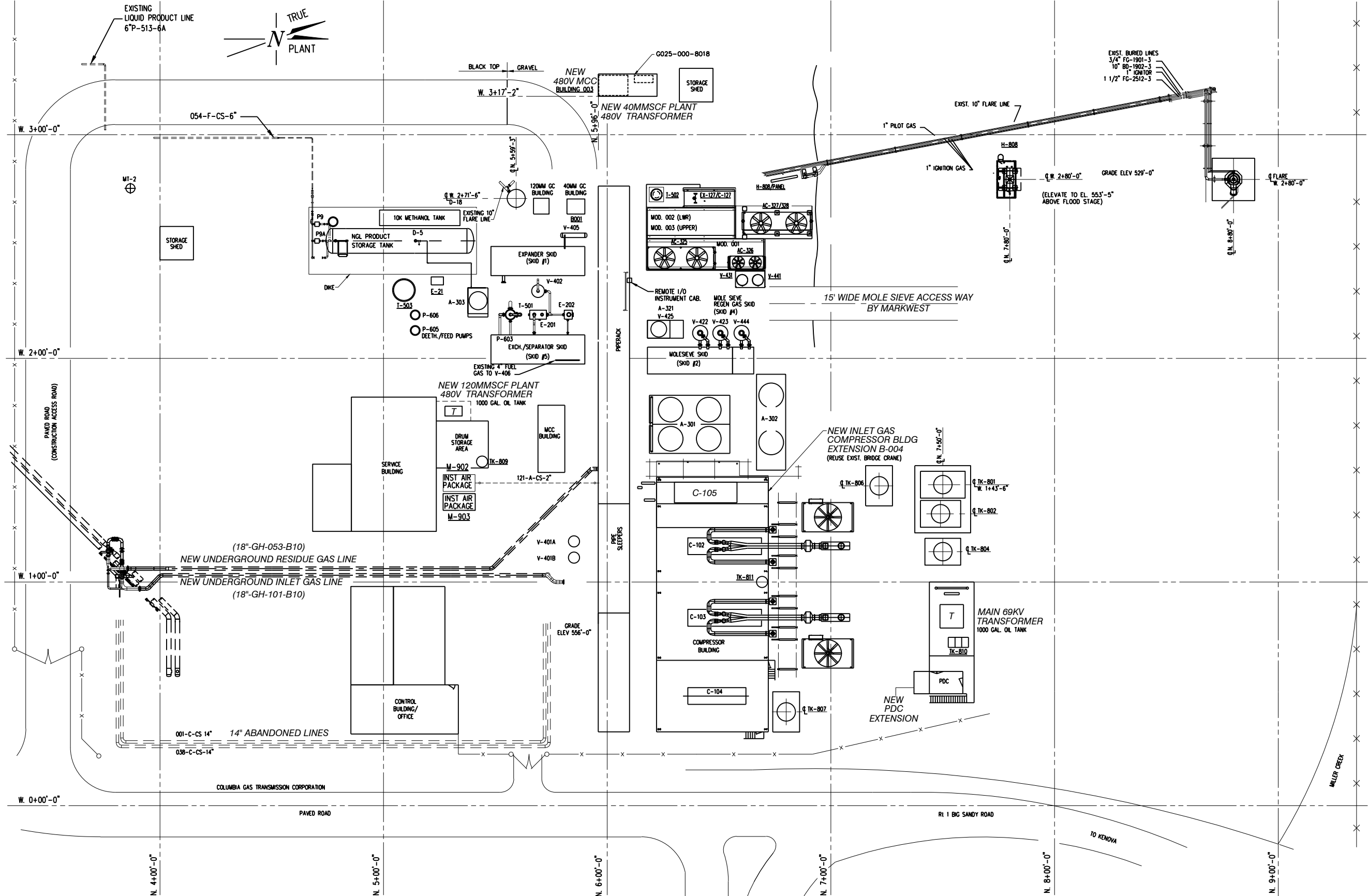
Non-Applicability of Other SIP Rules

A thorough examination of the West Virginia SIP rules with respect to applicability at the Kenova facility reveals many SIP regulations that do not apply or impose additional requirements on operations. Such SIP rules include those specific to a particular type of industrial operation that is categorically not applicable to the Kenova facility.

ATTACHMENT E

Plot Plan

K:\Engineering Department\NEBU\Engineering\Kenova\Construction Drawings\Piping\KE-1000.dwg, 5/2/2014 2:09:09 PM, mitchr



NO.	REVISION-DESCRIPTION	DATE	DRAWN	CHK'D	ENG. APP'D	PROCESSOR APP'D	DIRECTOR APP'D
1	UPDATED PER FIELD MARKS	5/2/14	SM				
0	PLOT PLAN GENERATED FROM KE-5000	1/23/14	SH	MR			

MARKWEST

MarkWest Energy Partners, L.P.

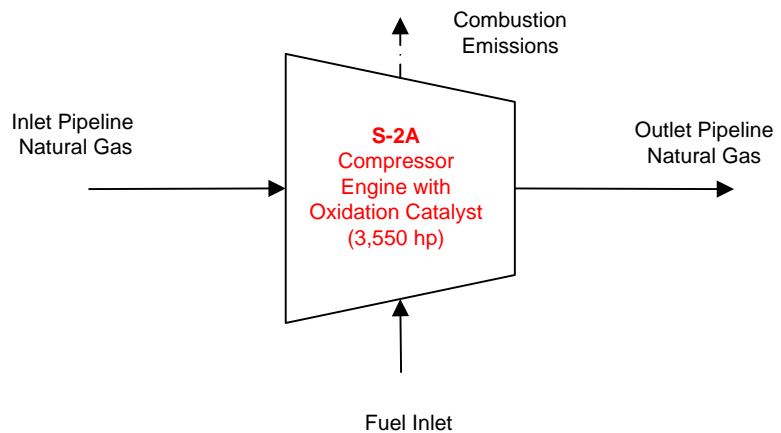
PLOT PLAN
120 & 40 MMSCFD PROPANE RECOVERY PLANT
KENOVA GAS PROCESSING PLANT

WAYNE CO. KENOVA WEST VIRGINIA

A.F.E.	DATE: 1/23/14
DRAWN: SH	DATE:
CHKD:	DATE:
ENG. APP:	DATE:
PROCESSOR APP:	DATE:
DIRECTOR APP:	DATE:
SCALE: 1"=20'-0"	CAD. FILE: KE-1000
DRAWING NO. KE-PM-1000	REV. 1

ATTACHMENT F

Detailed Process Flow Diagram



MarkWest Energy Appalachia, LLC.

Flow Legend

————▶ Gas Flow

- - - - -▶ Stack Emissions

Process Flow Diagram

Kenova Natural Gas Liquids Extraction Facility

Trinity
Consultants

November 2016

ATTACHMENT G

Process Description

ATTACHMENT G: PROCESS DESCRIPTION

Markwest is submitting this R-13 modification application to install a new Caterpillar G3612LE compressor engine (rated 3550 HP) at the Kenova Natural Gas Liquids Extraction Facility. The proposed compressor engine will replace the existing compressor existing engine (S-2) at the facility. The existing oxidation catalyst, compressor and associated components will remain unchanged.

ATTACHMENT I

Emission Units Table

Attachment I
Emission Units Table
(includes all emission units and air pollution control devices
that will be part of this permit application review, regardless of permitting status)

Emission Unit ID ¹	Emission Point ID ²	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type ³ and Date of Change	Control Device ⁴
S-2	2e	Caterpillar G3612 Natural Gas Compressor Engine	1995	3500 HP	Existing – to be removed	C-2
S-2A	2e	Caterpillar G3612LE Natural Gas Compressor Engine	TBD	3550 HP	New	C-2
S-3	3e	Emergency Flare and Purge	1995	100, 400 lb/hr	Existing	C-3
S-4	4e	Regenerative Heater	2000	3.0 MMBtu/hr	Existing	N/A
S-5	5e	Truck Loadout	2006	N/A	Existing	N/A
S-6	8e	Caterpillar G3612LE Natural Gas Compressor Engine	2014 (rebuilt 12/31/2013)	3550 HP	Existing	C-6
EG-1	6e	Emergency Generator	2013	230.6 HP	Existing	EGC-1
FUG	7e	Fugitive Emissions	1995	N/A	N/A	

¹ For <u>E</u> mission Units (or <u>S</u> ources) use the following numbering system: 1S, 2S, 3S,... or other appropriate designation. ² For <u>E</u> mission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation. ³ New, modification, removal ⁴ For <u>C</u> ontrol Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.						

ATTACHMENT J

Emission Points Data Summary Sheet

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type ¹	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		Vent Time for Emission Unit (chemical processes only)		All Regulated Pollutants - Chemical Name/CAS ³ (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions ⁴		Maximum Potential Controlled Emissions ⁵		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used ⁶	Emission Concentration ⁷ (ppmv or mg/m ⁴)
		ID No.	Source	ID No.	Device Type	Short Term ²	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
8E	Upward Vertical Stack	S-6	Compressor Engine #1A (Existing)	C-6	Oxidation Catalyst	NA	NA	NOx CO PM/PM ₁₀ /PM _{2.5} SO ₂ VOC			3.91 1.10 0.24 0.01 1.57	17.14 4.80 1.05 0.06 6.86	Gas/Vapor	O ^{A, B}	
2E	Upward Vertical Stack	S-2A	Compressor Engine #2 (New)	C-2	Oxidation Catalyst	NA	NA	NOx CO PM/PM ₁₀ /PM _{2.5} SO ₂ VOC HCHO HAP CO _{2e}	3.91 21.52 0.24 0.01 7.12 2.03 2.49 4,210	17.14 94.27 1.03 0.06 31.19 8.91 10.91 18,440	3.91 1.10 0.24 0.01 1.57 0.31 0.77 4,210	17.14 4.80 1.03 0.06 6.86 1.37 3.37 18,440	Gas/Vapor	O ^{A, B}	
3E	Upward Vertical Stack	S-3	Emergency Flare and Purge (Existing)	C-3	Flare	NA	NA	NOx CO PM/PM ₁₀ /PM _{2.5} SO ₂ VOC			0.04 0.01 0.00 0.00 0.00	0.18 0.04 0.00 0.00 0.00	Gas/Vapor	O ^D O ^D O ^D O ^D O ^D	
4E	Upward Vertical Stack	S-4	Regenerative Heater (Existing)	NA	NA	NA	NA	NOx CO PM/PM ₁₀ /PM _{2.5} SO ₂ VOC			0.15 0.25 0.02 0.00 0.02	0.66 1.10 0.10 0.01 0.07	Gas/Vapor	O ^A O ^A O ^A O ^A O ^A	
5E	Relief Vent	S-5	Truck Loadout (Existing)	NA	NA	NA	NA	NOx CO PM/PM ₁₀ /PM _{2.5} SO ₂ VOC			0.00 0.00 0.00 0.00 0.002	0.00 0.00 0.00 0.00 0.002	Gas/Vapor	O ^D O ^D O ^D O ^D O ^D	
6E	Upward Vertical Stack	EG-1	Emergency Generator (Existing)	EGC-1	3-way Catalyst	NA	NA	NOx CO PM/PM ₁₀ /PM _{2.5} SO ₂ VOC			0.01 0.77 0.00 0.00 0.06	0.01 0.19 0.00 0.00 0.02	Gas/Vapor	O ^{A, B}	
7E	Fugitive	FUG	Site-Wide Fugitive Emissions (Existing)	NA	NA	NA	NA	VOC	1.79	7.84	1.79	7.84	Gas/Vapor	O ^E	

- A. Emissions calculated using AP-42.
- B. Emissions calculated using manufacturer's specification sheet.
- C. Emissions calculated using stack test data.
- D. Emissions data from 2010 application.
- E. Emissions calculated using EPA 453/R-95-017, November 1995.

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

- ¹ Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.
- ² Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).
- ³ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. **DO NOT LIST** H₂, H₂O, N₂, O₂, and Noble Gases.
- ⁴ Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
- ⁵ Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
- ⁶ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).
- ⁷ Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m³) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO₂, use units of ppmv (See 45CSR10).

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (no change to existing) <input type="checkbox"/> If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? <input checked="" type="checkbox"/> Yes (no change to existing) <input type="checkbox"/> No <input type="checkbox"/> If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? <input checked="" type="checkbox"/> Yes (no change to existing) <input type="checkbox"/> No <input type="checkbox"/> If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS ¹	Maximum Potential Uncontrolled Emissions ²		Maximum Potential Controlled Emissions ³		Est. Method Used ⁴
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	NA	---	---	---	---	---
Unpaved Haul Roads	PM PM ₁₀ PM _{2.5}	---	---	---	---	---
Storage Pile Emissions	NA	---	---	---	---	---
Loading/Unloading Operations	VOC	---	0.002	---	0.002	A
Wastewater Treatment Evaporation & Operations	NA	---	---	---	---	---
Equipment Leaks	VOC HAP	---	7.84 0.78	---	7.84 0.78	B
General Clean-up VOC Emissions	NA	---	---	---	---	---
Other - Compressor Venting	VOC HAP CO _{2e}	---	13.76 2.13 415.5	---	13.76 2.13 415.5	C

A –U.S. EPA AP-42.

B –Protocol for Equipment Leak Emission Estimates, EPA 453/R-95-017, Table 2-1, November 1995. 40 CFR 98 Subpart W.

C – Engineering Estimates

¹ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.

² Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

³ Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

⁴ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

ATTACHMENT L

Emissions Unit Data Sheet

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): S2A

<p>1. Name or type and model of proposed affected source:</p> <p>Caterpillar G3612LE Natural Gas Fired Compressor Engine</p>
<p>2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.</p>
<p>3. Name(s) and maximum amount of proposed process material(s) charged per hour:</p> <p>NA</p>
<p>4. Name(s) and maximum amount of proposed material(s) produced per hour:</p> <p>Does not produce any materials. Compresses natural gas for processing.</p>
<p>5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:</p> <p>Internal combustion of natural gas.</p>

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):			
(a) Type and amount in appropriate units of fuel(s) to be burned:			
Pipeline quality natural gas – 22,412 scf/hr., 196.33 MMscf/yr			
(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:			
Natural gas with negligible H ₂ S and ash content.			
(c) Theoretical combustion air requirement (ACF/unit of fuel):			
Unknown	@	°F and	psia.
(d) Percent excess air: Unknown			
(e) Type and BTU/hr of burners and all other firing equipment planned to be used:			
23.53 MMbtu/hr spark ignition reciprocating internal combustion engine			
(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:			
NA			
(g) Proposed maximum design heat input:		23.53	× 10 ⁶ BTU/hr.
7. Projected operating schedule:			
Hours/Day	24	Days/Week	7
		Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@		77	°F and	14.5	psia
a.	NO _x	3.91	lb/hr		grains/ACF
b.	SO ₂	0.01	lb/hr		grains/ACF
c.	CO	21.52	lb/hr		grains/ACF
d.	PM ₁₀	0.24	lb/hr		grains/ACF
e.	PM _{2.5}	0.24	lb/hr		grains/ACF
f.	VOC (Includes HCHO)	7.12	lb/hr		grains/ACF
g.	Pb	NA	lb/hr		grains/ACF
h.	Specify other(s)				
	Formaldehyde (HCHO)	2.03	lb/hr		grains/ACF
	Total HAP	2.49	lb/hr		grains/ACF
			lb/hr		grains/ACF
			lb/hr		grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
 Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING

RECORDKEEPING

Must keep records of the following information:
 - All notifications submitted to comply with 40 CFR 60, Subpart JJJJ as well as all supporting documentation.
 - Maintenance conducted on the engine.
 - Documentation that the engine meets the emission standards in 40 CFR 60.4233(e)

REPORTING

Must submit the following notifications:
 - Submit an initial notification as required in 40 CFR 60.7(a)(1).
 - Pre-testing notification and protocol 30 days before engine testing per 40 CFR 60.8(d)
 - Submit copy of each performance test as conducted in 40 CFR 60.4244 within 60 days after the test is completed.

TESTING

Initial performance testing and subsequent testing every 8,760 hours of operation or 3 years, whichever comes first, in accordance with procedures in 40 CFR §60.4244(a)-(f).

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

NA

ATTACHMENT M

Air Pollution Control Device Sheet

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): C-6

Equipment Information

1. Manufacturer: Miratech Corporation (or equivalent) Model No. SP-RXS-RE-S2424XH (or equivalent)	2. Control Device Name: Type: Oxidation Catalyst
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: CO – 95.0% NMNEHC – 75.0% CH ₂ O – 90.0%	
8. Attached efficiency curve and/or other efficiency information. See attached Manufacturer's Specification sheet.	
9. Design inlet volume: SCFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. NA	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment. See attached Manufacturer's Specification sheet.	
13. Description of method of handling the collected material(s) for reuse or disposal. NA	

Gas Stream Characteristics

14. Are halogenated organics present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Are particulates present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Are metals present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
15. Inlet Emission stream parameters:	Maximum	Typical	
Pressure (mmHg):			
Heat Content (BTU/scf):			
Oxygen Content (%):		12.8	
Moisture Content (%):		17.0	
Relative Humidity (%):			

16. Type of pollutant(s) controlled: <input type="checkbox"/> SO _x <input type="checkbox"/> Odor <input type="checkbox"/> Particulate (type): <input checked="" type="checkbox"/> Other CO, NMNEHC, CH ₂ O				
17. Inlet gas velocity: _____ ft/sec	18. Pollutant specific gravity:			
19. Gas flow into the collector: 23,900 ACF @ 838 °F and PSIA	20. Gas stream temperature: Inlet: 838 °F Outlet: 1350 (max) °F			
21. Gas flow rate: Design Maximum: 24,043 ACFM Average Expected: 23,900 ACFM	22. Particulate Grain Loading in grains/scf: NA Inlet: Outlet:			
23. Emission rate of each pollutant (specify) into and out of collector:				
Pollutant	IN Pollutant	Emission Capture Efficiency %	OUT Pollutant	Control Efficiency %
	lb/hr	grains/acf	lb/hr	grains/acf
A CO	21.52		1.10	95
B NMNEHC	5.09		1.25	75
C CH ₂ O	2.03		0.31	90
D				
E				
24. Dimensions of stack: TBD Height _____ ft. TBD Diameter _____ ft.				
25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.				

Particulate Distribution

26. Complete the table: NA	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	Weight % for Size Range	Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): NA

28. Describe the collection material disposal system: NA

29. Have you included **Other Collectores Control Device** in the Emissions Points Data Summary Sheet? Yes

30. Proposed Monitoring, Recordkeeping, Reporting, and Testing

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:

Operate and maintain catalyst element according to the recommendations of the manufacturer

RECORDKEEPING:

Must keep records of the following information:

- All notifications submitted to comply with 40 CFR 60, Subpart JJJJ as well as all supporting documentation.
- Maintenance conducted on the engine.
- Documentation that the engine meets the emission standards in 40 CFR 60.4233(e)

REPORTING:

Must submit the following notifications:

- Submit an initial notification as required in 40 CFR 60.7(a)(1).
- Pre-testing notification and protocol 30 days before engine testing per 40 CFR 60.8(d)
- Submit copy of each performance test as conducted in 40 CFR 60.4244 within 60 days after the test is completed.

TESTING:

Initial performance testing and subsequent testing every 8,760 hours of operation or 3 years, whichever comes first, in accordance with procedures in 40 CFR §60.4244(a)-(f).

MONITORING:

Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.

RECORDKEEPING:

Please describe the proposed recordkeeping that will accompany the monitoring.

REPORTING:

Please describe any proposed emissions testing for this process equipment on air pollution control device.

TESTING:

Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

CO – 95.0%

NMNEHC – 75.0%

CH₂O – 90.0%

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

CO – 95.0%

NMNEHC – 75.0%

CH₂O – 90.0%

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

ATTACHMENT N

Supporting Emission Calculations

Company Name:
 Facility Name:
 Project Description:

MarkWest
Kenova Natural Gas Liquids Extraction Facility
Engine Replacement

Compressor Engine - New (S-2A)

Source Designation:	
Manufacturer:	Caterpillar
Model No.:	G3612LE
Stroke Cycle:	4-stroke
Type of Burn:	Lean
Manufacture Date:	2014
Fuel Used:	Natural Gas
Fuel High Heating Value (HHV) (Btu/scf):	1,050
Rated Horsepower (bhp):	3,550
Specific Fuel Consumption (Btu/bhp-hr)	6,629
Maximum Fuel Consumption at 100% Load (scf/hr):	22,412
Heat Input (MMBtu/hr)	23.53
Control Device:	Oxidation Catalyst

Operational Details:

Potential Annual Hours of Operation (hr/yr):	8,760
Potential Fuel Consumption (MMscf/yr):	196.33

Criteria and Manufacturer Specific Pollutant Emission Factors:

Pollutant	Emission Factors	Units	Estimation Basis / Emission Factor Source
NOx	0.50	g/bhp-hr	Vendor Spec Sheet
Uncontrolled CO	2.75	g/bhp-hr	Vendor Spec Sheet
Controlled CO	0.14	g/bhp-hr	Vendor Spec Sheet
SO ₂	0.00	lb/MMBtu	AP-42, Table 3.2-2 (July-2000)
PM ₁₀ (Filterable)	0.00	lb/MMBtu	AP-42, Table 3.2-2 (July-2000)
PM _{2.5} (Filterable)	0.00	lb/MMBtu	AP-42, Table 3.2-2 (July-2000)
PM Condensable	0.01	lb/MMBtu	AP-42, Table 3.2-2 (July-2000)
PM Total	0.01	lb/MMBtu	AP-42, Table 3.2-2 (July-2000)
Uncontrolled NMNEHC (excludes HCHO)	0.65	g/bhp-hr	Vendor Spec Sheet
Controlled NMNEHC (excludes HCHO)	0.16	g/bhp-hr	Vendor Spec Sheet
Uncontrolled VOC (includes HCHO)	0.91	g/bhp-hr	Vendor Spec Sheet
Controlled VOC (includes HCHO)	0.20	g/bhp-hr	Vendor Spec Sheet
Uncontrolled Formaldehyde (HCHO)	0.26	g/bhp-hr	Vendor Spec Sheet
Controlled Formaldehyde	0.04	g/bhp-hr	Vendor Spec Sheet

Company Name:
 Facility Name:
 Project Description:

MarkWest
Kenova Natural Gas Liquids Extraction Facility
Engine Replacement

Criteria and Manufacturer Specific Pollutant Emission Rates

Pollutant	Uncontrolled Potential Emissions		Controlled Potential Emissions	
	(lb/hr)	(tons/yr)	(lb/hr)	(tons/yr)
NO _x	3.91	17.14	3.91	17.14
CO	21.52	94.27	1.10	4.80
SO ₂	0.01	0.06	0.01	0.06
PM ₁₀ (Filterable)	0.002	0.01	0.002	0.01
PM _{2.5} (Filterable)	0.002	0.01	0.002	0.01
PM Condensable	0.23	1.02	0.23	1.02
PM Total	0.24	1.03	0.24	1.03
NMNEHC	5.09	22.28	1.25	5.48
VOC (includes HCHO)	7.12	31.19	1.57	6.86
Formaldehyde	2.03	8.91	0.31	1.37

Greenhouse Gas (GHG) Emissions Calculations:

Pollutant	Emission Factor	Units	Potential Emissions		Estimation Basis / Emission Factor Source
			(lb/hr)	(tons/yr)	
GHGs:					
CO ₂	441	g/bhp-hr	3,451.39	15,117.08	Vendor Spec Sheet
CH ₄	3.87	g/bhp-hr	30.29	132.66	Vendor Spec Sheet (THC-NMHC)
N ₂ O	0.00	kg/MMBtu	0.01	0.02	40 CFR 98, Tables C-1 & C-2
GHG (CO ₂ e)			4,210	18,440	40 CFR 98, Tables C-1 & C-2

Company Name:
 Facility Name:
 Project Description:

MarkWest
Kenova Natural Gas Liquids Extraction Facility
Engine Replacement

Hazardous Air Pollutant (HAP) Potential Emissions

Pollutant	Emission Factor (lb/MMBtu) ¹	Potential Emissions	
		(lb/hr)	(tons/yr)
HAPs:			
Acenaphthene	1.25E-06	2.94E-05	1.29E-04
Acenaphthylene	5.53E-06	1.30E-04	5.70E-04
Acetaldehyde	8.36E-03	1.97E-01	8.62E-01
Acrolein	5.14E-03	1.21E-01	5.30E-01
Benzene	4.40E-04	1.04E-02	4.54E-02
Benzo(b)fluoranthene	1.66E-07	3.91E-06	1.71E-05
Benzo(e)pyrene	4.15E-07	9.77E-06	4.28E-05
Benzo(g,h,i)perylene	4.14E-07	9.74E-06	4.27E-05
Biphenyl	2.12E-04	4.99E-03	2.19E-02
1,3-Butadiene	2.67E-04	6.28E-03	2.75E-02
Carbon Tetrachloride	3.67E-05	8.64E-04	3.78E-03
Chlorobenzene	3.04E-05	7.15E-04	3.13E-03
Chloroform	2.85E-05	6.71E-04	2.94E-03
Chrysene	6.93E-07	1.63E-05	7.14E-05
1,3-Dichloropropene	2.64E-05	6.21E-04	2.72E-03
Ethylbenzene	3.97E-05	9.34E-04	4.09E-03
Ethylene Dibromide	4.43E-05	1.04E-03	4.57E-03
Fluoranthene	1.11E-06	2.61E-05	1.14E-04
Fluorene	5.67E-06	1.33E-04	5.84E-04
Methanol	2.50E-03	5.88E-02	2.58E-01
Methylene Chloride	2.00E-05	4.71E-04	2.06E-03
n-Hexane	1.11E-03	2.61E-02	1.14E-01
Phenanthrene	1.04E-05	2.45E-04	1.07E-03
Phenol	2.40E-05	5.65E-04	2.47E-03
Pyrene	1.36E-06	3.20E-05	1.40E-04
Styrene	2.36E-05	5.55E-04	2.43E-03
Toluene	4.08E-04	9.60E-03	4.21E-02
1,1,2,2-Tetrachloroethane	4.00E-05	9.41E-04	4.12E-03
Tetrachloroethane	2.48E-06	5.84E-05	2.56E-04
1,1,2-Trichloroethane	3.18E-05	7.48E-04	3.28E-03
2,2,4-Trimethylpentane	2.50E-04	5.88E-03	2.58E-02
Vinyl Chloride	1.49E-05	3.51E-04	1.54E-03
Xylene	1.84E-04	4.33E-03	1.90E-02
Naphthalene	7.44E-05	1.75E-03	7.67E-03
2-Methylnaphthalene	3.32E-05	7.81E-04	3.42E-03
PAH	2.69E-05	6.33E-04	2.77E-03
Total HAP		0.77	3.37

¹ HAP emission factors from AP-42 Section 3.2, Table 3.2-2 "Uncontrolled Emission Factors for 4-Stroke Lean-Burn Engines," Supplement F, August 2000.

Notes:

¹ Emission Rate (lb/hr) = Rated Capacity (MMBtu/hr or bhp) × Emission Factor (lb/MMBtu or lb/bhp-hr).

² Annual Emissions (tons/yr)_{Potential} = (lb/hr)_{Emissions} × (Maximum Allowable Operating Hours, 8,760 hr/yr) × (1 ton/2000 lb).

Company Name: MarkWest
 Facility Name: Kenova Natural Gas Liquids Extraction Facility
 Project Description: Engine Replacement

Engine Crankcase Emissions

Number of Engines	Engine Rating (hp)	Leak Rate ¹ (scf/bhp-hr)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HCHO Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO Emissions (tpy)
2	3,550	0.5	31,098,000	0.08	0.02	0.03	0.23
Total				0.08	0.02	0.03	0.23

Notes:

¹ Engineering estimate

² Flow Rate of Engine (vendor data sheet) 23,900 ft³/min

Engine Crankcase Exhaust Composition

Constituent	Engine Exhaust Emissions (tpy)	Composition of Exhaust Gas (lb/MMscf)
VOC	31.2	4.97
HCHO	8.9	1.42
Total HAP	12.3	1.96
CO	94	15

Total Emissions from Gas Venting Sources:

Blowdown Type	Number of Events Per Year	Gas Volume (scf/event)	VOC Emissions (tpy)	HAP Emissions (tpy)	CH ₄ Emissions (tpy)	CO ₂ Emissions (tpy)	CO ₂ e Emissions (tpy)
Rod Packing Leaks	Continuous	1,051,200	11.68	1.79	14.19	0.15	354.78
Compressor Blowdowns	120	1,000	1.33	0.20	1.62	0.02	40.50
Compressor Starts	120	500	0.67	0.10	0.81	0.01	20.25
Total			13.69	2.10	16.61	0.17	415.53

Notes:

¹ VOC and HAP emissions are based on sum of the fractions of the pollutants in the site-specific gas analysis in those classifications, the molecular weight of the gas, and are calculated in accordance with standard conversion methodology and factors.

² CH₄ and CO₂ emissions are based on fractions of these pollutants in the site-specific gas analysis, and are calculated in accordance with Equations W-35 and W-36 in Subpart W of 40 CFR 98.

³ GHG (CO₂e) is carbon dioxide equivalent, which is the summation of CO₂ (GWP = 1) + CH₄ (GWP = 25) + N₂O (GWP = 298).

⁴ The gas volume per event and number of events is conservatively estimated based on facility design and compression engineering personnel.

⁵ The number of compressor blowdowns conservatively assumes 5 blowdowns per compressor per month.

Rod Packing Venting:

Number of Compressors	Number of Rods per Compressor	Leak Factor (scf/hr)	Hours of Operation (hr/yr)	Total Volume NG Emitted (scf/yr)
2	4	15	8,760	1,051,200

Notes:

¹ Vendor does not publish specific rodpacking emission leak rates. The leak rates are based on engineering estimates on the operation of the engines.

Example Calculations:

Crankcase leaks (scf/yr) = # of compressors * EF (scf/hp-hr) * hp* operation (8,760 hrs/yr)

Potential crankcase emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Engine Exhaust Concentration (lb uncontrolled emission rate/(flow rate of exhaust scf/min x 60)) ÷ 2,000 (lb/ton)

Compressor Rod Packing leaks (scf/yr) = # of compressors * EF (scf/hp-hr) * hp* operation (8,760 hrs/yr)

Potential emissions VOC/HAP (tpy) = Gas volume vented (scf/yr) * Molar weight of natural gas (lb/lb-mol) * Weight % VOC/HAP ÷ 100 ÷ 379 (scf/lb-mol) ÷ 2,000 (lb/ton)

Potential emissions CH₄/CO₂ (tpy) = Gas volume vented (scf/yr) * Mole % CH₄/CO₂ ÷ 100 * Density CH₄/CO₂ (kg/scf) * 1,000 (g/kg) ÷ 453.6 (g/lb) ÷ 2,000 (lb/ton)

Company Name:
 Facility Name:
 Project Description:

MarkWest
Kenova Natural Gas Liquids Extraction Facility
Engine Replacement

Source Description	NO _x		SO ₂		CO		PM		VOC		HAP		Formaldehyde		CO ₂ e	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Compressor Engine #2 (S-2) - To be removed	3.91	17.14	0.01	0.03	1.93	8.46	0.23	1.01	1.11	4.86	1.23	5.27	1.00	4.39	2,705	11,850
Emergency Flare & Purge (S-3)	0.04	0.18	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.00	neg	neg	--	--		
Regenerative Heater (S-4)	0.15	0.66	0.00	0.01	0.25	1.10	0.02	0.10	0.02	0.07	0.01	0.02	0.00	0.00	351	1,539
Truck Loadout (S-5)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	neg	neg	--	--		
Emergency Generator (EG-1)	0.01	0.01	0.00	0.00	0.77	0.19	0.00	0.00	0.06	0.02	0.03	0.01	0.01	0.00	241	60
Site-Wide Fugitive (FUG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79	7.84	0.18	0.78	--	--		
Compressor Engine Venting (FUG)	--	--	--	--	--	0.23	--	--	--	13.76	--	2.13	--	0.02	--	415.5
Compressor Engine #1 (S-6)	3.91	17.14	0.01	0.06	1.10	4.80	0.24	1.05	1.57	6.86	0.78	3.42	0.31	1.37	2,823	12,367
Proposed Project																
Compressor Engine #2A (S-2A)	3.91	17.14	0.01	0.06	1.10	4.80	0.24	1.03	1.57	6.86	0.77	3.37	0.31	1.37	4210	18440
TOTAL SITE-WIDE PRE PROJECT	8.03	35.12	0.02	0.10	4.06	14.81	0.49	2.17	4.54	33.42	2.23	11.63	1.32	5.79	6121.67	26231.42
TOTAL SITE-WIDE POST PROJECT	8.03	35.12	0.03	0.13	3.22	11.15	0.50	2.19	5.00	35.41	1.76	9.73	0.64	2.77	7626.37	32822.01
PROJECT INCREASE	0.00	0.00	0.01	0.03	-0.84	-3.66	0.01	0.02	0.46	1.99	-0.46	-1.90	-0.69	-3.02	1505	6591

Company Name:

MarkWest

Facility Name:

Kenova Natural Gas Liquids Extraction Facility

Project Description:

Engine Replacement

Constituent	Natural Gas Stream Speciation (Mole %)	Molecular Weight	Molar Weight	Average Weight Fraction	Natural Gas Stream Speciation (Wt. %)
Carbon Dioxide	0.240	44.01	0.106	0.00	0.42
Nitrogen	0.417	28.01	0.117	0.00	0.47
Methane	63.761	16.04	10.227	0.41	41.04
Ethane	20.105	30.07	6.046	0.24	24.26
Propane	8.602	44.10	3.793	0.15	15.22
Isobutane	1.414	58.12	0.822	0.03	3.30
n-Butane	2.424	58.12	1.409	0.06	5.65
Isopentane	0.931	72.15	0.672	0.03	2.70
n-Pentane	0.609	72.15	0.439	0.02	1.76
Cyclopentane	0.0000	70.1	0.000	0.00	0.00
n-Hexane	1.4970	86.18	1.290	0.05	5.18
Cyclohexane	0.0000	84.16	0.000	0.00	0.00
Other Hexanes	0.0000	86.18	0.000	0.00	0.00
Heptanes	0.0000	100.21	0.000	0.00	0.00
Methylcyclohexane	0.0000	98.19	0.000	0.00	0.00
2,2,4-Trimethylpentane	0.0000	114.23	0.000	0.00	0.00
Benzene*	0.0000	78.11	0.000	0.00	0.00
Toluene*	0.00000	92.14	0.000	0.00	0.00
Ethylbenzene*	0.00000	106.17	0.000	0.00	0.00
Xylenes*	0.00000	106.16	0.000	0.00	0.00
C8 + Heavies	0.0000	114.23	0.000	0.00	0.00
Totals	100.0	1590.83	24.92	1.00	100.0

TOC (Total)	99.34		99.11
VOC (Total)	15.48		33.81
HAP (Total)	1.50		5.18



To: Nathan Clevenger
Mark West
6655 South Lewis
Tulsa , OK 74136

Phone: (606) 932-8207
Email: nclevenger@markwest.com

CC: Debora Calderón/MIRATECH Corporation

From: Thomas Jones
MIRATECH Corporation
420 S 145th E Ave
Mail Drop A
Tulsa, OK 74108

Phone: (918) 720-7889
Mobile: (918) 794-9378
Fax: (918) 933-6238
Email: tjones@miratechcorp.com

Project Reference: 3612 Retro fit
Proposal Number: TJ-11-0731 Rev(1)
Date: 3/21/2011
Firm Quote For: 30 days from Proposal Date

Dear Nathan:

MIRATECH Corporation welcomes the opportunity to provide you with a proposal for an NSCR system. We are confident that your organization will benefit from selecting us for this project for the following reasons:

- **Experience.**
 - MIRATECH is the leader in providing NSCR, SCR & DPF systems; having more than 17,000 successfully operating units installed in North America, South America, Europe and Asia.
- **World-Class Technology.**
 - Consistently set the standards for Best Available Control Technology (BACT)
 - Simple, user-friendly control and communication technology; connects to any building's communication systems
- **U.S.-based Field Services & Support.**
 - Fast-response field service & technical support
 - Replacement components in stock in Tulsa, Oklahoma
 - In-house engineering & product support

The system offered for this project is in accordance with the data received or estimated from your company. The system is designed to provide emission reduction for carbon monoxide (CO), hydrocarbons (NMNEHC), and formaldehyde (CH₂O) as listed on the System Specifications and Performance Warranty Data page. MIRATECH warrants the quoted performance based on the engine emission and operating data you have provided us and that is contained in this proposal. Please note that some engine assumptions were used and converter size may change based on actual engine data.

Once again, thank you for the opportunity to provide this proposal. If you have any questions, please do not hesitate to contact me. I will call you next week to confirm your receipt and satisfaction with this proposal.

Best Regards,

Thomas Jones
Area Sales Manager
MIRATECH Corporation

Quotation Summary

The prices are as follows:

NSCR System

NSCR Housing & Catalyst - SP-PT-66S2424x41-26/24-XH4B0

1 per engine

System Total

\$35,809.80 per engine

Terms and Conditions:

This offer is in strict adherence to the attached *MIRATECH Holdings Terms and Conditions Rev 7 dated August 2009*.

Shipment

All equipment is Ex Works Tulsa, OK

Delivery

The following lead times specify the time from receipt of order by MIRATECH to product ready to ship. Lead times shown are for quantities of 1 or 2 unless otherwise specified. **For quantities in excess of 2, please obtain a commitment from MIRATECH.**

15 business days (SP-PT-66S2424x41-26/24-XH4B0)

Payment Terms

Invoice on shipment, payment net 30 days (subject to account status).

Scope of Supply

MIRATECH Corporation Scope of Supply

NSCR Housing & Catalyst	Model Number	Quantity per Engine
NSCR Housing	SP-PT-66S2424x41-26/24-XH4B0	1
Oxidation Catalyst	SP-PT-66S2424x41-26/24-HSG	4
	SP-RXS-RE-S2424XH	

Customer Scope of Supply

- Description**
- Support Structure
 - Attachment to Support Structure (Bolts, Nuts, Levels, etc.)
 - Expansion Joints
 - Exhaust Piping
 - Inlet Pipe Bolts, Nuts, & Gasket
 - Outlet Pipe Bolts, Nuts, & Gasket

Application Data

Project Information

Site Location: WV
 Project Name: 3612 Retro fit
 Application: Gas Compression
 Number of Engines: 1
 Operating Hours per Year: 8760

Engine Specifications

Engine Manufacturer: Caterpillar
 Model Number: G 3612 LE TA
 Rated Speed: 1,000 RPM
 Type of Fuel: Natural Gas
 Type of Lube Oil: 0.6 wt% sulfated ash or less
 Lube Oil Consumption: < 0.00027 gal/bhp-hr

Engine Cycle Data

Load	Speed	Power	Exhaust Flow	Exhaust Temp.	Fuel Cons.	NO _x	CO	NMHC	NMNEHC	CH ₂ O	PM ₁₀	O ₂	H ₂ O
%		bhp	acfm (cfm)	F	BTU/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	%	%
100	Rated	3550	24043	838	6791	0.5	2.75	0.97	0.64	0.4		12.8	17

Raw Engine Emission Data

	g/bhp-hr	lb/MW-hr	ppmvd	ppmvd @ 15% O ₂	lb/hr	g/kW-hr	tons/yr
NO _x	0.50	1.48	67	49	3.91	0.67	17.14
CO	2.75	8.13	608	443	21.52	3.69	94.27
NMNEHC	0.64	1.89	247	180	5.01	0.86	21.94
CH ₂ O	0.40	1.18	83	60	3.13	0.54	13.71
% O ₂		12.8					
H ₂ O Assumption		17.0					

System Specifications and Performance Warranty Data

NSCR System Specifications (SP-PT-66S2424x41-26/24-XH4B0)

Design Exhaust Flow Rate: 24,043 acfm (cfm)
 Design Exhaust Temperature¹: 838°F
 System Pressure Loss: 5.0 inches of WC (Fresh)
 Exhaust Temperature Limits: 550 – 1250°F (catalyst inlet); 1350°F (catalyst outlet)

Post System Emission Data

	g/bhp-hr	lb/MW-hr	ppmvd	ppmvd @ 15% O ₂	lb/hr	g/kW-hr	tons/yr
CO	0.14	0.41	30	22	1.08	0.18	4.71
NMNEHC	0.16	0.47	62	45	1.25	0.21	5.48
CH ₂ O	0.04	0.12	8	6	0.31	0.05	1.37

Calculated Percent Reductions

	% Reduction
CO	95.0
NMNEHC	75.0
CH2O	90.0

Equipment Details

NSCR Housing & Catalyst Details (SP-PT-66S2424x41-26/24-XH4B0)

NSCR Housing Details

- Model Number: SP-PT-66S2424x41-26/24-HSG
- Quantity²: 1
- Material: Carbon Steel
- Paint: Standard High Temperature Black Paint
- Diameter: 66 inches
- Inlet Pipe Size & Connection: 26 inch FF Flange, 150# ANSI standard bolt pattern
- Outlet Pipe Size & Connection: 24 inch FF Flange, 150# ANSI standard bolt pattern
- Overall Length: 68 inches
- Weight Without Catalyst: 1,532 lbs
- Weight Including Catalyst: 1,800 lbs
- Instrumentation Ports: 2 inlet/2 outlet (1/2" NPT)

Oxidation Catalyst Details

- Model Number: SP-RXS-RE-S2424XH
- Quantity²: 4
- Weight: 72 lbs

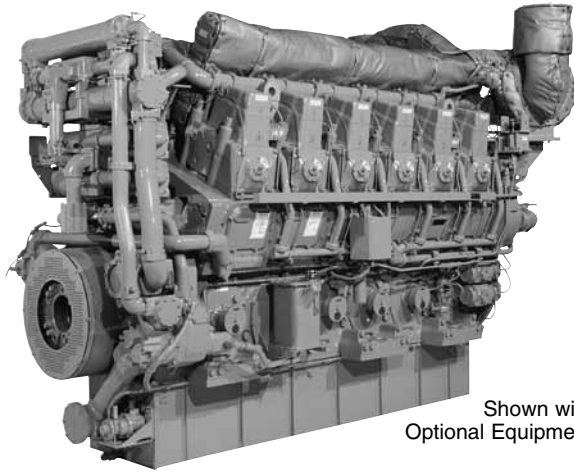
Special Notes/Conditions

- 1 Carbon steel housings are suitable for use in all applications where the housing will not be insulated. Carbon steel housings may only be insulated in applications where the exhaust temperature does not exceed 900°F. If your application requires insulation with an engine exhaust temperature exceeding 900°F, a stainless steel housing is required. Customer installed insulation on carbon steel housings in applications where exhaust temperature exceeds 900°F voids any MIRATECH product warranty.
- 2 Quantities are per engine.
 - A packed silencer installed upstream of the MIRATECH catalyst system will void MIRATECH's limited warranty.
 - Final catalyst housings are dependent on engine output and required emission reductions. Changes may be made to optimize the system design at the time of order.
 - Any drawings included with this proposal are preliminary in nature and could change depending on final product selection.



G3612 LE Gas Petroleum Engine

2647-2823 kW
(3550-3785 bhp)
1000 rpm



Shown with
Optional Equipment

0.5 g/bhp-hr NOx or 0.7 g/bhp-hr NOx (NTE)

CAT® ENGINE SPECIFICATIONS

V-12, 4-Stroke-Cycle

Bore	300 mm (11.8 in.)
Stroke	300 mm (11.8 in.)
Displacement	254 L (15,528 cu. in.)
Aspiration	Turbocharged-Aftercooled
Digital Engine Management	
Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Engine Weight	
net dry (approx)	25,084 kg (55,300 lb)
Power Density	8.9 kg/kW (14.6 lb/hp)
Power per Displacement	14.9 bhp/L
Total Cooling System Capacity	734.4 L (194 gal)
Jacket Water	670 L (177 gal)
Aftercooler Circuit	64 L (17 gal)
Lube Oil System (refill)	1030 L (272 gal)
Oil Change Interval	5000 hours
Rotation (from flywheel end)	Counterclockwise
Flywheel Teeth	255

FEATURES

Engine Design

- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

Emissions

Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2010/11 with the use of an oxidation catalyst

Lean Burn Engine Technology

Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

Ease of Operation

- High-strength pan and rails for excellent mounting and stability
- Side covers on block allow for inspection of internal components

Advanced Digital Engine Management

ADEM A3 engine management system integrates speed control, air/fuel ratio control, and ignition/detonation controls into a complete engine management system. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Full Range of Attachments

Large variety of factory-installed engine attachments reduces packaging time.

Testing

Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro

GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network

- More than 2,200 dealer outlets
- Cat factory-trained dealer technicians service every aspect of your petroleum engine
- Cat parts and labor warranty
- Preventive maintenance agreements available for repair-before-failure options

S•O•SSM program matches your oil and coolant samples against Caterpillar set standards to determine:

- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience

- Over 60 years of natural gas engine production
- Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site

For all your petroleum power requirements, visit www.catoilandgas.cat.com.



STANDARD EQUIPMENT

Air Inlet System

Air cleaner — standard duty
Inlet air adapter

Control System

A3 control system — provides electronic governing integrated with air/fuel ratio control and individual cylinder ignition timing control

Cooling System

Jacket water pump
Jacket water thermostats and housing
Aftercooler pump
Aftercooler water thermostats and housing
Single-stage aftercooler

Exhaust System

Dry wrapped exhaust manifolds
Vertical outlet adapter

Flywheel & Flywheel Housing

SAE standard rotation

Fuel System

Gas admission valves — electronically controlled fuel supply pressure

Ignition System

A3 control system — senses individual cylinder detonation and controls individual cylinder timing

Instrumentation

LCD display panel — monitors engine parameters and displays diagnostic codes

Lube System

Crankcase breathers — top mounted
Oil cooler
Oil filter
Oil pan drain valve

Mounting System

Engine mounting feet (six total)

Protection System

Electronic shutoff system with purge cycle
Crankcase explosion relief valves
Gas shutoff valve

Starting System

Air starting system

General

Paint — Cat yellow
Vibration dampers

OPTIONAL EQUIPMENT

Air Inlet System

Heavy-duty air cleaner with precleaners
Heavy-duty air cleaner with rain protection

Charging System

Charging alternators

Control System

Custom control system software — available for non-standard ratings, field programmable using flash memory

Cooling System

Expansion tank
Flexible connections
Jacket water heater

Exhaust System

Flexible bellows adapters
Exhaust expander
Weld flanges

Fuel System

Fuel filter
Gas pressure regulator
Flexible connection
Low energy fuel system
Corrosive gas fuel system

Ignition System

CSA certification

Instrumentation

Remote data monitoring and speed control
Compatible with Cat Electronic Technician (ET) and Data View
Communication Device — PL1000T/E
Display panel deletion is optional

Lube System

Air or electric motor-driven prelude
Duplex oil filter
LH or RH service
Lube oil makeup system

Mounting System

Mounting plates (set of six)

Power Take-Offs

Front stub shafts

Starting System

Air pressure reducing valve
Natural gas starting system

General

Engine barring device
Damper guard



G3612 LE GAS PETROLEUM ENGINE

2647-2823 bkW (3550-3785 bhp)

TECHNICAL DATA

G3612 LE Gas Petroleum Engine — 1000 rpm

		DM5134-03	DM5309-06	DM5310-06	DM8607-02
Engine Power					
@ 100% Load	bkW (bhp)	2733 (3665)	2823 (3785)	2647 (3550)	2647 (3550)
@ 75% Load	bkW (bhp)	2049 (2749)	2117 (2839)	1985 (2663)	1985 (2663)
Engine Speed		1000	1000	1000	1000
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	1219.2 (4000)	1219.2 (4000)	609.6 (2000)	304.8 (1000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	21	20	23	23
SCAC Temperature	°C (°F)	43 (110)	32 (90)	55 (130)	55 (130)
Emissions*					
NOx	g/bkW-hr (g/bhp-hr)	0.94 (0.7)	0.94 (0.7)	0.94 (0.7)	0.67 (0.5)
CO	g/bkW-hr (g/bhp-hr)	3.4 (2.5)	3.4 (2.5)	3.4 (2.5)	3.7 (2.75)
CO ₂	g/bkW-hr (g/bhp-hr)	587 (438)	585 (436)	589 (439)	591 (441)
VOC**	g/bkW-hr (g/bhp-hr)	0.79 (0.59)	0.75 (0.56)	0.82 (0.61)	0.87 (0.65)
Fuel Consumption***					
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	9.31 (6580)	9.28 (6561)	9.34 (6600)	9.38 (6629)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	9.7 (6856)	9.66 (6829)	9.74 (6883)	9.78 (6914)
Heat Balance					
Heat Rejection to Jacket Water					
@ 100% Load	bkW (Btu/min)	656 (37,336)	677 (38,539)	639 (36,379)	638 (36,338)
@ 75% Load	bkW (Btu/min)	576 (32,714)	594 (33,755)	546 (31,052)	548 (31,179)
Heat Rejection to Aftercooler					
@ 100% Load	bkW (Btu/min)	515 (29,299)	563 (32,045)	468 (26,661)	488 (27,783)
@ 75% Load	bkW (Btu/min)	281 (15,954)	310 (17,616)	252 (14,361)	264 (15,016)
Heat Rejection to Exhaust					
@ 100% Load	bkW (Btu/min)	2705 (153,813)	2743 (156,017)	2664 (151,486)	2673 (152,035)
@ 75% Load	bkW (Btu/min)	2152 (122,365)	2184 (124,184)	2132 (121,263)	2141 (121,731)
Exhaust System					
Exhaust Gas Flow Rate					
@ 100% Load	N•m ³ /bkW-hr (cfm)	690.14 (24,372)	705.85 (24,927)	674.20 (23,809)	682.15 (24,090)
@ 75% Load	N•m ³ /bkW-hr (cfm)	543.32 (19,187)	553.65 (19,552)	532.67 (18,811)	538.95 (19,033)
Exhaust Stack Temperature					
@ 100% Load	°C (°F)	453.30 (848)	448 (838)	459 (858)	448 (838)
@ 75% Load	°C (°F)	472.20 (882)	464 (867)	480 (896)	469 (876)
Intake System					
Air Inlet Flow Rate					
@ 100% Load	N•m ³ /bkW-hr (scfm)	265.78 (9386)	273.91 (9673)	257.66 (9099)	264.99 (9358)
@ 75% Load	N•m ³ /bkW-hr (scfm)	203.85 (7199)	210.00 (7416)	197.71 (6982)	203.34 (7181)
Gas Pressure	kPag (psig)	295-324 (42.8-47)	295-324 (42.8-47)	295-324 (42.8-47)	295-324 (42.8-47)

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

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

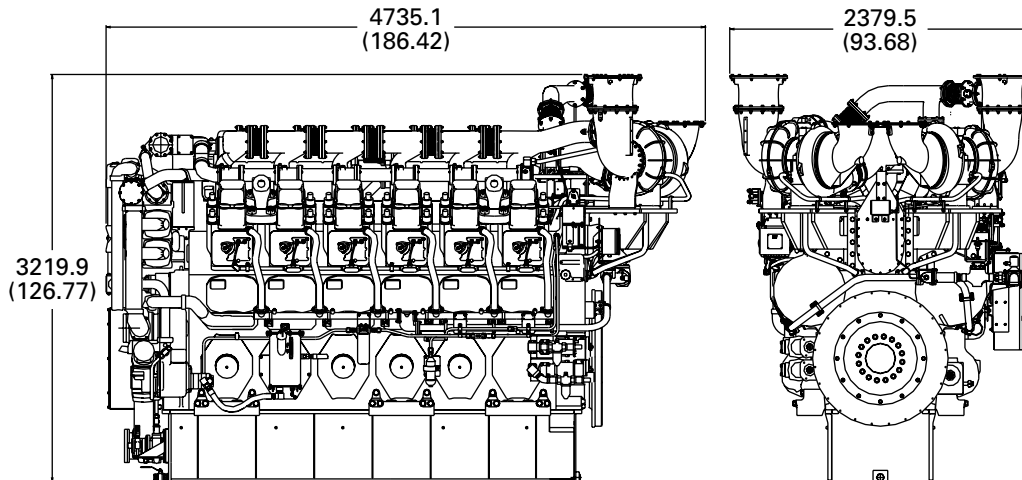
***ISO 3046/1



G3612 LE GAS PETROLEUM ENGINE

2647-2823 bkW (3550-3785 bhp)

GAS PETROLEUM ENGINE



DIMENSIONS		
Length	mm (in)	4735.1 (186.42)
Width	mm (in)	2379.5 (93.68)
Height	mm (in)	3219.9 (126.77)
Shipping Weight	kg (lb)	25,084 (55,300)

Note: General configuration not to be used for installation. See general dimension drawings for detail.

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

Materials and specifications are subject to change without notice. The International System of Units (SI) is used in this publication. CAT, CATERPILLAR, their respective logos, S•O•S, ADEM, "Caterpillar Yellow" and the "Power Edge" trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.

ATTACHMENT O

Monitoring/Recordkeeping/Reporting/Testing Plans

Attachment O: Monitoring, Recordkeeping, and Reporting, and Testing Plan

Plan Type	Emission unit	Pollutant	Requirements	Frequency	Method of Measurement	Regulatory Reference
Testing	Compressor Engine (S2A)	NOx, CO, VOC	In accordance with 40 CFR 60.4244: EPA Method 7E for NOx, EPA Method 10 for CO and EPA Method 25A for VOC. Can petition for portable analyzer testing in lieu of stack test.	Initial performance test and subsequent performance testing every 8760 hours or three years, whichever comes first	EPA Method 7E for NOx, EPA Method 10 for CO and EPA Method 25A for VOC	40 CFR 60.4243(b)(2)(ii)
Recordkeeping and Reporting	Compressor Engine (S2A)	NOx, CO, VOC	<p>Must keep records of the following information:</p> <ul style="list-style-type: none"> - All notifications submitted to comply with 40 CFR 60, Subpart JJJJ as well as all supporting documentation. - Maintenance conducted on the engine. - Documentation that the engine meets the emission standards in 40 CFR 60.4233(e) 	<p>Must submit the following notifications:</p> <ul style="list-style-type: none"> - Initial notification as required in 40 CFR 60.7(a)(1). - Pre-testing notification and protocol 30 days before engine testing per 40 CFR 60.8(d) <p>Submit copy of each performance test as conducted in 40 CFR 60.4244 within 60 days after the test is completed.</p>	EPA Test Methods, as applicable.	<p>Recordkeeping: 40 CFR 60.4245(a)</p> <p>Reporting: 40 CFR 60.4245(b) and (d)</p>

ATTACHMENT P

Public Notice

AIR QUALITY PERMIT NOTICE Notice of Application

Notice is given that MarkWest Energy Appalachia, LLC. has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a modification to its existing R13-1814F permit for the replacement of an existing compressor engine at the Kenova Natural Gas Liquids Extraction Facility located on 50 Big Sandy Road, Kenova, Wayne County, WV. The latitude and longitude coordinates are: 38.37251° -82.59105° respectively.

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

Particulate Matter (PM) = 0.02 tpy
Sulfur Dioxide (SO₂) = 0.03 tpy
Volatile Organic Compounds (VOC) = 1.99 tpy
Carbon Monoxide (CO) = - 3.66 tpy
Nitrogen Oxides (NO_x) = <0.01 tpy
Hazardous Air Pollutants (HAPs) = -1.90 tpy
Formaldehyde = -3.02 tpy
Carbon Dioxide Equivalents (CO_{2e}) = 6,591 tpy

Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1250, during normal business hours.

Dated this the **XX** day of November, 2016.

By: MarkWest Energy Appalachia, LLC.
Jennifer Osborne
Sr. Environmental Coordinator
PO Box 575
2 MarkWest Drive
South Shore, KY, 41175

APPLICATION FEE