



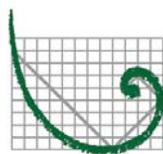
AMERICAN ENERGY  
MARCELLUS

# American Energy Marcellus, LLC

**G70-A General Air Permit Modification  
Application  
WJ Criswell 405 Natural Gas Production Site**

Wileyville, West Virginia

Prepared By:



**ERM**

ENVIRONMENTAL RESOURCES MANAGEMENT, Inc.  
Hurricane, West Virginia

April 2015



AMERICAN ENERGY  
MARCELLUS

April 10, 2015

Mr. William F. Durham, Director  
West Virginia Department of Environmental Protection  
Division of Air Quality  
601 57<sup>th</sup> Street, SE  
Charleston, West Virginia, 25304

**RE: G70-A Permit Modification Application  
WJ Criswell 405 Well Pad  
American Energy – Marcellus, LLC**

Dear Director Durham:

American Energy – Marcellus, LLC (AEM), an affiliate of American Energy Partners , LP, is pleased to submit the enclosed application for a General Permit G70-A Modification to the WJ Criswell 405 well pad near Wileyville, in Wetzel County, West Virginia. An original hard copy and two electronic copies of the complete application package are enclosed.

A check for the application fee in the amount of \$500.00 made payable to the WVDEP – Division of Air Quality is also included with this package.

A public notice for the proposed project will be published in *The Wetzel Chronicle* as soon as possible. AEM will forward the original Affidavit of Publication to your attention once it is received from the publisher.

If you have any questions about the information submitted or if you would like to discuss this project, please do not hesitate to contact me at (405) 607-5411.

Sincerely,

John McGreevy  
EH&S Coordinator

cc: Grant Morgan, ERM – Grant.morgan@erm.com

## INTRODUCTION

American Energy Marcellus, LLC (AEM) is submitting this G70-A Class II Application for Permit Modification to the WVDEP's Department of Air Quality for the WJ Criswell 405 natural gas production site located in Wetzel County, West Virginia. This application addresses the operational activities associated with the production of natural gas and condensates at the WJ Criswell 405 pad.

## FACILITY DESCRIPTION

The AEM WJ Criswell 405 natural gas production site operates in Wetzel County, WV and consists of three (3) natural gas wells. Natural gas and liquids (including water and condensates) are extracted from underground deposits. The natural gas will be transported from the wells to a gas line for compression and additional processing, as necessary. The produced liquids are stored in storage vessels.

The applicant is currently authorized to operate the following pieces of equipment under Permit G70-A 124:

- Three (3) GPU burners each rated at 1.0 MMBtu/hr heat input;
- One (1) flash separator line heater rated at 1.0 MMBtu/hr heat input;
- One (1) reciprocating compressor engine rated at 203 bhp;
- Three (3) 400 barrel (bbl) produced water tanks;
- Three (3) 400 barrel (bbl) condensate tanks;
- One (1) condensate stabilizer line heater rated at 0.75 MMBtu/hr heat input;
- One (1) National Oilwell Varco MEVC200 Enclosed Combustion Device with a capacity of 18.24 MMBtu/hr;
- One (1) Produced Water Tank Truck Loading Operations; and
- One (1) Condensate Tank Truck Loading Operations.

With this application for permit modification, the applicant seeks the authority to make the following modifications:

- Addition of three (3) line heaters each rated at 1.5 MMBtu/hr heat input;
- Modification of three (3) gas processing unit (GPU) burners from 1.0 MMBtu/hr to 1.5 MMBtu/hr;
- Addition of one (1) 47 bhp Hipower natural gas prime-power generator;
- Addition of flashing emissions from the three (3) 400 barrel (bbl) produced water tanks;
- Modification of tank truck loading emissions to account for the vapor balancing of the tanks during unloading operations.
- Addition of Haul Road Fugitive Emissions;

- Modification of the condensate tank loading process and throughput to conservatively account for the flashing emissions, as further explained below;

AEM currently has the authority to operate a condensate stabilizer with a burner rated at 0.75 MMBtu/hr. The condensate stabilizer serves as a third stage of fluid separation for the condensate produced at the Site. The condensate stabilizer heats the condensate and routes the volatilized hydrocarbons through a condenser to a pressurized Natural Gas Liquids (NGLs) storage vessel.

Based upon current observed daily condensate production, AEM does not expect the quantity of condensate production that would justify the operation of the condensate stabilizer. AEM is filling this application to account for the loading of the condensate tank directly from the flash separator. E&P Tank process simulation model results have been included with this application, which were used to calculate the flashing, working, and breathing emissions associated with this method of condensate tank loading. The daily and annual condensate production rates have been adjusted to the highest level of production now expected at the Facility. At this time, AEM requests that the condensate stabilizer remain an authorized emission source. With this permitting approach, AEM is reasonably conservative in its permitting actions and is authorized to operate the condensate stabilizer should field conditions deem it necessary. In the event that the condensate stabilizer is operated, VOC emissions from the flashing of condensate would be reduced below the potential emissions included in this application.

A process flow diagram is included in this application in Attachment D.

## **STATEMENT OF AGGREGATION**

The WJ Criswell 405 facility is located in Wetzel County, WV and operated by AEM. Stationary sources of air pollutants may require aggregation of total emission levels to evaluate the potential applicability of Title I, Parts C and D preconstruction permitting programs and the Title V operating permit program if these sources share the same industrial grouping, are operating under common control, and are classified as contiguous or adjacent properties. AEM will operate the WJ Criswell 405 facility with the same industrial grouping as nearby facilities, and some of these facilities are under common control. AEM, however, is not subject to the aggregation of stationary emission sources because these sites do not meet the definition of contiguous or adjacent facilities.

The WJ Criswell 405 facility will operate under SIC code 1311 (Crude Petroleum and Natural Gas Extraction). There are surrounding wells and compressor stations operated by AEM that share the same two-digit major SIC code of 13 for

Crude Petroleum and Natural Gas Extraction. Therefore, the WJ Criswell 405 Facility does share the same SIC codes as the surrounding wells and compressor stations.

AEM is the sole operator of the WJ Criswell 405 pad. AEM is also the sole operator of other production sites and compressor stations in the area. Therefore, AEM does qualify as having nearby operations under common control.

Nearby sites do not meet the definition of contiguous or adjacent properties since they are not in contact and do not share a common boundary.

Based on the above reasoning, AEM is not subject to the aggregation of stationary emission sources since the stationary sources are not considered contiguous or adjacent facilities.

## **REGULATORY DISCUSSION**

This section outlines the State air quality regulations that could be reasonably expected to apply to the WJ Criswell 405 facility and makes an applicability determination for each regulation based on activities conducted at the site and the emissions of regulated air pollutants. This review is presented to supplement and/or add clarification to the information provided in the WVDEP G70-A permit application forms.

The West Virginia State Regulations address applicable state (i.e. State Implementation Plan) rules as well as federal regulations, including Title I Prevention of Significant Deterioration and Nonattainment New Source Review preconstruction permitting, Title V, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants. The regulatory requirements in reference to WJ Criswell 405 are described in detail in the below section.

## **WEST VIRGINIA STATE AIR REGULATIONS**

*45 CSR 02 – To Prevent and Control Particulate Air Pollution From Combustion of Fuel in Indirect Heat Exchangers*

The line heaters are indirect heat exchangers that combust natural gas. Such units are subject to 10% opacity as a six-minute block average limitation, but are exempt from most other requirements in the rule aside from discretionary testing requirements.

*45 CSR 04 – To Prevent and Control the Discharge of Air Pollutants into the Air Which Causes or Contributes to an Objectionable Odor*

Operations conducted at the WJ Criswell 405 facility are subject to this requirement. Based on the nature of the process at the wellpad, the presence of objectionable odors is unlikely.

*45 CSR 06 – Control of Air Pollution from the Combustion of Refuse*

The enclosed combustion device located on the WJ Criswell 405 natural gas production site is subject to this regulation. Per 45 CSR 6-4.3, opacity of emissions from the enclosed combustion device shall not exceed 20 percent, except as provided by 4.4. Particulate matter emissions from this unit will not exceed the levels calculated in accordance with 6-4.1.

*45 CSR 10 – To Prevent and Control Air Pollution From the Emission of Sulfur Oxides*

The line heaters are indirect heat exchangers that combust natural gas but are exempt since the heat input capacities are less than 10 MMBtu/hr.

*45 CSR 13 – Permits for Construction, Modification, Relocation, And Operation of Stationary Sources of Air Pollutants*

This G70-A permit modification application is being submitted for the operational activities associated with AEM's production of natural gas.

*45 CSR 14 / 45 CSR 19 – Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration / Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contributed to Non-attainment*

Federally regulated construction permitting programs regulate new and modified major sources of regulated pollutants. The G70A-applicability criteria exclude facilities that meet the definition of a major source as defined in 45 CSR 19 from being eligible for the general permit.

Operation of equipment at the WJ Criswell 405 facility will not exceed major source emission thresholds established by these permitting programs. AEM will monitor future construction and modification activities at the site and compare any future increase in emissions with major source thresholds to ensure these activities will not trigger these programs.

*45 CSR 16 - Standards of Performance for New Stationary Sources (NSPS)*

45CSR 16 applies to all registrants with affected facilities that are subject to any of the NSPS requirements described in more detail in the Federal Regulations

section. Applicable requirements of NSPS, Subparts JJJJ and OOOO are included in the G70-A general permit.

This facility includes gas well affected facilities under Subpart OOOO. Additional discussion is provided in the Federal Regulation Discussion of this permit application.

#### *45 CSR 30 – Requirements for Operating Permits*

45 CSR 30 applies to the requirements of the federal Title V operating permit program (40 CFR 70). 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 HAPs, and 100 tpy of all other regulated pollutants.

The potential emissions of all regulated pollutants are below the corresponding threshold(s) at this facility. The facility is not a major source with respect to the Title V operating permit program.

#### *45 CSR 34 – National Emission Standards for Hazardous Air Pollutants (NESHAP)*

45 CSR 34 applies to all registrants that are subject to any of the NESHAP requirements. Any sources subject to NESAHP Subpart HHH are excluded from coverage under the G70-A general permit.

The following NESHAP included in the G70-A permit are not applicable to the WJ Criswell 405 facility:

- 40CFR63 Subpart HH (National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities).
- 40CFR63 Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines)

## **FEDERAL REGULATIONS**

#### *40 CFR 60, Subpart OOOO (Standards of Performance for Crude oil and Natural Gas Production, Transmission and Distribution)*

Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO<sub>2</sub>) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. The applicable provisions and requirements of Subpart OOOO are included under the G70-A permit.

There are several equipment types that will be installed at WJ Criswell 405 that do not meet the affected facility definitions as specified by EPA. These include pneumatic controllers and storage vessels.

Pneumatic Controllers: Any pneumatic controller installed at this facility will be intermittent bleed devices. Therefore, there will not be any pneumatic controller affected facilities located at this site.

Storage vessels: Based on PTE calculations included within this permit, emissions from each storage vessel will be routed to an enclosed combustion device such that the total tank emissions for the entire facility are below 6 tons per year (tpy) of VOC. The operation of the enclosed combustion device will be a legally and practically enforceable permit condition. For this reason, the WJ Criswell 405 Facility does not meet the definition of Storage Vessel Affected Facility under 40 CFR Part 60 Subpart OOOO.

No additional NSPS are currently applicable to this facility.



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

**APPLICATION FOR GENERAL PERMIT REGISTRATION**  
 CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE  
 A STATIONARY SOURCE OF AIR POLLUTANTS

- CONSTRUCTION     MODIFICATION     RELOCATION     CLASS I ADMINISTRATIVE UPDATE  
 CLASS II ADMINISTRATIVE UPDATE

**CHECK WHICH TYPE OF GENERAL PERMIT REGISTRATION YOU ARE APPLYING FOR:**

- |   |   |
|---|---|
| <input type="checkbox"/> <b>G10-D</b> – Coal Preparation and Handling                                   | <input type="checkbox"/> <b>G40-C</b> – Nonmetallic Minerals Processing                             |
| <input type="checkbox"/> <b>G20-B</b> – Hot Mix Asphalt   | <input type="checkbox"/> <b>G50-B</b> – Concrete Batch  |
| <input type="checkbox"/> <b>G30-D</b> – Natural Gas Compressor Stations                                 | <input type="checkbox"/> <b>G60-C</b> - Class II Emergency Generator                                |
| <input type="checkbox"/> <b>G33-A</b> – Spark Ignition Internal Combustion Engines                      | <input type="checkbox"/> <b>G65-C</b> – Class I Emergency Generator                                 |
| <input type="checkbox"/> <b>G35-A</b> – Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit) | <input checked="" type="checkbox"/> <b>G70-A</b> – Class II Oil and Natural Gas Production Facility |

**SECTION I. GENERAL INFORMATION**

1. Name of applicant (as registered with the WV Secretary of State's Office): <b>American Energy – Marcellus, LLC</b>		2. Federal Employer ID No. (FEIN): <b>46-5580354</b>	
3. Applicant's mailing address: <b>301 NW 63<sup>rd</sup> St., Suite 600 Oklahoma City, OK 73116</b>		4. Applicant's physical address: <b>Four Mile Road, Wileyville, WV</b>	
5. If applicant is a subsidiary corporation, please provide the name of parent corporation: <b>American Energy Partners, LP</b>			
6. <b>WV BUSINESS REGISTRATION.</b> Is the applicant a resident of the State of West Virginia? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO – IF YES, provide a copy of the Certificate of <b>Incorporation/ Organization / Limited Partnership</b> (one page) including any name change amendments or other Business Registration Certificate as <b>Attachment A</b> . – IF NO, provide a copy of the <b>Certificate of Authority / Authority of LLC / Registration</b> (one page) including any name change amendments or other Business Certificate as <b>Attachment A</b> .			

**SECTION II. FACILITY INFORMATION**

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.):  Oil and natural gas production facility	8a. Standard Industrial Classification Classification (SIC) code: <b>1311</b>	AND	8b. North American Industry System (NAICS) code: <b>211111</b>
9. DAQ Plant ID No. (for existing facilities only):  <b>103-00098</b>	10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):  <b>G70-A124</b>		

**A: PRIMARY OPERATING SITE INFORMATION**

11A. Facility name of primary operating site:  <b>WJ Criswell 405</b>  _____	12A. Address of primary operating site:  Mailing: <b>301 NW 63<sup>rd</sup> St., Suite 600, Oklahoma City, OK 73116</b>  Physical: <b>Four Mile Road, Wileyville, WV</b>	
13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <span style="float:right"><input checked="" type="checkbox"/> YES    <input type="checkbox"/> NO</span> – IF YES, please explain: <u>LEASE</u>  _____  – IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.		
14A. – For <b>Modifications or Administrative Updates</b> at an existing facility, please provide directions to the present location of the facility from the nearest state road; – For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a <b>MAP</b> as <b>Attachment F</b> .  <b>Route 7 East out of New Martinsville towards Morgantown, Bear right on Route 20 toward Pine Grove, left onto North Fork C/R 15/17, left onto Barker Run C/R 17, right onto Hoyt Ridge C/R 58, right on lease road.</b>  _____		
15A. Nearest city or town:  <b>Wileyville</b>	16A. County:  <b>Wetzel</b>	17A. UTM Coordinates: Northing (KM): <b>4,384.25</b> Easting (KM): <b>532.769</b> Zone: <b>17</b>
18A. Briefly describe the proposed new operation or change (s) to the facility: <b>Oil and natural gas production facility. See Attachment B for complete process description.</b>		19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: <b>39.60737</b> Longitude: <b>-80.61828</b>

**B: 1<sup>ST</sup> ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)**

11B. Name of 1 <sup>st</sup> alternate operating site:  <u>N/A</u>  _____	12B. Address of 1 <sup>st</sup> alternate operating site:  Mailing: _____ Physical: _____  _____
13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <span style="float:right"><b>9 YES    9 NO</b></span> – IF YES, please explain: _____  _____  – IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.	
14B. – For <b>Modifications or Administrative Updates</b> at an existing facility, please provide directions to the present location of the facility from the nearest state road; – For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a <b>MAP</b> as <b>Attachment F</b> .  _____  _____  _____	

15B. Nearest city or town:	16B. County:	17B. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18B. Briefly describe the proposed new operation or change (s) to the facility:		19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

**C: 2<sup>ND</sup> ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits):**

11C. Name of 2 <sup>nd</sup> alternate operating site:  _____ N/A _____	12C. Address of 2 <sup>nd</sup> alternate operating site:  Mailing: _____ Physical: _____
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13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? 9 YES    9 NO

— IF YES, please explain: \_\_\_\_\_

— IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14C. — For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

— For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

\_\_\_\_\_

\_\_\_\_\_

15C. Nearest city or town:	16C. County:	17C. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
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18C. Briefly describe the proposed new operation or change (s) to the facility:	19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____
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20. Provide the date of anticipated installation or change: <b>08/01/2015</b>	21. Date of anticipated Start-up if registration is granted: <b>08/01/2015</b>
<input type="checkbox"/> If this is an <b>After-The-Fact</b> permit application, provide the date upon which the proposed change did happen: :  _____/_____/_____	

22. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).

Hours per day 24 Days per week 7 Weeks per year 52 Percentage of operation 100%

**SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS**

23. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

24. Include a **Table of Contents** as the first page of your application package.

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

25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.

- ATTACHMENT A : CURRENT BUSINESS CERTIFICATE
- ATTACHMENT B: PROCESS DESCRIPTION
- ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS
- ATTACHMENT D: PROCESS FLOW DIAGRAM
- ATTACHMENT E: PLOT PLAN
- ATTACHMENT F: AREA MAP
- ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM
- ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS
- ATTACHMENT I: EMISSIONS CALCULATIONS
- ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT
- ATTACHMENT K: ELECTRONIC SUBMITTAL
- ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE
- ATTACHMENT M: SITING CRITERIA WAIVER (NOT INCLUDED)
  
- ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)
- ATTACHMENT O: EMISSIONS SUMMARY SHEETS
- OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE (Equipment Drawings, Aggregation Discussion, etc.) (NOT INCLUDED)

Please mail an original and two copies of the complete General Permit Registration Application with the signature(s) to the DAQ Permitting Section, at the address shown on the front page of this application. Please DO NOT fax permit applications. For questions regarding applications or West Virginia Air Pollution Rules and Regulations, please refer to the website shown on the front page of the application or call the phone number also provided on the front page of the application.

**SECTION IV. CERTIFICATION OF INFORMATION**

This General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of a 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, Emission Inventory, Certified Emission Statement, 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 Registration Application will be returned to the applicant.

FOR A CORPORATION (domestic or foreign)

I certify that I am a President, Vice President, Secretary, Treasurer or in charge of a principal business function of the corporation

FOR A PARTNERSHIP

I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

I certify that I am the President or a member of the Board of Directors

FOR A JOINT VENTURE

I certify that I am the President, General Partner or General Manager

FOR A SOLE PROPRIETORSHIP

I certify that I am the Owner and Proprietor

I hereby certify that (please print or type) \_\_\_\_\_  
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 Office of Air Quality immediately, and/or,

*I hereby certify that all information contained in this 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*

Signature \_\_\_\_\_  
(please use blue ink) Responsible Official Date

Name & Title **Tim Cummings, Director – Operations, AEM**  
(please print or type)

Signature \_\_\_\_\_  
(please use blue ink) Authorized Representative (if applicable) Date

Applicant's Name **American Energy – Marcellus, LLC.**

Phone & Fax **(405) 608-5491**  
Phone Fax

Email **tim.cummings@aep-lp.com**

## Table of Contents

<b>ATTACHMENT A</b>	BUSINESS CERTIFICATE
<b>ATTACHMENT B</b>	PROCESS DESCRIPTION
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<b>ATTACHMENT M</b>	SITTING CRITERIA WAIVER <b>(NOT APPLICABLE)</b>
<b>ATTACHMENT N</b>	SAFETY DATA SHEETS (SDS)
<b>ATTACHMENT O</b>	EMISSION SUMMARY SHEETS
	OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE <b>(NOT APPLICABLE)</b>

# **Attachment A**

# State of West Virginia



## Certificate

*I, Natalie E. Tennant, Secretary of State of the State of West Virginia, hereby certify that*

**AMERICAN ENERGY-MARCELLUS, LLC**

**Control Number: 9A5GM**

a limited liability company, organized under the laws of the State of Oklahoma 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 May 6, 2014, 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 May 6, 2014*

*Natalie E. Tennant*

*Secretary of State*



# **Attachment B**

## **Attachment B**

### **Process Description**

This permit modification application is being filed for American Energy – Marcellus, LLC (AEM) and addresses operational activities associated with the WJ Criswell 405 natural gas production site. Incoming raw natural gas from the three (3) wells. The raw gas is first routed through the 1.5 MMBtu/hr gas production units (GPUs) (GPU-1 to GPU-3) where the first stage of fluid separation occurs. The GPUs separate the well stream flow into a high pressure natural gas sales stream and condensate liquid stream. In the second stage of separation, the liquid streams are routed through three (3) 1.5 MMBtu/hr line heaters (HTR-1 to HTR-3) to aid in the downstream separation process. The fluids are then routed to the 1.0 MMBtu/hr low pressure flash separator (SEP-1) where condensate and produced water are separated. The flash from the low pressure separator is captured via flash gas compressors driven by a natural gas-fired engine (ENG-1) and routed to the sales gas pipeline. Produced water from the flash separator is routed to three (3) 400-bbl produced water storage tanks (PTK-1 to PTK-3). The condensate from the flash separator is routed to the three (3) 400-bbl condensate storage tanks (CTK-1 to CTK-3).

The natural gas stream will exit the facility for transmission via pipeline. Condensate and produced water are transported offsite via tank truck. Flashing, working, and breathing, emissions from the three (3) 400-bbl produced water storage tanks and three (3) 400-bbl condensate storage tanks will be routed to the enclosed combustion device (18C). Tank truck loading operations from the produced water loading operations (TRL 1) and the condensate loading operations (TRL 2) will be vapor balanced to the tanks and controlled by the enclosed combustion device (18C).

AEP requests to maintain the permitted 1,200 bbl/day condensate stabilizer with a 0.75 MMBtu/hr burner assembly (CS-1). The condensate stabilizer raises the temperature of the condensate and drives off hydrocarbons. These hydrocarbons are then transferred under pressure to the natural gas liquids (NGL) tank on site. The depleted condensate stream is transferred to the three (3) 400-bbl condensate storage tanks.

Based upon current observed daily condensate production, AEM does not expect the quantity of condensate production that would justify the operation of the condensate stabilizer. AEM is filling this application to account for the loading of the condensate tank directly from the flash separator. At this time, AEM requests that the condensate

stabilizer remain an authorized emission source. With this permitting approach, AEM is reasonably conservative in its permitting actions and has the authorization to operate the condensate stabilizer should field conditions deem it necessary.

AEP will also add one (1) 47 bhp Hipower prime-power natural gas generator (ENG-2) for facility electrical generation.

A process flow diagram is included as Attachment D.

# **Attachment C**

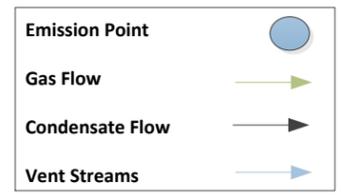
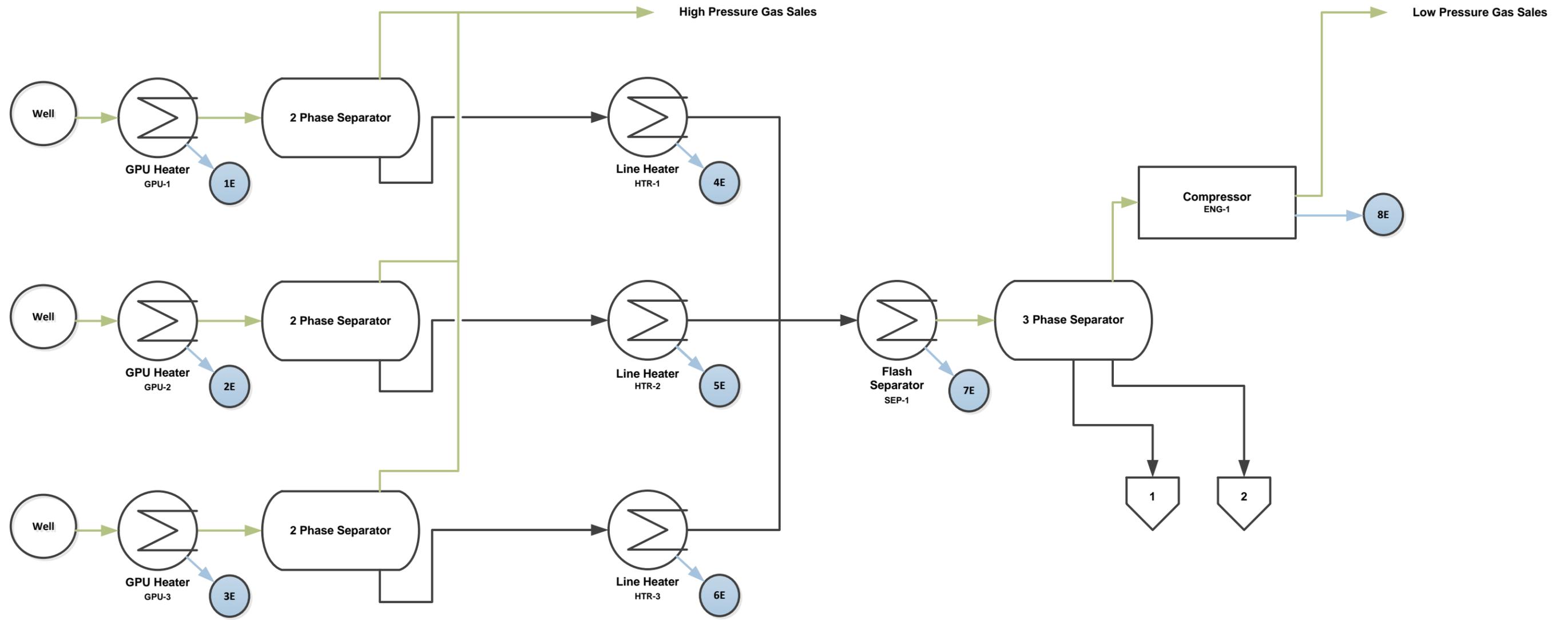
## **Attachment C**

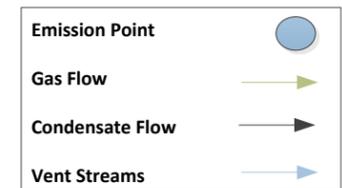
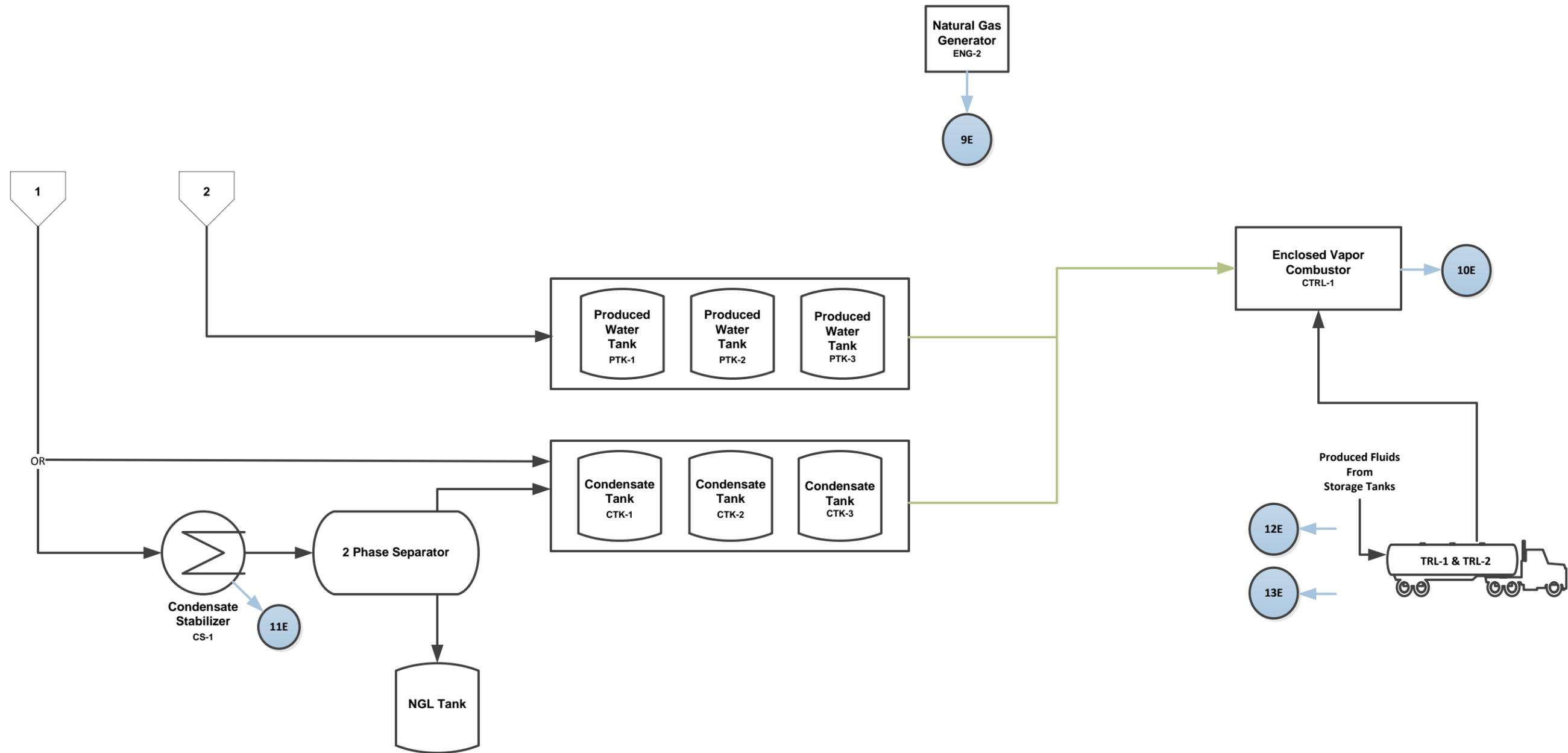
### **G70-A General Permit Description of Fugitive Emissions**

This permit application is being filed for American Energy – Marcellus, LLC (AEM) and addresses operational activities associated with the WJ Criswell 405 natural gas production site. Fugitive emissions on the site are generated from a number of sources, including an unpaved haul road and equipment leaks. These fugitive emission sources cannot be controlled by air pollution control devices. Emission levels for fugitive emissions were calculated using AP-42 emission factors, results of a gas analysis, and 40 CFR 98 Subpart W factors and equipment counts. A summary of the fugitive emissions on the WJ Criswell 405 natural gas production site can be found in Attachment O – Emissions Summary Sheet.

# **Attachment D**

**Attachment D**  
**WJ Criswell 405 Natural Gas Production**  
**Process Flow Diagram**



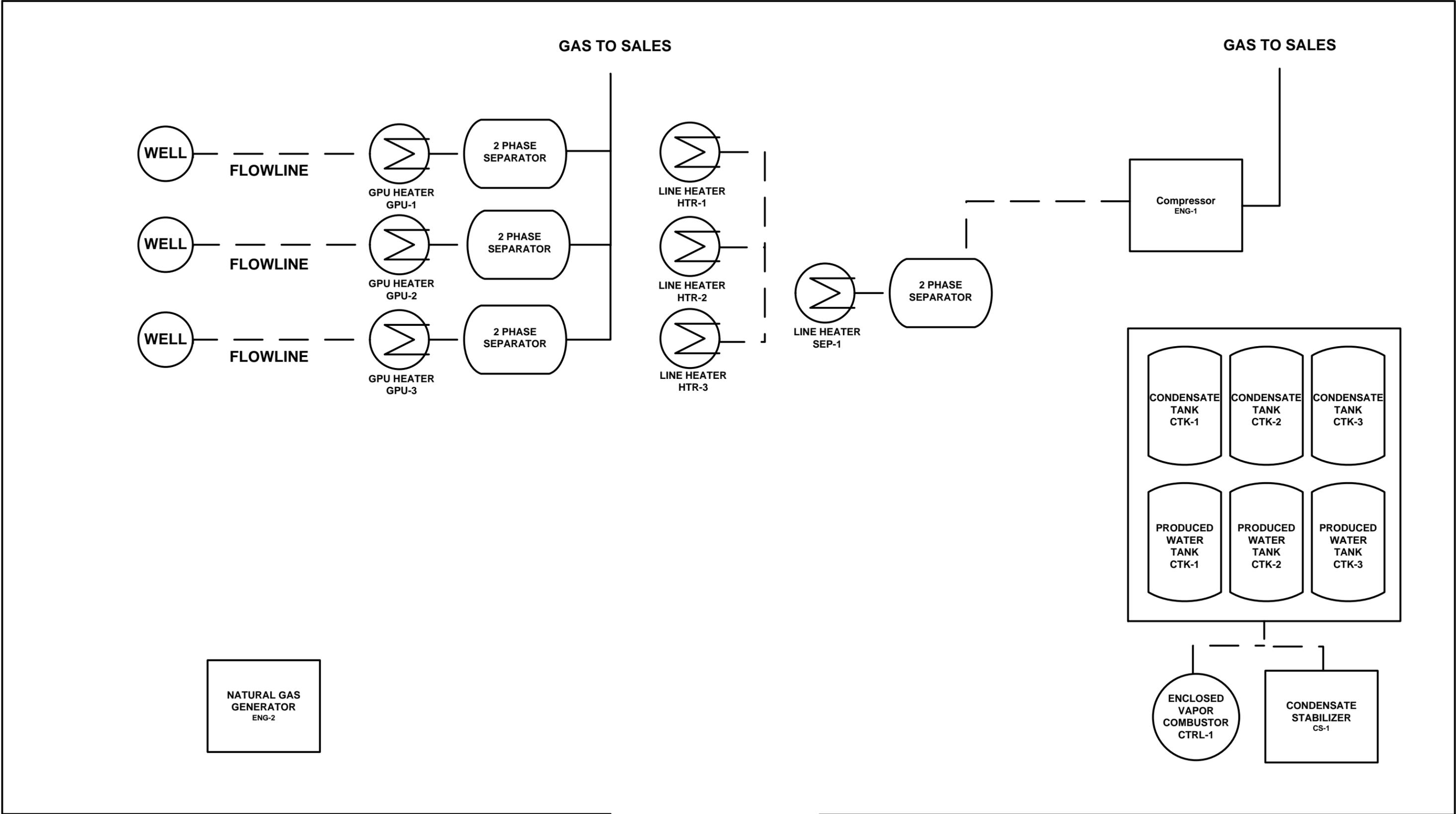


# **Attachment E**

Attachment E

Plot Plan

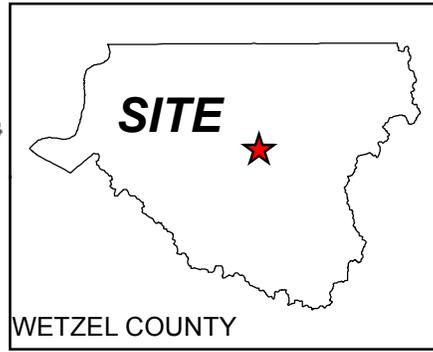
WJ Criswell 405 Natural Gas Production Site



# **Attachment F**

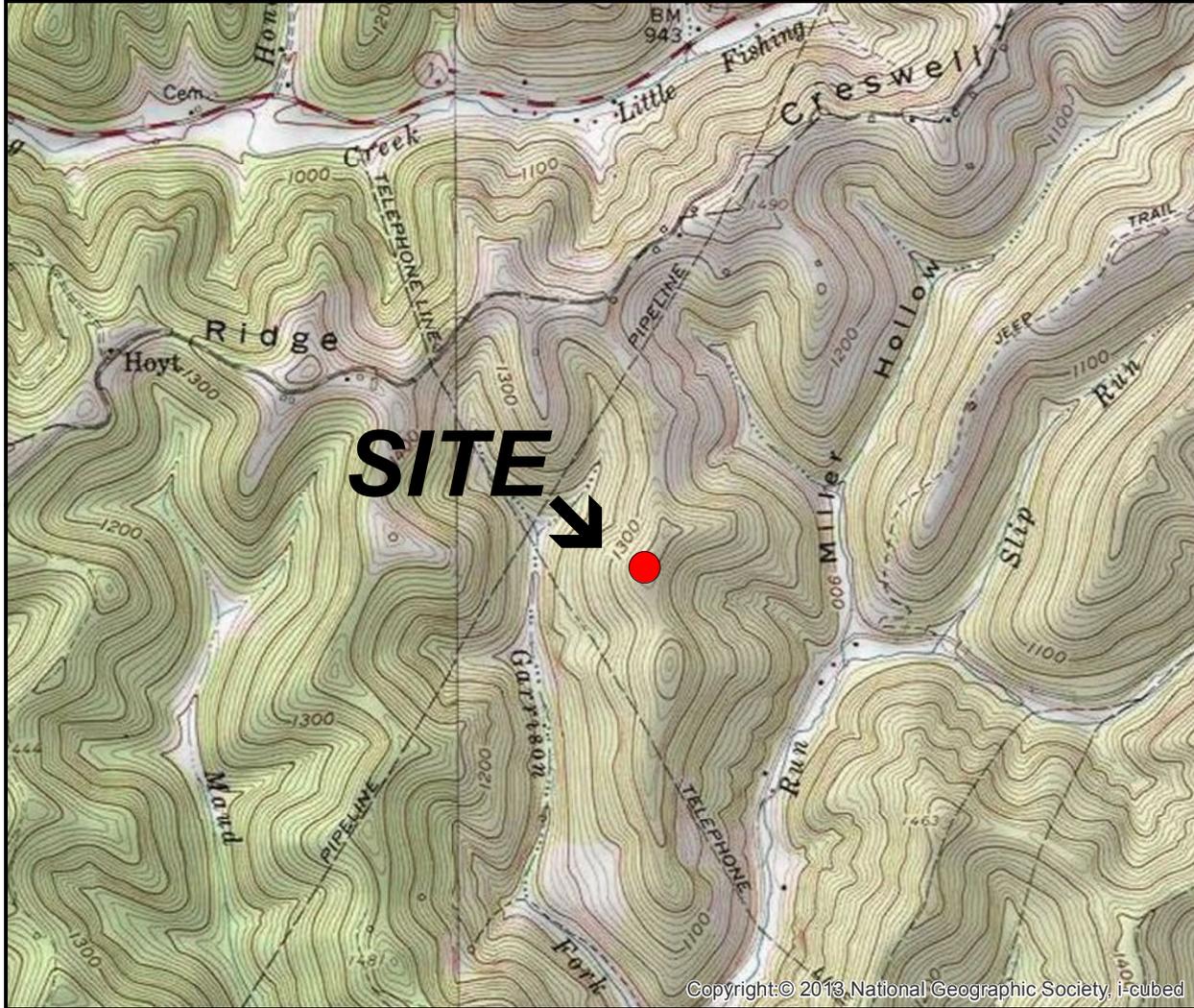


WEST VIRGINIA



WETZEL COUNTY

LAT. 39.607357 LONG. -80.618428  
 WILEYVILLE TOWNSHIP  
 WETZEL COUNTY  
 WEST VIRGINIA



## SITE LOCATION MAP

USGS 24K QUAD GRID  
 PINE GROVE & BIG RUN



### AMERICAN ENERGY MARCELLUS, LLC

WJ CRISWELL 405 WELL PAD

WILEYVILLE TOWNSHIP  
 WETZEL COUNTY, WEST VIRGINIA

Review JS

CHK'D JS

0293766

Drawn By  
 FB 4/2/15

Environmental Resources Management

ATTACHMENT F

# **Attachment G**

**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 <sup>1</sup>	Emission Point ID <sup>2</sup>	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type <sup>3</sup> and Date of Change	Control Device <sup>4</sup>
GPU-1, GPU-2, GPU-3	1E-3E	Three (3) GPU Burners	2015	1.5 MMBtu/hr each	Modification	N/A
HTR1, HTR-2, HTR3	4E-6E	Three (3) Line Heaters	2015	1.5 MMBtu/hr each	New	N/A
SEP-1	7E	One (1) Flash Separator Heater	2015	1.0 MBtu/hr	No Change	N/A
ENG-1	8E	One (1) Reciprocating Natural Gas Compressor Engine – USA Compression	2015	203 bhp	No Change	NSCR Catalytic Converter
ENG-2	9E	One (1) Reciprocating Natural Gas Generator Engine – Hipower (EPA Certified)	2015	47 bhp	New	N/A
PTK-1, PTK-2, PTK-3	10E	Three (3) Produced Water Tanks	2015	400 bbl each	No Change	Enclosed Combustor (CTRL-1)
CTK-1, CTK-2, CTK-3	10E	Three (3) Condensate Tanks	2015	400 bbl each	No Change	Enclosed Combustor (CTRL-1)
TRL-1	10E	Condensate Truck Loading	2015	195 bbl/day	Modification – Routed to Control Device	Enclosed Combustor (CTRL-1)
TRL-2	10E	Produced Water Truck Loading	2015	195 bbl/day	Modification – Routed to Control Device	Enclosed Combustor (CTRL-1)
CTRL-1	10E	Enclosed Combustion Device	2015	18.42 MMBtu/hr	No Change	N/A
CS-1	11E	One (1) Condensate Stabilizer	2015	0.75 MMBtu/hr	No Change	N/A
TRL-1	12E	Condensate Truck Loading	2015	195 bbl/day	Modification	N/A
TRL-2	13E	Produced Water Truck Loading	2015	195 bbl/day	Modification	N/A

<sup>1</sup> For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S,... or other appropriate designation.

<sup>2</sup> For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.

<sup>3</sup> New, modification, removal

<sup>4</sup> For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

## NATURAL GAS WELL AFFECTED FACILITY DATA SHEET

*Complete this data sheet if you are the owner or operator of a gas well affected facility for which construction, modification, or reconstruction commenced after August 23, 2011. This form must be completed for natural gas well affected facilities regardless of when flowback operations occur (or have occurred).*

Please provide the API number(s) for each NG well at this facility:	
47-103-02974	
47-103-02977	
47-103-02978	

*Note: This is the same API well number(s) provided in the well completion notification and as provided to the WVDEP, Office of Oil and Gas for the well permit. The API number may be provided on the application without the state code (047).*

*Every oil and gas well permitted in West Virginia since 1929 has been issued an API (American Petroleum Institute) number. This API is used by agencies to identify and track oil and gas wells.*

*The API number has the following format: 047-001-00001*

*Where,*

*047 = State code. The state code for WV is 047.*

*001 = County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).*

*00001= Well number. Each well will have a unique well number.*

## NATURAL GAS FIRED FUEL BURNING UNITS EMISSION DATA SHEET

*Complete the information on this data for each Gas Producing Unit(s), Heater Treater(s), and in-line heater(s) at the production pad. Reboiler information should be entered on the Glycol Dehydration Emission Unit Data Sheet.*

Emission Unit ID # <sup>1</sup>	Emission Point ID# <sup>2</sup>	Emission Unit Description (Manufacturer / Model #)	Year Installed/ Modified	Type <sup>3</sup> and Date of Change	Control Device <sup>4</sup>	Design Heat Input (mmBtu/hr) <sup>5</sup>	Fuel Heating Value (Btu/scf) <sup>6</sup>
GPU-1, GPU-2, GPU-3	1E-3E	Three (3) GPU Burners - Valerus	2015	Modification	N/A	1.5	1,285
HTR-1, HTR-2, HTR-3	4E-6E	Three (3) Line heaters	2015	New	N/A	1.5	1,285
CS-1	11E	One (1) Condensate Stabilizer Burner	2015	No Change	N/A	0.75	1,285

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

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

<sup>3</sup> New, modification, removal

<sup>4</sup> Complete appropriate air pollution control device sheet for any control device.

<sup>5</sup> Enter design heat input capacity in mmBtu/hr.

<sup>6</sup> Enter the fuel heating value in Btu/standard cubic foot.

## NATURAL GAS-FIRED COMPRESSOR ENGINE (RICE) EMISSION UNIT DATA SHEET

*Complete this section for any natural gas-fired reciprocating internal combustion engine.*

Emission Unit (Source) ID No. <sup>1</sup>		ENG-2	
Emission Point ID No. <sup>2</sup>		9E	
Engine Manufacturer and Model		Hipower HRGM 30 T6	
Manufacturer's Rated bhp/rpm		47 bhp / 1,800 rpm	
Source Status <sup>3</sup>		NS	
Date Installed/Modified/Removed <sup>4</sup>		2015	
Engine Manufactured/Reconstruction Date <sup>5</sup>		2014	
Is this engine subject to 40CFR60, Subpart JJJJ?		Yes	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60, Subpart JJJJ? (Yes or No) <sup>6</sup>		Yes	
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		No	
Engine, Fuel and Combustion Data	Engine Type <sup>7</sup>	LB4S	
	APCD Type <sup>8</sup>	None	
	Fuel Type <sup>9</sup>	PQ	
	H <sub>2</sub> S (gr/100 scf)	0.25	
	Operating bhp/rpm	47 bhp / 1,800 rpm	
	BSFC (Btu/bhp-hr)	10,936	
	Fuel throughput (ft <sup>3</sup> /hr)	400	
	Fuel throughput (MMft <sup>3</sup> /yr)	3.5	
	Operation (hrs/yr)	8,760	
Reference <sup>10</sup>	Potential Emissions <sup>11</sup>	lbs/hr	tons/yr
AP-42	NO <sub>x</sub>	0.37	1.63
AP-42	CO	0.61	2.68
AP-42	VOC	0.37	1.63
AP-42	SO <sub>2</sub>	<0.001	0.001
AP-42	PM <sub>10</sub>	0.01	0.02
AP-42	Formaldehyde	0.03	0.119
MRR <sup>12</sup>	Proposed Monitoring:	AEM will comply with all monitoring requirements set forth in the issued permit.	
	Proposed Recordkeeping:	AEM will comply with all recordkeeping requirements set forth in the issued permit.	
	Proposed Reporting:	AEM will comply with all reporting requirements set forth in the issued permit.	

**Instructions for completing the Engine Emission Unit Data Sheet:**

## TANK TRUCK LOADING EMISSION UNIT DATA SHEET

*Furnish the following information for each new or modified bulk liquid transfer area or loading rack at the natural gas production pad.  
This form is to be used for bulk liquid transfer operations to tank trucks.*

1. Emission Unit ID: <b>TRL-1</b> <b>(Condensate)</b>		2. Emission Point ID: <b>10E</b>		3. Year Installed/ Modified: <b>2015</b>	
4. Emission Unit Description: <b>Condensate Truck Loading</b>					
5. Loading Area Data: <b>Adjacent to tanks</b>					
5A. Number of pumps: <b>1</b>		5B. Number of liquids loaded: <b>1</b>		5C. Maximum number of tank trucks loading at one time: <b>1</b>	
6. Describe cleaning location, compounds and procedure for tank trucks: Transfer point is kept clear of debris. Lines are kept in good working order.					
7. Are tank trucks pressure tested for leaks at this or any other location? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If YES, describe: N/A – Cargo vessels are pressure tested in accordance with DOT requirements, if applicable.					
8. Projected Maximum Operating Schedule (for rack or transfer point as a whole):					
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.	
hours/day	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	
days/week	<b>7</b>	<b>7</b>	<b>7</b>	<b>7</b>	

9. Bulk Liquid Data ( <i>add pages as necessary</i> ):			
Liquid Name	<b>Condensate Liquids</b>		
Max. daily throughput (1000 gal/day)	<b>2.94</b>		
Max. annual throughput (1000 gal/yr)	<b>2,989.35</b>		
Loading Method <sup>1</sup>	<b>SUB</b>		
Max. Fill Rate (gal/min)	<b>5.7</b>		
Average Fill Time (min/loading)	<b>60</b>		
Max. Bulk Liquid Temperature (°F)	<b>50</b>		
True Vapor Pressure <sup>2</sup>	<b>8.13</b>		
Cargo Vessel Condition <sup>3</sup>	<b>U</b>		
Control Equipment or Method <sup>4</sup>	<b>ECD</b>		
Minimum collection efficiency (%)	<b>70%</b>		
Minimum control efficiency (%)	<b>98%</b>		
<i>* Continued on next page</i>			

Maximum Emission Rate	Loading (lb/hr)	<b>1.03</b>		
	Annual (ton/yr)	<b>4.52</b>		
Estimation Method <sup>5</sup>		<b>EPA</b>		
Notes:				
<sup>1</sup> BF = Bottom Fill    SP = Splash Fill    SUB = Submerged Fill				
<sup>2</sup> At maximum bulk liquid temperature				
<sup>3</sup> B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)				
<sup>4</sup> List as many as apply (complete and submit appropriate <i>Air Pollution Control Device Sheets as Attachment "H"</i> ): CA = Carbon Adsorption VB = Dedicated Vapor Balance (closed system) ECD = Enclosed Combustion Device F = Flare TO = Thermal Oxidation or Incineration				
<sup>5</sup> EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)				

<b>10. Proposed Monitoring, Recordkeeping, Reporting, and Testing</b>	
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.	
<p>MONITORING <i>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.</i></p> <p><b>The loadout operation will be visual monitored during the procedure.</b></p>	<p>RECORDKEEPING <i>Please describe the proposed recordkeeping that will accompany the monitoring.</i></p> <p><b>Records will be kept of the amount of liquids transferred, as well as the frequency of the operation.</b></p>
<p>REPORTING <i>Please describe the proposed frequency of reporting of the recordkeeping.</i></p> <p><b>Reporting of records will be performed as required by permit standards.</b></p>	<p>TESTING <i>Please describe any proposed emissions testing for this process equipment/air pollution control device.</i></p> <p><b>Testing will be performed as required by applicable standards.</b></p>
11. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty:	
N/A	

## TANK TRUCK LOADING EMISSION UNIT DATA SHEET

*Furnish the following information for each new or modified bulk liquid transfer area or loading rack at the natural gas production pad.  
This form is to be used for bulk liquid transfer operations to tank trucks.*

1. Emission Unit ID: <b>TRL-2</b> <b>(Produced Water)</b>	2. Emission Point ID: <b>10E</b>	3. Year Installed/ Modified: <b>2015</b>		
4. Emission Unit Description: <b>The emissions from truck loading.</b>				
5. Loading Area Data: <b>Adjacent to tanks</b>				
5A. Number of pumps: <b>1</b>	5B. Number of liquids loaded: <b>1</b>	5C. Maximum number of tank trucks loading at one time: <b>1</b>		
6. Describe cleaning location, compounds and procedure for tank trucks: Transfer point is kept clear of debris. Lines are kept in good working order.				
7. Are tank trucks pressure tested for leaks at this or any other location? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If YES, describe: Cargo vessels are pressure tested in accordance with DOT requirements, if applicable.				
8. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>
days/week	<b>7</b>	<b>7</b>	<b>7</b>	<b>7</b>

9. Bulk Liquid Data ( <i>add pages as necessary</i> ):			
Liquid Name	<b>Produced Water</b>		
Max. daily throughput (1000 gal/day)	<b>8.19</b>		
Max. annual throughput (1000 gal/yr)	<b>2,989.35</b>		
Loading Method <sup>1</sup>	<b>SUB</b>		
Max. Fill Rate (gal/min)	<b>5.7</b>		
Average Fill Time (min/loading)	<b>60</b>		
Max. Bulk Liquid Temperature (°F)	<b>50</b>		
True Vapor Pressure <sup>2</sup>	<b>0.2422</b>		
Cargo Vessel Condition <sup>3</sup>	<b>C</b>		
Control Equipment or Method <sup>4</sup>	<b>ECD</b>		
Minimum collection efficiency (%)	<b>70%</b>		
Minimum control efficiency (%)	<b>98%</b>		
<i>* Continued on next page</i>			

Maximum Emission Rate	Loading (lb/hr)	<b>0.02</b>		
	Annual (ton/yr)	<b>0.07</b>		
Estimation Method <sup>5</sup>		<b>EPA</b>		
Notes:				
<sup>1</sup> BF = Bottom Fill    SP = Splash Fill    SUB = Submerged Fill				
<sup>2</sup> At maximum bulk liquid temperature				
<sup>3</sup> B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)				
<sup>4</sup> List as many as apply (complete and submit appropriate <i>Air Pollution Control Device Sheets as Attachment "H"</i> ): CA = Carbon Adsorption VB = Dedicated Vapor Balance (closed system) ECD = Enclosed Combustion Device F = Flare TO = Thermal Oxidation or Incineration				
<sup>5</sup> EPA = EPA Emission Factor as stated in AP-42 MB = Material Balance TM = Test Measurement based upon test data submittal O = other (describe)				

<b>10. Proposed Monitoring, Recordkeeping, Reporting, and Testing</b> 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.	
<p>MONITORING <i>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.</i></p> <p><b>The loadout operation will be visual monitored during the procedure.</b></p>	<p>RECORDKEEPING <i>Please describe the proposed recordkeeping that will accompany the monitoring.</i></p> <p><b>Records will be kept of the amount of liquids transferred, as well as the frequency of the operation. Produced Water truck tickets will be maintained. Production data will be recorded.</b></p>
<p>REPORTING <i>Please describe the proposed frequency of reporting of the recordkeeping.</i></p> <p><b>Reporting of records will be performed as required by permit standards.</b></p>	<p>TESTING <i>Please describe any proposed emissions testing for this process equipment/air pollution control device.</i></p> <p><b>Testing will be performed as required by applicable standards.</b></p>
<p>11. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty:</p> <p><b>N/A</b></p>	

# STORAGE VESSEL EMISSION UNIT DATA SHEET

*Provide the following information for each new or modified bulk liquid storage tank.*

## I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name <b>Condensate Storage</b>	2. Tank Name <b>Three (3) 400 bbl Condensate Storage Tanks</b>
3. Emission Unit ID number <b>CTK-1, CTK-2, CTK-3</b>	4. Emission Point ID number <b>10E &amp; 12E</b>
5. Date Installed or Modified ( <i>for existing tanks</i> ) <b>2015</b>	6. Type of change: <input type="checkbox"/> New construction <input type="checkbox"/> New stored material <input checked="" type="checkbox"/> Other
7A. Description of Tank Modification ( <i>if applicable</i> )	
7B. Will more than one material be stored in this tank? <i>If so, a separate form must be completed for each material.</i> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.) <b>N/A</b>	

## II. TANK INFORMATION (required)

8. Design Capacity ( <i>specify barrels or gallons</i> ). Use the internal cross-sectional area multiplied by internal height. <b>400 bbl</b>	
9A. Tank Internal Diameter (ft.) <b>12</b>	9B. Tank Internal Height (ft.) <b>20</b>
10A. Maximum Liquid Height (ft.) <b>18</b>	10B. Average Liquid Height (ft.) <b>10</b>
11A. Maximum Vapor Space Height (ft.) <b>20</b>	11B. Average Vapor Space Height (ft.) <b>10</b>
12. Nominal Capacity ( <i>specify barrels or gallons</i> ). This is also known as "working volume." <b>16,000</b>	
13A. Maximum annual throughput (gal/yr) <b>1,073,100</b>	13B. Maximum daily throughput (gal/day) <b>2,940</b>
14. Number of tank turnovers per year <b>68</b>	15. Maximum tank fill rate (gal/min) <b>2.04</b>
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Is the tank system a variable vapor space system? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical                      ___ horizontal                      ___ flat roof <input checked="" type="checkbox"/> cone roof                      ___ dome roof                      ___ other (describe)  <input type="checkbox"/> External Floating Roof                      ___ pontoon roof                      ___ double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof                      ___ vertical column support                      ___ self-supporting <input type="checkbox"/> Variable Vapor Space                      ___ lifter roof                      ___ diaphragm <input type="checkbox"/> Pressurized                      ___ spherical                      ___ cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

## III. TANK CONSTRUCTION AND OPERATION INFORMATION (*check which one applies*)

<input type="checkbox"/> Refer to enclosed TANKS Summary Sheets
<input checked="" type="checkbox"/> Refer to the responses to items 19 – 26 in section VII

## IV. SITE INFORMATION (*check which one applies*)

<input type="checkbox"/> Refer to enclosed TANKS Summary Sheets
<input checked="" type="checkbox"/> Refer to the responses to items 27 – 33 in section VII

## V. LIQUID INFORMATION (*check which one applies*)

<input type="checkbox"/> Refer to enclosed TANKS Summary Sheets
---



26C. Deck seam. Continuous sheet construction: <input type="checkbox"/> 5 ft. wide <input type="checkbox"/> 6 ft. wide <input type="checkbox"/> 7 ft. wide <input type="checkbox"/> 5 x 7.5 ft. wide <input type="checkbox"/> 5 x 12 ft. wide <input type="checkbox"/> other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft <sup>2</sup> ):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
<b>SITE INFORMATION:</b>			
27. Provide the city and state on which the data in this section are based: Pittsburgh, Pa			
28. Daily Avg. Ambient Temperature (°F): <b>65</b>		29. Annual Avg. Maximum Temperature (°F): <b>70</b>	
30. Annual Avg. Minimum Temperature (°F): <b>55</b>		31. Avg. Wind Speed (mph): <b>5</b>	
32. Annual Avg. Solar Insulation Factor (BTU/ft <sup>2</sup> -day): <b>1,202</b>		33. Atmospheric Pressure (psia): <b>14.11</b>	
<b>LIQUID INFORMATION:</b>			
34. Avg. daily temperature range of bulk liquid (°F): <b>65</b>	34A. Minimum (°F): <b>55</b>	34B. Maximum (°F): <b>70</b>	
35. Avg. operating pressure range of tank (psig): <b>5.9</b>	35A. Minimum (psig): <b>5.4</b>	35B. Maximum (psig): <b>6.5</b>	
36A. Minimum liquid surface temperature (°F): <b>47</b>		36B. Corresponding vapor pressure (psia): <b>5.4</b>	
37A. Avg. liquid surface temperature (°F): <b>50</b>		37B. Corresponding vapor pressure (psia): <b>5.9</b>	
38A. Maximum liquid surface temperature (°F): <b>56</b>		38B. Corresponding vapor pressure (psia): <b>6.5</b>	
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:	<b>Condensate</b>		
39B. CAS number:	<b>68919-39-1</b>		
39C. Liquid density (lb/gal):	<b>5</b>		
39D. Liquid molecular weight (lb/lb-mole):	<b>96.24</b>		
39E. Vapor molecular weight (lb/lb-mole):	<b>49.6</b>		
39F. Maximum true vapor pressure (psia):	<b>1.12</b>		
39G. Maxim Reid vapor pressure (psia):	<b>12.5</b>		
39H. Months Storage per year. From: To:	<b>January - December</b>		

# STORAGE VESSEL EMISSION UNIT DATA SHEET

*Provide the following information for each new or modified bulk liquid storage tank.*

## I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name <b>Produced Water Storage</b>	2. Tank Name <b>Three (3) 400 bbl Produced Water Storage Tanks</b>
3. Emission Unit ID number <b>PTK-1, PTK-2, PTK-3</b>	4. Emission Point ID number <b>10E &amp; 13E</b>
5. Date Installed or Modified ( <i>for existing tanks</i> ) <b>2015</b>	6. Type of change: <input type="checkbox"/> New construction <input type="checkbox"/> New stored material <input checked="" type="checkbox"/> Other
7A. Description of Tank Modification ( <i>if applicable</i> )	
7B. Will more than one material be stored in this tank? <i>If so, a separate form must be completed for each material.</i> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.) <b>N/A</b>	

## II. TANK INFORMATION (required)

8. Design Capacity ( <i>specify barrels or gallons</i> ). Use the internal cross-sectional area multiplied by internal height. <b>400 bbl</b>	
9A. Tank Internal Diameter (ft.) <b>12</b>	9B. Tank Internal Height (ft.) <b>20</b>
10A. Maximum Liquid Height (ft.) <b>18</b>	10B. Average Liquid Height (ft.) <b>10</b>
11A. Maximum Vapor Space Height (ft.) <b>20</b>	11B. Average Vapor Space Height (ft.) <b>10</b>
12. Nominal Capacity ( <i>specify barrels or gallons</i> ). This is also known as "working volume." <b>16,000</b>	
13A. Maximum annual throughput (gal/yr) <b>2,989,350</b>	13B. Maximum daily throughput (gal/day) <b>8,190</b>
14. Number of tank turnovers per year <b>187</b>	15. Maximum tank fill rate (gal/min) <b>5.7</b>
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Is the tank system a variable vapor space system? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical <input type="checkbox"/> horizontal <input type="checkbox"/> flat roof <input checked="" type="checkbox"/> cone roof <input type="checkbox"/> dome roof <input type="checkbox"/> other (describe)  <input type="checkbox"/> External Floating Roof <input type="checkbox"/> pontoon roof <input type="checkbox"/> double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof <input type="checkbox"/> vertical column support <input type="checkbox"/> self-supporting <input type="checkbox"/> Variable Vapor Space <input type="checkbox"/> lifter roof <input type="checkbox"/> diaphragm <input type="checkbox"/> Pressurized <input type="checkbox"/> spherical <input type="checkbox"/> cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

## III. TANK CONSTRUCTION AND OPERATION INFORMATION (*check which one applies*)

<input type="checkbox"/> Refer to enclosed TANKS Summary Sheets
<input checked="" type="checkbox"/> Refer to the responses to items 19 – 26 in section VII

## IV. SITE INFORMATION (*check which one applies*)

<input type="checkbox"/> Refer to enclosed TANKS Summary Sheets
<input checked="" type="checkbox"/> Refer to the responses to items 27 – 33 in section VII

## V. LIQUID INFORMATION (*check which one applies*)

<input type="checkbox"/> Refer to enclosed TANKS Summary Sheets
---



26C. Deck seam. Continuous sheet construction: <input type="checkbox"/> 5 ft. wide <input type="checkbox"/> 6 ft. wide <input type="checkbox"/> 7 ft. wide <input type="checkbox"/> 5 x 7.5 ft. wide <input type="checkbox"/> 5 x 12 ft. wide <input type="checkbox"/> other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft <sup>2</sup> ):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
<b>SITE INFORMATION:</b>			
27. Provide the city and state on which the data in this section are based: Pittsburgh, Pa			
28. Daily Avg. Ambient Temperature (°F): <b>65</b>		29. Annual Avg. Maximum Temperature (°F): <b>70</b>	
30. Annual Avg. Minimum Temperature (°F): <b>55</b>		31. Avg. Wind Speed (mph): <b>5</b>	
32. Annual Avg. Solar Insulation Factor (BTU/ft <sup>2</sup> -day): <b>1,202</b>		33. Atmospheric Pressure (psia): <b>14.11</b>	
<b>LIQUID INFORMATION:</b>			
34. Avg. daily temperature range of bulk liquid (°F): <b>65</b>	34A. Minimum (°F): <b>55</b>	34B. Maximum (°F): <b>70</b>	
35. Avg. operating pressure range of tank (psig): <b>5.9</b>	35A. Minimum (psig): <b>5.4</b>	35B. Maximum (psig): <b>6.5</b>	
36A. Minimum liquid surface temperature (°F): <b>47</b>		36B. Corresponding vapor pressure (psia): <b>5.4</b>	
37A. Avg. liquid surface temperature (°F): <b>50</b>		37B. Corresponding vapor pressure (psia): <b>5.9</b>	
38A. Maximum liquid surface temperature (°F): <b>56</b>		38B. Corresponding vapor pressure (psia): <b>6.5</b>	
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:	<b>Produced Water</b>		
39B. CAS number:			
39C. Liquid density (lb/gal):	<b>5</b>		
39D. Liquid molecular weight (lb/lb-mole):	<b>18.02</b>		
39E. Vapor molecular weight (lb/lb-mole):	<b>18.02</b>		
39F. Maximum true vapor pressure (psia):	<b>NA</b>		
39G. Maxim Reid vapor pressure (psia):	<b>NA</b>		
39H. Months Storage per year. From: To:	<b>January - December</b>		

# **Attachment H**

# AIR POLLUTION CONTROL DEVICE

## Vapor Combustion Control Device Sheet

*Complete this vapor combustion control device sheet for each enclosed combustion device, flare, thermal oxidizer, or completion combustion device that is located at the natural gas production pad for the purpose of thermally destructing waste gas to control emissions of regulated pollutants to the atmosphere.*

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS FORM BEFORE COMPLETING.**

### General Information

1. Control Device ID#: <b>CTRL-1 / 10E</b>		2. Installation Date: <b>01/2015</b> <input type="checkbox"/> New	
3. Maximum Rated Total Flow Capacity: <b>200,000 scfd</b>	4. Maximum Design Heat Input: <b>18.42 MMBtu/hr</b>	5. Design Heat Content: <b>2,200 BTU/scf</b>	

### Control Device Information

6. Select the type of vapor combustion control device being used:  Enclosed Combustion Device  
 Elevated Flare  Ground Flare  Thermal Oxidizer  Completion Combustion Device

7. Manufacturer: <b>National Oilwell Varco (NOV)</b> Model No.: <b>MEVC200</b>	8. Hours of operation per year: <b>8,760</b>
---	--

9. List the emission units whose emissions are controlled by this vapor combustion control device:

10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
PTK-1	Produced Water Tank	CTK-3	Condensate Tank
PTK-2	Produced Water Tank	TRL-1	Produced Water Truck Loading
PTK-3	Produced Water Tank	TRL-2	Condensate Truck Loading
CTK-1	Condensate Tank		
CTK-2	Condensate Tank		

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

11. Assist Type	12. Flare Height	13. Tip Diameter	14. Was the design per §60.18?
<input type="checkbox"/> Steam - <input type="checkbox"/> Air - <input type="checkbox"/> Pressure - <input checked="" type="checkbox"/> Non -	<b>20 ft</b>	<b>N/A ft</b>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

### Waste Gas Information

15. Maximum waste gas flow rate (scfm):	16. Heat value of waste gas stream (BTU/ft3)	17. Temperature of the emissions stream (°F)	18. Exit Velocity of the emissions stream (ft/s)
<b>139.6</b>	<b>2,200</b>	<b>1,400 – 2,100</b>	<b>N/A</b>

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

Pilot Information				
20. Type/Grade of pilot fuel:	21. Number of pilot lights:	22. Fuel flow rate to pilot flame per pilot (scf/hr):	23. Heat input per pilot (BTU/hr):	24. Will automatic re-ignition be used?
Natural Gas	Continuous Pilot	13.6	17,500	<input type="checkbox"/> Yes <input type="checkbox"/> No
25. If automatic re-ignition will be used, describe the method:				
26. Describe the method of controlling flame: <b>Smokeless Capacity</b>				
27. Is pilot flame equipped with a monitor to detect the presence of the flame?  <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		28. If yes, what type? <input checked="" type="checkbox"/> Thermocouple <input type="checkbox"/> Infra-Red <input type="checkbox"/> Ultra Violet <input type="checkbox"/> Camera with monitoring control room <input type="checkbox"/> Other, describe:		

29. Pollutant(s) Controlled	30. % Capture Efficiency	31. Manufacturer's Guaranteed Control Efficiency (%)
VOC	98	98
32. Has the control device been tested by the manufacturer and certified? <b>See attached information.</b>		
33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty: <b>See Attached Information</b>		
34. Additional Information Attached? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO  <i>Please attach a copy of manufacturer's data sheet. Please attach a copy of manufacturer's drawing. Please attach a copy of the manufacturer's performance testing.</i>		

**If any of the requested information is not available, please contact the manufacturer.**



**QUOTATION**

**CLIENT: American Energy Partners, LP**

**SUBJECT: Mission Enclosed Vapor Combustor (MEVC200)**

**NOV PROPOSAL: H-14100-14-200 Rev.4**

0	5/19/14	TW	RC	PM	Quotation
REV	DATE	BY	CHECKED	APPROVED	COMMENTS

NOV  
10011 MEADOWGLEN LANE, 2<sup>ND</sup> FLOOR  
HOUSTON, TX 77042  
TEL: 1-713-395-5000 FAX: 1-713-395-5001

**CONTENTS**

**1 COMMERCIAL AND TECHNICAL..... 3**

**1.1 Introduction..... 3**

**1.2 Prices ..... 5**

**1.3 Technical Summary ..... 5**

**1.4 Delivery ..... 6**

**1.5 Commercial Clarifications/Exceptions ..... 6**

**1.6 Quotation Validity ..... 7**

**1.7 Service ..... 7**

**2 ATTACHMENTS ..... 7**

**2.1 NOV Documents..... 7**

## 1 COMMERCIAL AND TECHNICAL

### 1.1 Introduction

In response to your inquiry, NOV is pleased to offer the following proposal for a NOV Mission Enclosed Vapor Combustor (MEVC). The model MEVC200 is capable of 18.42 MMBTU/HR, Medium Temperature Flares (MTF). NOV Mission offers a full line of reliable enclosed combustors for the ever changing requirements of today's regulation filled oil and gas industry. Mission's MEVC design incorporates years of experience with tank vapors with a combustor design which is highly effective, tested and certified "99%" for destruction of vent emissions from oil and condensate tank batteries, loading operations and storage facilities. NOV's stainless steel enclosed flare design is capable of meeting industry regulations while offering significant cost savings. Scalable to customer application, this flare is proven throughout the world. The following items will show the advantages and benefits to incorporating this equipment into the Storage Tank facility:

#### APPLICATIONS

- Associated gas
- Dehydrators
- Pipeline blow down
- Oil and condensate loading facilities
- Equipment maintenance
- Oil and condensate storage tanks

#### FEATURES AND BENEFITS:

- Meets EPA 40 CFR 60.00 regulations
- Remote location solar panel option available
- 98%+ destruction efficiency (independent 3rd party tested)
- Flexible & fully automated and programmable system (additional parameters optional)
- Quad O compliant ready
- Special custom application larger units available
- Low capital and operating costs
- Very high turndown ratio
- Scalable flow rates
- Field proven design
- Only requires 300 btu/ft<sup>3</sup> gas to maintain combustion
- High Temperature Flares (HTF) with 99.99% DRE are also available

Thank you for this opportunity to quote on your combustor needs. Should you have any questions or concerns regarding the commercial terms, the scope of supply offered, or any technical points which may need clarification, please feel free to contact NOV at:

Contact : Pete Magnani  
Email : [pete.magnani@nov.com](mailto:pete.magnani@nov.com)  
Telephone : 1-713-395-5000  
Fax : 1-713-395-5001  
Address : 10011 Meadowglen Lane, 2<sup>nd</sup> Floor  
Houston, TX 77042  
USA

## 1.2 Prices

### Base Unit Price

Item	Description	Quantity	Unit Price (USD)	Total Price (USD)
1	MEVC200, Enclosed Vapor Combustor Flow $\geq$ 40-200MSCFD. Inlet Pressure from 2oz/in2 minimum. 20ft height, 47" OD diameter, and 3" 150#RF connection. Includes the Data logging, pressure transmitter in lieu of pressure switch, and continuous pilot. This includes 14.25" stack extension. This is a DC Control Panel unit. All as described in 1.3 below.	1	\$22,795.00	\$22,795.00

### Accessories

Part No.	Description	Unit Price (USD)
MEVC200-BP	Stainless Steel Bird Screen for MEVC200	\$913.00
MEVC200-KOP	Stainless Steel Condensate Knock Out Pot for MEVC200	\$1,500.00
MEVC200-WG	Galvanized Steel Wind Guard for MEVC200 Air Intake	\$417.00
MEVC200-SP	Skid mounted solar panel and battery backup for MEVC200	\$3,920.00

### Spare Parts

Part No.	Description	Unit Price (USD)
MEVC-CP	Replacement Control Panel for MEVC100	\$3,485.00
MEVC-PT	Replacement Pressure Transmitter for MEVC200	\$535.00
MEVC-TC	Replacement Thermocouple for MEVC200	\$115.00
MEVC-IC	Replacement Ignition Transformer for MEVC200	\$360.00
MEVC-IE	Replacement Ignition Electrode for MEVC200	\$25.00

**All prices are quoted Ex-Works manufacturing facility and exclude all taxes, import duties, freight and/or insurance charges.**

## 1.3 Technical Summary

- **Flare Gas Stream: 5.4 MW MTF:**
  - Type: Enclosed Tank Battery Flare
  - Composition: 2200 btu/ft3 gas
  - Temperature: Ambient to 100°F +/- 20 deg°F
  - Flow Rate: up to 200,000 scfd (based on 2200 BTU /ft3 gas) or 139.6 scfm
  - Auxiliary Fuel Requirements N/A
  - Burner Size 18.42 million BTU/hr (5.4 MW)
  - Inlet Pressure Requirements 2-4 oz/in2 (3.5-7.0 “w.c.)
  - Turndown Ratio 5:1
  - Data points recorded include combustion temperature, operation pressure, and run time
- **Mechanical:**
  - Design Wind Speed 100 mph
  - Ambient Temperature -20 deg F up to 110 deg F
  - Electrical Area Classification General Area Classification (non-hazardous)
  - Elevation Up to 3,000 ft ASL – please advise if higher elevation
- **Process:**
  - Smokeless Capacity 100% Sdf
  - Operating Temperature 1400 deg F to 2100 deg F (1500 deg F Nominal); Retention Time 0.3 sec.
  - Flare Inlet Pressure 2-4 oz/in2 (3.5-7.0 “w.c.)
- **Utilities:**
  - Pilot Gas Process Gas
  - Electricity 24VDC Panel/ 10A (Solar Option) Auxiliary Fuel N/A
  - Instrument air/gas 80 psig for valve actuation.
- **Emissions:**
  - Destruction Efficiency: 98% DRE

## 1.4 Delivery

The delivery for the Equipment listed in NOV Scope of Supply is as follows:

- Delivery:
  - 2-3 weeks ARO, Ex-Works Chattanooga, TN

## 1.5 Commercial Clarifications/Exceptions

- 1.5.1 Terms are net 30 days:
- 100% - Upon notice of readiness to ship.
- 1.5.2 Quoted prices exclude all taxes, import duties, freight and/or insurance charges.
- 1.5.3 Delivery to be confirmed upon acceptance of purchase order.
- 1.5.4 NOV Worldwide Terms and Conditions shall apply.

1.5.7 NOV standard documentation will apply.

**1.6 Quotation Validity**

Validity is 30 days from the date of this proposal.

**1.7 Service**

Available upon request.

**2 ATTACHMENTS**

**2.1 NOV Documents**

- NOV Terms and Conditions

# **Attachment I**

## Line Heaters GPU-1, GPU-2, GPU-3, HTR-1, HTR-2, HTR-3

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source	Boiler Rating (MMBtu/hr)	Heat Value of Natural Gas (Btu/scf)	Annual Operating Hours	Max. Hourly Emissions. (lb/hr)	Max. Annual Emissions. (tpy)
VOC's	5.5	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	0.006	0.03
Hexane	1.8	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	0.002	0.009
Formaldehyde	0.075	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	<0.001	<0.001
Benzene	0.0021	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	<0.001	<0.001
Toluene	0.0034	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	<0.001	<0.001
Pb	0.0005	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	<0.001	<0.001
CO	84	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	0.10	0.43
NOx	100	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	0.12	0.51
PM <sub>10</sub>	7.6	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	0.009	0.04
SO <sub>2</sub>	0.6	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.50	1,285	8,760	<0.001	0.003
CO <sub>2</sub>	53.06	kg CO <sub>2</sub> / MMBtu	40 CFR Subpart C	1.50	1,285	8,760	175.47	768.54
CH <sub>4</sub>	0.001	kg CH <sub>4</sub> / MMBtu	40 CFR Subpart C	1.50	1,285	8,760	0.003	0.01
N <sub>2</sub> O	0.0001	kg N <sub>2</sub> O / MMBtu	40 CFR Subpart C	1.50	1,285	8,760	<0.001	0.001
Total HAPs							0.002	0.010
Total CO <sub>2</sub> e							175.65	769.33

- Notes:**
- Emission rates displayed above represent the maximum hourly and maximum annual emissions for one line heater. Cumulative emission rates for all line heaters are displayed in the Total Site Emissions Table.
  - Greenhouse Gas Emissions are calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.
  - AP-42, Chapter 1.4 references are from the July 1998 revision.
  - Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.
  - CO<sub>2</sub> equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO<sub>2</sub>=1, GWP CH<sub>4</sub>=25, GWP N<sub>2</sub>O=298

**Example Equations:**  
 Max. Hourly Emission Rate (lb/hr) = Emission Factor (lb/10<sup>6</sup> scf) ÷ Heating Value of Natural Gas (Btu/scf) x Boiler Rating (MMBtu/hr)

## Flash Separator SEP-1

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source	Boiler Rating (MMBtu/hr)	Heat Value of Natural Gas (Btu/scf)	Annual Operating Hours	Max. Hourly Emissions. (lb/hr)	Max. Annual Emissions. (tpy)
VOC's	5.5	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	0.004	0.02
Hexane	1.8	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	0.001	0.006
Formaldehyde	0.075	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	<0.001	<0.001
Benzene	0.0021	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	<0.001	<0.001
Toluene	0.0034	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	<0.001	<0.001
Pb	0.0005	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	<0.001	<0.001
CO	84	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	0.07	0.29
NOx	100	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	0.08	0.34
PM <sub>10</sub>	7.6	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	0.006	0.03
SO <sub>2</sub>	0.6	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	1.00	1,285	8,760	<0.001	0.002
CO <sub>2</sub>	53.06	kg CO <sub>2</sub> / MMBtu	40 CFR Subpart C	1.00	1,285	8,760	116.98	512.36
CH <sub>4</sub>	0.001	kg CH <sub>4</sub> / MMBtu	40 CFR Subpart C	1.00	1,285	8,760	0.002	0.01
N <sub>2</sub> O	0.0001	kg N <sub>2</sub> O / MMBtu	40 CFR Subpart C	1.00	1,285	8,760	<0.001	<0.001
Total HAPs							0.001	0.006
Total CO <sub>2</sub> e							117.10	512.89

**Notes:**

- Emission rates displayed above represent the max. hourly and max. annual emissions for one line heater.
- Greenhouse Gas Emissions are calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.
- AP-42, Chapter 1.4 references are from the July 1998 revision.
- Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.
- CO<sub>2</sub> equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO<sub>2</sub>=1, GWP CH<sub>4</sub>=25, GWP N<sub>2</sub>O=298

**Example Equations:**

Max. Hourly Emission Rate (lb/hr) = Emission Factor (lb/10<sup>6</sup> scf) ÷ Heating Value of Natural Gas (Btu/scf) x Boiler Rating (MMBtu/hr)

## Condensate Stabilizer CS-1

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source	Boiler Rating (MMBtu/hr)	Heat Value of Natural Gas (Btu/scf)	Annual Operating Hours	Max. Hourly Emissions. (lb/hr)	Max. Annual Emissions. (tpy)
VOC's	5.5	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	0.003	0.01
Hexane	1.8	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	0.001	0.005
Formaldehyde	0.075	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	<0.001	<0.001
Benzene	0.0021	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	<0.001	<0.001
Toluene	0.0034	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	<0.001	<0.001
Pb	0.0005	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	<0.001	<0.001
CO	84	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	0.05	0.21
NOx	100	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	0.06	0.26
PM <sub>10</sub>	7.6	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	0.004	0.02
SO <sub>2</sub>	0.6	lb/10 <sup>6</sup> scf	AP-42 Chapter 1.4	0.75	1,285	8,760	<0.001	0.002
CO <sub>2</sub>	53.06	kg CO <sub>2</sub> / MMBtu	40 CFR Subpart C	0.75	1,285	8,760	87.73	384.27
CH <sub>4</sub>	0.001	kg CH <sub>4</sub> / MMBtu	40 CFR Subpart C	0.75	1,285	8,760	0.002	0.01
N <sub>2</sub> O	0.0001	kg N <sub>2</sub> O / MMBtu	40 CFR Subpart C	0.75	1,285	8,760	<0.001	<0.001
Total HAPs							0.001	0.005
Total CO <sub>2</sub> e							87.82	384.67

**Notes:**

- Emission rates displayed above represent the max. hourly and max. annual emissions for one line heater.
- Greenhouse Gas Emissions are calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.
- AP-42, Chapter 1.4 references are from the July 1998 revision.
- Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.
- CO<sub>2</sub> equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO<sub>2</sub>=1, GWP CH<sub>4</sub>=25, GWP N<sub>2</sub>O=298

**Example Equations:**

Max. Hourly Emission Rate (lb/hr) = Emission Factor (lb/10<sup>6</sup> scf) ÷ Heating Value of Natural Gas (Btu/scf) x Boiler Rating (MMBtu/hr)

## Natural Gas Generator ENG-2

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source	Engine Rating (bhp)	Fuel Consumption (Btu/bhp-hr)	Heat Value of Natural Gas (Btu/scf)	Annual Operating Hours	Max. Hourly Emissions. (lb/hr)	Max. Annual Emissions. (tpy)
VOC's	3.6	g/bhp-hr	Vendor Guarantee (EPA Certification)	47.0	10,936	1,285	8,760	0.37	1.63
Hexane	1.11E-03	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	<0.001	0.002
Formaldehyde	5.28E-02	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	0.03	0.119
Benzene	4.40E-04	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	<0.001	<0.001
Toluene	4.08E-04	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	<0.001	<0.001
Ethylbenze	3.97E-05	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	<0.001	<0.001
Xylene	1.84E-04	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	<0.001	<0.001
CO	5.90	g/bhp-hr	Vendor Guarantee (EPA Certification)	47.0	10,936	1,285	8,760	0.61	2.68
NOx	3.60	g/bhp-hr	Vendor Guarantee (EPA Certification)	47.0	10,936	1,285	8,760	0.37	1.63
PM <sub>10</sub>	9.91E-03	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	0.01	0.02
SO <sub>2</sub>	5.88E-04	lb/MMBtu	AP-42 Chapter 3.2	47.0	10,936	1,285	8,760	<0.001	0.001
CO <sub>2</sub>	53.06	kg CO <sub>2</sub> / MMBtu	40 CFR Subpart C	47.0	10,936	1,285	8,760	57.77	253.03
CH <sub>4</sub>	0.001	kg CH <sub>4</sub> / MMBtu	40 CFR Subpart C	47.0	10,936	1,285	8,760	0.001	0.005
N <sub>2</sub> O	0.0001	kg N <sub>2</sub> O / MMBtu	40 CFR Subpart C	47.0	10,936	1,285	8,760	<0.001	<0.001
Total HAPs								0.03	0.12
Total CO <sub>2</sub> e								57.83	253.30

**Notes:**

- Emission rates displayed above represent the max. hourly and max. annual emissions for one NG generator.
- Greenhouse Gas Emissions are calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.
- AP-42, Chapter 3.2, Table 3.2-2 - Uncontrolled Emission Factors for 4-Stroke Lean Burn Engines
- Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.
- CO<sub>2</sub> equivalency solved for using Global Warming Potentials found in 40 CFR 98 Table A-1 (Updated January 2014). GWP CO<sub>2</sub>=1, GWP CH<sub>4</sub>=25, GWP N<sub>2</sub>O=298
- Vendor Guarantee Emissions are listed in Attachment I
- Vendor Guarantee Emissions are converted from g/kW-hr to g/bhp-hr. 1 kW = 1.34 bhp

**Example Equations:**

Max. Hourly Emission Rate (lb/hr) = Emission Factor (lb/10<sup>6</sup> scf) ÷ Heating Value of Natural Gas (Btu/scf) x Boiler Rating (MMBtu/hr)

### Produced Water Tanks PTK-1, PTK-2, PTK-3

Pollutant	Max. Hourly Emissions using E&P Tanks (lb/hr)	Max. Annual Emissions using E&P Tanks (tons/yr)
VOCs	0.79	3.46
HAPs	0.02	0.09
CO <sub>2</sub>	0.000	0.000
CH <sub>4</sub>	0.006	0.03
Total CO <sub>2</sub> e	0.15	0.66

**Notes:**

-Emission rates for Produced Water Tanks PTK-1, PTK-2, PTK-3 were calculated using E&P Tanks software. E&P Tanks output sheets for the WJ Criswell 405 Pad are attached.

-Emissions were calculated using Engineering Estimates to establish inputs to the E&P Tanks software. AEM has applied an industry standards assumption that 1% of the produced water realized in the tank will be condensate, based upon imperfect fluid separation. AEM believes that this is a conservative estimation, since the WJ Criswell 405 natural gas production facility utilizes 2 stages of fluid separation.

-The emission rates displayed above are pre-control device emissions.

-CO<sub>2</sub> equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO<sub>2</sub>=1, GWP CH<sub>4</sub>=25, GWP N<sub>2</sub>O=298

-For emission calculation purposes, the total throughput for all produced water tanks is modeled as being received through a single tank. The throughput value represents the total throughput for all three (3) 400-barrel tanks. Therefore, emission rates represent a total from all produced water tanks located on the well pad. Actual throughput for each tank will vary based on operations.

### Condensate Tanks CTK-1, CTK-2, CTK-3

Pollutant	Max. Hourly Emissions using E&P Tanks (lb/hr)	Max. Annual Emissions using E&P Tanks (tons/yr)
VOCs	28.35	124.17
HAPs	0.72	3.13
CO <sub>2</sub>	0.00	0.00
CH <sub>4</sub>	0.22	0.98
Total CO <sub>2</sub> e	5.60	24.53

- Notes:**
- Emission rates for Condensate Tanks CTK-1, CTK-2, and CTK-3 were calculated using E&P Tanks software. E&P Tanks software output sheets for the WJ Criswell 405 Pad are attached.
  - The emission rates displayed above are pre-control device emissions.
  - CO<sub>2</sub> equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO<sub>2</sub>=1, GWP CH<sub>4</sub>=25, GWP N<sub>2</sub>O=298
  - For emission calculation purposes, the total throughput for the condensate tanks is modeled as being received through a single tank. The throughput value represents the total throughput for all three (3) 400-barrel tanks. Therefore, emission rates represent a total from all condensate tanks located on the well pad. Actual throughput for each tank will vary based on operations.

**Truck Loading Operations TRL-1, TRL-2**

Unit ID	Description	S, Saturation Factor	P, psia	MW (lb/lb-mol)	Temperature (°F)	Temperature (°R)	L (lb/Mgal)	Throughput (Mgal/yr)	VOC (tpy)	HAP (tpy)	CO <sub>2</sub> (tpy)	CH <sub>4</sub> (tpy)
14S	Condensate Truck Loading	0.6	8.13	96.24	50	510	11.48	1,073	4.52	0.12	0.000	0.13
15S	Produced Water Loading	0.6	0.24	18.02	50	510	0.06	2,989	0.07	0.002	0.000	0.002

<b>Total Emissions from Condensate Truck Loading Operations</b>										
Pollutant	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tons/yr)	Vapor Collection Efficiency	Enclosed Combustion Device Combustion Efficiency	Post-Control Max. Hourly Emissions (lb/hr)	Post-Control Max. Annual Emissions (tons/yr)	Max. Hourly Uncaptured Emissions (lb/hr)	Max. Annual Emissions Uncaptured Emissions (tons/yr)	Gas Stream	Mole Fraction
VOCs	1.03	4.52	70%	98%	0.01	0.06	0.31	1.36	Methane	0.02
HAPs	0.03	0.12	70%	98%	<0.001	0.002	0.008	0.03	Ethane	0.22
CO <sub>2</sub>	<0.001	<0.001	70%	98%	14.64	64.12	<0.001	<0.001	Propane	0.40
CH <sub>4</sub>	0.03	0.13	70%	98%	<0.001	0.002	0.009	0.04	Butane	0.23
Total CO <sub>2</sub> e	0.72	3.16	--	--	14.65	64.16	0.22	0.95	Pentanes	0.08
									Hexane	0.02
									Carbon Dioxide	0.000

<b>Total Emissions from Produced Water Truck Loading Operations</b>											
Pollutant	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tons/yr)	Vapor Collection Efficiency	Enclosed Combustion Device Combustion Efficiency	Post-Control Max. Hourly Emissions (lb/hr)	Post-Control Max. Annual Emissions (tons/yr)	Max. Hourly Uncaptured Emissions (lb/hr)	Max. Annual Emissions Uncaptured Emissions (tons/yr)	Vent Gas Properties	Mass Flowrate (lb/hr)	Density (lb/ft <sup>3</sup> )
VOCs	0.00	0.01	70%	98%	<0.001	<0.001	<0.001	0.00	Condensate Unloading	6.16	0.10
HAPs	<0.001	0.002	70%	98%	<0.001	<0.001	<0.001	<0.001	Produced Unloading	0.92	0.10
CO <sub>2</sub>	<0.001	<0.001	70%	98%	2.16	9.48	<0.001	<0.001			
CH <sub>4</sub>	<0.001	0.00	70%	98%	<0.001	<0.001	<0.001	<0.001			
Total CO <sub>2</sub> e	0.01	0.05	--	--	2.16	9.48	0.00	0.01			

**Notes:**

- Emission rates for liquid unloading operations were calculated using E&P Tanks software. E&P Tanks summary sheets are attached.
- The gas composition for Tank Truck Unloading events is assumed to be similar to the working and breathing losses solved in the E&P Tank simulation.

### Enclosed Combustion Devices CTRL-1

Emissions from Tanks							Gas Composition of Vent Gas			
Input to Enclosed Combustion Device	Pollutant	Pollutant Loading Rate to Enclosed Combustion Device (lbs/hr)	Pollutant Loading Rate to Enclosed Combustion Device (tons/year)	Enclosed Combustion Device Combustion Efficiency	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tons/yr)	Gas Stream	Mole Fraction		
Condensate Tanks (CTK-1, CTK-2, CTK,3)	VOCs	28.35	124.17	98%	0.57	2.48	Methane	0.02		
	HAPs	0.72	3.13	98%	0.014	0.06	Ethane	0.22		
	CO <sub>2</sub>	<0.001	<0.001	98%	112.03	490.68	Propane	0.40		
	CH <sub>4</sub>	0.22	0.98	98%	0.00	0.02	Butane	0.23		
Produced Water Tanks (PTK-1, PTK-2, PTK-3)	VOCs	0.79	3.46	98%	0.02	0.07	Pentanes	0.08		
	HAPs	0.02	0.09	98%	<0.001	0.002	Hexane	0.02		
	CO <sub>2</sub>	<0.001	<0.001	98%	3.09	13.54	Carbon Dioxide	0.000		
	CH <sub>4</sub>	0.01	0.03	98%	<0.001	<0.001	<b>Vent Gas Properties</b>			
Truck Loading - (TRL-1) Condensate Loading	VOCs	0.72	3.16	98%	0.01	0.06	<b>Vent Gas Properties</b>		<b>Mass Flow Rate (lb/hr)</b>	<b>Density (lb/ft<sup>3</sup>)</b>
	HAPs	0.02	0.081	98%	<0.001	0.00				
	CO <sub>2</sub>	<0.001	<0.001	98%	14.64	64.12	Condensate Tank	32.99	0.10	
	CH <sub>4</sub>	0.020	0.09	98%	<0.001	0.00	Produced Water Tank	0.92	0.10	
Truck Loading - (TRL-2) Produced Water Loading	VOCs	0.00	0.00	98%	<0.001	<0.001				
	HAPs	<0.001	0.001	98%	<0.001	<0.001				
	CO <sub>2</sub>	<0.001	<0.001	98%	2.16	9.48				
	CH <sub>4</sub>	<0.001	0.00	98%	<0.001	<0.001				
<b>Totals</b>	VOCs	29.86	130.80	--	0.60	2.62				
	HAPs	0.75	3.31	--	0.02	0.07				
	CO <sub>2</sub>	<0.001	<0.001	--	131.92	577.83				
	CH <sub>4</sub>	0.25	1.10	--	0.01	0.02				
	CO <sub>2</sub> e	6.26	27.43	--	132.05	578.37				

#### Emissions from Pilot Operations

Pollutant	Emission Factor (lb/10 <sup>6</sup> scf)	Emission Factors (kg X/MMBtu)	Heat Value of Natural Gas (Btu/scf)	Enclosed Ground Flare Pilot Rating (Btu/hr)	Enclosed Ground Flare Burner Rating (Btu/hr)	Pilot Max. Hourly Emissions (lb/yr)	Pilot Max. Hourly Emissions (tons/yr)	Burner Max. Hourly Emissions (lb/hr)	Burner Max. Annual Emissions (tons/hr)	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tons/yr)
VOCs	5.5	--	1,285	17,500	18,420,000	<0.001	<0.001	0.08	0.35	0.08	0.35
Hexane	1.8	--	1,285	17,500	18,420,000	<0.001	<0.001	0.03	0.11	0.03	0.11
Formaldehyde	0.075	--	1,285	17,500	18,420,000	<0.001	<0.001	0.001	0.005	0.001	0.005
CO	84	--	1,285	17,500	18,420,000	0.001	0.01	1.20	5.27	1.21	5.28
NO <sub>x</sub>	100	--	1,285	17,500	18,420,000	0.001	0.01	1.43	6.28	1.43	6.28
PM <sub>10</sub>	7.6	--	1,285	17,500	18,420,000	<0.001	<0.001	0.11	0.48	0.11	0.48
SO <sub>2</sub>	0.6	--	1,285	17,500	18,420,000	<0.001	<0.001	0.009	0.04	0.009	0.04
CO <sub>2</sub>	--	52	1,285	17,500	18,420,000	2.01	8.80	1,937.51	8,486.30	1,939.52	8,495.10
CH <sub>4</sub>	--	0.0	1,285	17,500	18,420,000	<0.001	<0.001	0.04	0.16	0.04	0.16
N <sub>2</sub> O	--	<0.001	1,285	17,500	18,420,000	<0.001	<0.001	0.004	0.02	0.004	0.02
Total HAPs						<0.001	<0.001	0.03	0.12	0.03	0.12
CO <sub>2</sub> e						2.01	8.81	1,939.55	8,495.24	1,941.56	8,504.04

**Total Enclosed Combustion Device Emissions**

Pollutant	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions (tons/yr)
VOCs	0.68	2.96
HAPs	0.04	0.18
CO	1.21	5.28
NOx	1.43	6.28
PM <sub>10</sub>	0.11	0.48
SO <sub>2</sub>	0.01	0.04
CO <sub>2</sub>	2,071.44	9,072.93
CH <sub>4</sub>	0.04	0.19
N <sub>2</sub> O	0.00	0.02
CO <sub>2</sub> e	2,073.61	9,082.42

**Notes:**

- Emissions from Enclosed Combustion Device Operations from AP-42, Chapter 1.4 references are from the July 1998 revision.
- Greenhouse Gas Emissions from the Enclosed Combustion Device Pilot and Burner calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.
- Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.
- CO<sub>2</sub> equivalency solved for using Global Warming Potentials found in 40 CFR 98 Table A-1 (Updated January 2014). GWP CO<sub>2</sub>=1, GWP CH<sub>4</sub>=25, GWP N<sub>2</sub>O=298

**Example Calculations:**

Emissions from Tanks VOCs (lb/hr) = Amount of Gas sent to Enclosed Combustion Device (lb/hr) x 0.02 = Max. Hourly Emissions (lb/hr)

Emissions from Enclosed Combustion Device Operations (lb/hr) = Emission factor (lb/106 Btu) x Heat Value of Natural Gas (Btu/scf) ÷ 1,000,000 x Enclosed Combustion Device Pilot Gas Usage (mcf/d) x 1,000 ÷ 24

Emissions from Enclosed Combustion Device Vapor Destruction CO<sub>2</sub> Methodologies shown below sample equation

Emissions from Enclosed Combustion Device Operations CO<sub>2</sub> (tons/yr) = ((Enclosed Combustion Device Pilot Gas Usage (mcf/d) x 1,000 x 365 x Fraction of Gas Combusted by Enclosed Combustion Device x Mole Fraction of Methane x Number of Carbon Atoms in Methane) + ... + (Enclosed Combustion Device Pilot Gas Usage (mcf/d) x 1,000 x 365 x Fraction of Gas Combusted by Enclosed Combustion Device x Mole Fraction of Pentanes-plus x Number of Carbon Atoms in Pentanes-plus)) x .0526 (kg/ft<sup>3</sup>) CO<sub>2</sub> x .001 x 1.102 tons/tonnes

$$E_{a,CH_4}(un-combusted) = V_a * (1 - \eta) * X_{CH_4} \quad (\text{Eq. W-19})$$

$$E_{a,CO_2}(un-combusted) = V_a * X_{CO_2} \quad (\text{Eq. W-20})$$

$$E_{a,CO_2}(combusted) = \sum_{j=1}^5 (\eta * V_a * Y_j * R_j) \quad (\text{Eq. W-21})$$

Where:

E<sub>a,CH4</sub>(un-combusted) = Contribution of annual un-combusted CH<sub>4</sub> emissions from Enclosed Combustion Device stack in cubic feet, under actual conditions.

E<sub>a,CO2</sub>(un-combusted) = Contribution of annual un-combusted CO<sub>2</sub> emissions from Enclosed Combustion Device stack in cubic feet, under actual conditions.

E<sub>a,CO2</sub>(combusted) = Contribution of annual combusted CO<sub>2</sub> emissions from Enclosed Combustion Device stack in cubic feet, under actual conditions.

V<sub>a</sub> = Volume of gas sent to Enclosed Combustion Device in cubic feet, during the year.

η = Fraction of gas combusted by a burning Enclosed Combustion Device (default is 0.98). For gas sent to an unlit Enclosed Combustion Device, η is zero.

X<sub>CH4</sub> = Mole fraction of CH<sub>4</sub> in gas to the Enclosed Combustion Device.

X<sub>CO2</sub> = Mole fraction of CO<sub>2</sub> in gas to the Enclosed Combustion Device.

Y<sub>j</sub> = Mole fraction of gas hydrocarbon constituents j (such as methane, ethane, propane, butane, and pentanes-plus).

R<sub>j</sub> = Number of carbon atoms in the gas hydrocarbon constituent j: 1 for methane, 2 for ethane, 3 for propane, 4 for butane, and 5 for pentanes plus).

## Fugitive Emissions from Unpaved Haul Roads

Constant	Industrial Roads		
	PM	PM-10	PM-2.5
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

where

- k Particle size multiplier<sup>1</sup>
- s 4.8 Silt content of road surface material (%)
- p 150 Number of days per year with precipitation

Item Number	Description	Number of Wheels	W	Miles per Trip	Maximum Trips per Year	Control Efficiency (%)	PM Emissions (lbs/hr)	PM Emissions (tons/yr)	PM-10 Emissions (lbs/hr)	PM-10 Emissions (tons/yr)	PM-2.5 Emissions (lbs/hr)	PM-2.5 Emissions (tons/yr)
			Mean Vehicle Weight (tons)									
1	Liquids Hauling	14	30	1.55	967	NA	6.66	3.22	1.70	0.82	0.17	0.08
2	Employee Vehicles	4	3	1.55	200	NA	2.36	0.24	0.60	0.06	0.06	0.006
<b>Totals:</b>							<b>9.02</b>	<b>3.46</b>	<b>2.30</b>	<b>0.88</b>	<b>0.23</b>	<b>0.09</b>

**Notes:**

- <sup>1</sup> - Particle Size Multiplier used from AP-42 13.2.2 - Final Version 11/2006
- <sup>2</sup> - Silt Content of Road Surface uses Sand and Gravel Processing Plant Road from AP-42 13.2.2 - Final Version 11/2006
- <sup>3</sup> - Number of days per year with precipitation >0.01 in3 found using AP-42 13.2.2 Figure 13.2.2-1 - Final Version 11/2006

**Example Calculations:**

Emissions (lb/Vehicle Mile Traveled) -  $E = k \times (s/12)^a \times (W/3)^b$  Equation 1a from AP-42 13.2.2 - Final Version 11/2006

Size Specific Emissions (lb/VMT) -  $E_{ext} = E[(365-p)/365]$  Equation 2 from AP-42 13.2.2 - Final Version 11/2006

## Fugitive Leaks

Default Average Component Counts for Major Onshore Natural Gas Production Equipment <sup>1</sup>				
Facility Equipment Type	Valves	Connectors	Open-ended Lines	Pressure Relief Valves
Wellheads	8	38	0.5	0
Separators	1	6	0	0
Meters/Piping	12	45	0	0
Compressors	12	57	0	0
In-line Heaters	14	65	2	1
Dehydrators	24	90	2	2

Well Specific Equipment Counts	
Facility Equipment Type	Count on Site
Wellheads	3
Separators	3
Meters/Piping	4
Compressors	1
In-line Heaters	8
Dehydrators	0

<sup>1</sup>- Table W-1B to 40CFR98 Subpart W

Gas Composition						
	Propane	Butane	Pentanes	Hexane	CO <sub>2</sub>	CH <sub>4</sub>
Mole %	3.62	1.12	0.28	0.12	0.14	80.73
MW	44	58	72	86.00	44.00	16.00

Fugitive Emissions													
Facility Equipment Type	Total Count	Emission Rate (scf/hr/component) <sup>2</sup>	Hours of Operation	VOCs (lbs/hr)	VOCs (tons/yr)	HAPs (lbs/hr)	HAPs (tons/yr)	CO <sub>2</sub> (lbs/hr)	CO <sub>2</sub> (tons/yr)	CH <sub>4</sub> (lbs/hr)	CH <sub>4</sub> (tons/yr)	Total CO <sub>2</sub> e (lbs/hr)	Total CO <sub>2</sub> e (tons/yr)
Valves	187	0.027	8760	0.03	0.15	0.001	0.01	<0.001	0.003	0.17	0.74	4.23	18.53
Connectors	832	0.003	8760	0.02	0.07	<0.001	0.00	<0.001	0.002	0.08	0.37	2.09	9.16
Open-ended Lines	18	0.06	8760	0.01	0.03	<0.001	0.001	<0.001	<0.001	0.04	0.16	0.89	3.92
Pressure Relief Valves	8	0.04	8760	0.002	0.009	<0.001	<0.001	<0.001	<0.001	0.01	0.05	0.27	1.17
<b>Total Emissions:</b>				<b>0.06</b>	<b>0.26</b>	<b>0.00</b>	<b>0.01</b>	<b>0.001</b>	<b>0.01</b>	<b>0.30</b>	<b>1.31</b>	<b>7.48</b>	<b>32.78</b>

<sup>2</sup>- Table W-1A to 40CFR98 Subpart W

**Example Equations:**

Fugitive Emissions (lb/hr) = Count x Emission Rate x Hours of Operation ÷ 385.5 scf/lbmol x mol VOC's

**Total WJ Criswell 405 Site Emission Levels - Modification**

Emission Sources	VOCs		HAPs		CO		NO <sub>x</sub>		PM		SO <sub>2</sub>		CO <sub>2</sub>		CH <sub>4</sub>		N <sub>2</sub> O		CO <sub>2</sub> e	
	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Line Heater (GPU-1)	0.006	0.03	0.002	0.01	0.10	0.43	0.12	0.51	0.009	0.04	<0.001	0.003	175.47	768.54	0.003	0.01	<0.001	0.001	175.65	769.33
Line Heater (GPU-2)	0.006	0.03	0.002	0.01	0.10	0.43	0.12	0.51	0.009	0.04	<0.001	0.003	175.47	768.54	0.003	0.01	<0.001	0.001	175.65	769.33
Line Heater (GPU-3)	0.006	0.03	0.002	0.01	0.10	0.43	0.12	0.51	0.009	0.04	<0.001	0.003	175.47	768.54	0.003	0.01	<0.001	0.001	175.65	769.33
Enclosed Vapor Combustor (CTRL-1)	0.68	2.96	0.04	0.18	1.21	5.28	1.43	6.28	0.11	0.48	0.009	0.04	2,071.44	9,072.93	0.04	0.19	0.004	0.02	2,073.61	9,082.42
Line Heater (HTR-1)	0.006	0.03	0.002	0.01	0.10	0.43	0.12	0.51	0.009	0.04	<0.001	0.003	175.47	768.54	0.003	0.01	<0.001	0.001	175.65	769.33
Line Heater (HTR-2)	0.006	0.03	0.002	0.01	0.10	0.43	0.12	0.51	0.009	0.04	<0.001	0.003	175.47	768.54	0.003	0.01	<0.001	0.001	175.65	769.33
Line Heater (HTR-3)	0.006	0.03	0.002	0.01	0.10	0.43	0.12	0.51	0.009	0.04	<0.001	0.003	175.47	768.54	0.003	0.01	<0.001	0.001	175.65	769.33
Natural Gas Generator (ENG-2)	0.37	1.63	0.03	0.12	0.61	2.68	0.37	1.63	0.005	0.02	<0.001	0.001	57.77	253.03	0.001	0.005	<0.001	<0.001	57.83	253.30
Liquid Unloading - Condensate (TRL-1)	0.31	1.36	0.008	0.03	--	--	--	--	--	--	--	--	<0.001	<0.001	0.009	0.04	--	--	0.22	0.95
Liquid Unloading - Produced Water (TRL-2)	<0.001	0.002	<0.001	<0.001	--	--	--	--	--	--	--	--	<0.001	<0.001	<0.001	<0.001	--	--	0.003	0.01
Haul Roads	--	--	--	--	--	--	--	--	9.02	3.46	--	--	--	--	--	--	--	--	--	--
Fugitives Leaks	0.06	0.26	0.002	0.01	--	--	--	--	--	--	--	--	0.001	0.006	0.30	1.31	--	--	7.48	32.78
<b>Totals</b>	<b>1.46</b>	<b>6.38</b>	<b>0.094</b>	<b>0.41</b>	<b>2.41</b>	<b>10.53</b>	<b>2.51</b>	<b>10.99</b>	<b>9.19</b>	<b>4.19</b>	<b>0.01</b>	<b>0.06</b>	<b>3,182.01</b>	<b>13,937.21</b>	<b>0.37</b>	<b>1.63</b>	<b>0.01</b>	<b>0.03</b>	<b>3,193.03</b>	<b>13,985.46</b>

**Total WJ Criswell 405 Site Emission Levels - Initial G70A Permit**

Emission Sources	VOCs		HAPs		CO		NO <sub>x</sub>		PM		SO <sub>2</sub>		CO <sub>2</sub>		CH <sub>4</sub>		N <sub>2</sub> O		CO <sub>2</sub> e	
	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
<b>Totals</b>	<b>1.43</b>	<b>6.26</b>	<b>0.07</b>	<b>0.32</b>	<b>2.03</b>	<b>8.91</b>	<b>2.06</b>	<b>9.03</b>	<b>0.16</b>	<b>0.69</b>	<b>0.01</b>	<b>0.05</b>	<b>2280.57</b>	<b>9988.92</b>	<b>4.01</b>	<b>17.55</b>	<b>0.04</b>	<b>0.17</b>	<b>2392.56</b>	<b>10479.42</b>

**Total Proposed WJ Criswell 405 Site Emission Level Net Change**

Emission Sources	VOCs		HAPs		CO		NO <sub>x</sub>		PM		SO <sub>2</sub>		CO <sub>2</sub>		CH <sub>4</sub>		N <sub>2</sub> O		CO <sub>2</sub> e	
	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
<b>Net Change in Emissions</b>	<b>0.03</b>	<b>0.12</b>	<b>0.02</b>	<b>0.09</b>	<b>0.38</b>	<b>1.62</b>	<b>0.45</b>	<b>1.96</b>	<b>9.03</b>	<b>3.50</b>	<b>0.003</b>	<b>0.01</b>	<b>901</b>	<b>3,948</b>	<b>-3.64</b>	<b>-15.92</b>	<b>-0.03</b>	<b>-0.14</b>	<b>800</b>	<b>3,506</b>

\*Emission Units have not been modified with this submission



## GM Vortec Series

## Specification & Application Data



Photo may depict optional equipment.

### Description

HIPOWER® rental generators are an efficient, reliable and versatile source of mobile electrical power. They are designed to operate in the most extreme working conditions. All HIPOWER® Gaseous Rental Generators have a unique combination of innovative design and the use of high quality materials that provide the user with the most dependable power that you can rely on for non-stop power with easy to operate controls.

The generator set is powered by a radiator-cooled, industrial GM Vortec gaseous engine, which meets current Environmental Protection Agency (EPA) non-road exhaust emission regulations, driving a single bearing, four-pole, three-phase alternator, with IP23 protection. The Prime Power kVA rating for generator set is given with a 125 degree C alternator winding temperature rise.

### HIPOWER® Features and Benefits

**GM Vortec Engine:** Long-life, heavy-duty, 4-cycle, gaseous engine from a world renown manufacturer for economy of operation and maximum reliability and durability. Capable of full rated load acceptance in one step.

**Cooling:** Radiator with belt driven pusher fan.

**Filtration:** Heavy-duty replaceable element air-cleaner.

**Alternator:** Single bearing, rotating field, self-excited, self-ventilated, 12-wire re-connectable, 60Hz brushless alternator with permanent magnetic generator (PMG) for reduced service and maintenance requirements, with Class H insulation. Automatic voltage regulator (AVR) providing close voltage regulation. Has a high skVA starting capability for electric motor loads.

**Arrangement:** Engine and alternator units are closed coupled together and with mobile style anti-vibration isolators, mounted between the assembly and a heavy-duty steel base. The sturdy base frame has openings allowing for winching, slinging and forklift pockets for ease of handling

### 60Hz Prime Power Ratings kW & kVA

Voltage VAC	Phase	PF	LPG		NG	
			kW	kVA	kW	kVA
120/240	1	0.8	15.6	19.5	14.3	17.9
120/208	3	0.8	24.0	30.0	22.0	27.5
120/240 Delta	3	0.8	N.A	N.A	N.A	N.A
277/480	3	0.8	24.0	30.0	22.0	27.5
347/600	3	0.8	24.0	30.0	22.0	27.5

**Rating Definitions:** (N.A. = Not available for model designated)  
Prime - All Rental Sets are Prime Rated - Prime rating is applicable for supplying power to a varying load in lieu of utility for an unlimited amount of running of amount of running time. (Max. load factor = 80%)  
A 10% overload capacity is available for 1 out of every 12 hours.

### HIPOWER® Features and Benefits

**Enclosure:** Fully sound attenuated enclosure, fabricated in 11-gauge steel, powder coated with finish that exceeds 1000-hr salt spray test, curved edges, minimum outside fasteners.

Ample layer of durable sound insulating material placed all around the inside of the container, doors and ducting with metal retainer frames. Can be cleaned by high-pressure water and is oil and fire resistant.

Vertical air discharge for quiet operation.

Wide steel lockable access doors with rubber seals, for easy entrance of all maintenance personnel and any necessary service by technicians, with stainless steel hinges, hardware and fasteners resistant to corrosion.

**Exhaust:** Effective low noise, steel residential-type exhaust silencer and catalytic converter with rain cap

**Controls:** Digital control panel to operate all manual and automatic start and stop features. Many programmable automatic functions for local and remote controls with LED lights, tamper proof engine hour recorder with analog meters: voltmeter & switch, three (3) ammeters, Hz meter, fuel gauge and battery charger.

### HIPOWER® Rental Options

**Voltage Selector Switch:** Three-position, manual voltage selector switch. Lockable in three positions for switching set between 120/240V single phase and 120/208 and 277/480V 3-phase. - NOT AVAILABLE AT 600V CONNECTION.

**Power Distribution:** Consult HIPOWER® regarding the comprehensive range of power distribution accessories available.

**Oil field heavy duty rental skid:** Heavy duty sub base

(See page 3 for additional options)



### Application & Specification Data

#### Gaseous Generator Set Specification:

Governor regulation class	ISO 8528 Part 1 Class G3
Voltage regulation, no load to full load	plus or minus 1%
Frequency regulation	Ischronous
Radio frequency emissions compliance	Meets requirements of most industrial and commercial applications
skVA at 480 volts with 30% voltage dip	76
Main Line Circuit breaker – amps capacity	105

#### ENGINE

Manufacturer	PSI-General Motors
Model	Vortec 3.0L
EPA certified	Yes
Crankshaft speed	1,800rpm
Type	LPG/NG fueled, 4-stroke
Ignition	Spark Plug
Aspiration	Natural
Number of Cylinders	4
Cylinder arrangement	In-line
Displacement CID (liters)	181 (3.0)
Bore and Stroke ins (mm)	4 x 3.6 (10.2 x 9.1)
Nominal power	LPG 48 hp NG 47 hp
Cooling	Liquid
Governor	Electronic
Starting motor & alternator	12 volt
Compression ratio	9.3 : 1
Air cleaner type	Dry, replaceable cartridge
Exhaust gas flow at full output lb/hr (kg/hr)	250 (7.1)
Exhaust temperature at full load - dry exhaust °F ( °C)	1056 (569)
Maximum permitted back pressure - in. HG (kPa)	3.0 (10.2)

#### Cooling System:

Radiator- cooled cooling air flow - cu. ft./min. (cu. m/min.)	2500 (72)
Alternator cooling flow - cu. ft./min. (cu. m/min.)	250 (4.5)
Combustion air - cu. ft./min. (cu. m/min.)	64 (1.8)
Total cooling air flow (engine + alternator + combustion)	2814 (78.3)
Radiator system capacity, including engine - gallons (L)	5.0 (18.9)

#### Lubrication system:

Oil pan capacity - quarts (L)	4.0 (3.8)
Oil pan capacity with filter - quarts (L)	4.3 (4.1)
Oil filter - quantity and type	1, Replaceable Spin-On
Recommended lubricating oil grade - above 0 ° F (below 0 ° F)	
Oil consumption at full load	Less than 0.1% of fuel consumption
Oil pressure – psi (bars)	46.0 (320.0)

#### Engine Electrical System:

Starting motor voltage	12 volt
Battery - AH	1, size BC I# 24F
Maximum battery charge alternator output - amps	70
Cold Cranking Amps - minimum	600

**HIPOWER Sound Attenuated Enclosure:****Model - AT1**

Noise level - dBA at 23 feet (7 meters)	74
Dimensions - inches	82 x 36 x 47
Dry weight – lbs.	1,617

**Fuel System:** (\*Measured at gen-set fuel inlet, downstream of any dry fuel or filter accessories.)

Fuel type	LPG or Natural Gas, vapor withdrawl
Fuel supply line - inlet	1" NPTF
*Natural gas and LPG fuel supply pressure - in. column H <sub>2</sub> O (kPa)	7" - 11" (1.74 - 2.74)

**Prime Rating Fuel consumption:**

LPG - cu. ft./hour (kg/hour) at 100% standby rating	168 (4.8)
Natural Gas - cu. ft./hour (kg/hour) at 100% standby rating	400 (11.3)

**Alternator Specification:**

Manufacturer	Stamford	
Alternator model, winding & AVR model	127/208; 277/480 volts	PI 144 H
	600 volts	PI 144 H
Voltages	3-phase 120/208, 277/480, 347/600	
Alternator Type	4-pole, rotating field	
Excitation System	Brushless with EBS/AS480 AVR	
Power factor	0.8	
Number of leads	12	
Stator Pitch	2/3	
Insulation	Class H	
Windings – Temperature Rise	120° C	
Enclosure (IEC-34-S)	IP 23	
Bearing	Single, sealed	
Coupling	Flexible disc	
Amortisseur windings	Full	
Voltage regulation – no load to full load with MX341 AVR	plus or minus 1%	
TIF	< 50	
Line harmonics	5% maximum	

**Standard Accessories:** (see back-page for control panel details)

● Radiator with pusher fan	● All rotating components (i.e. fan) protected with metal guards
● Dry air cleaner	● All hot components (i.e. exhaust) protected with metal guards
● Heavy-duty engine start batteries in rack with cables	● Ground connection prepared for ground spike (not supplied)
● Emergency stop switch	● Main line ABB UL listed circuit breaker for overload protection
● Control Panel DSE7310 (See over for details)	● Operation and installation literature
● Two dry contacts for auto-start	● CSA certified
● Steel base for mounting on firm surface such as concrete	● Control panel DSE 7310 MANUAL & AUTO START MODULE

**Optional Accessories:**

<input type="checkbox"/> Rotary voltage selector switch (not available with 600V connection)	<input type="checkbox"/> Interior lights
<input type="checkbox"/> Alternator anti-condensation heaters	<input type="checkbox"/> Shore power receptacle
<input type="checkbox"/> Winterization kit for low ambient temperature	<input type="checkbox"/> Engine Block heater
<input type="checkbox"/> Electric actuator and louvers for air intake and exhaust	<input type="checkbox"/> Control panel heater
<input type="checkbox"/> Snow hoods for air intake and exhaust	<input type="checkbox"/> Oil fiels heavy duty rental skid
<input type="checkbox"/> DOT certified towing trailer	<input type="checkbox"/> Oil Make-up system

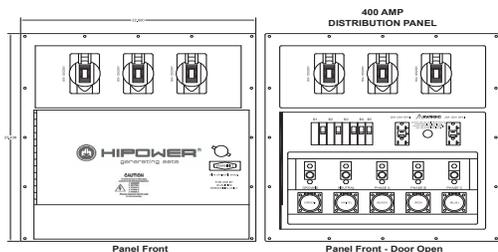
- **Distribution power panel** \*See image RH back-page  
Aluminum 0.090" enclosure black powder coated - covered panel NEMA 3R/IP67rated weather proof assembly – Individual Square-D QOU branch breakers - 2 x 20A 125V NEMA 5-20 GFCI duplex receptacles - 3 x 50A 125/250V CS6369 Twist -lock receptacles & Lexan covers - 50A California Style twist lock (1Φ only) - 1 set Camlock devices rated 400A - Color coded Camlock devices 3Φ - 5W black, red, blue, white & green - Pad lockable 1/4 turn door access with cable trap - Auxiliary bus bars with mechanical lugs - Mechanical lugs up to 250MCM cable

**HIPOWER® DSE 7310 Control Panel:** The DSE model 7310 digital control panel is back-lit with icon LCD text display, and is PC configurable. It works with the engine electronic governor with PLC functionality, protected front panel editing, and includes: manual, automatic and remote (input) start, PC configurable six inputs and four outputs, configurable timers and alarms, generator voltage and Hz display, battery voltage display, engine speed display, multiple engine parameters are monitored simultaneously, comprehensive shutdown or warning on fault condition, engine preheat, LED and LCD alarm indication, tamper-proof hour counter provides accurate information for monitoring and maintenance periods. The module monitors: engine speed, frequency, voltage and engine run hours and also displays the warning and shutdown status

**Engine alarms included:** High coolant temperature, low oil pressure, low coolant level, unexpected shutdown, low fuel level, stop failure, low battery voltage, battery charging alternator failure, over-speed, under-speed, start failure and emergency stop.

**Alternator alarms included:** Overload, unbalanced voltage, over voltage, under voltage, over frequency, under frequency, short circuit, reverse power, and incorrect phase sequence.

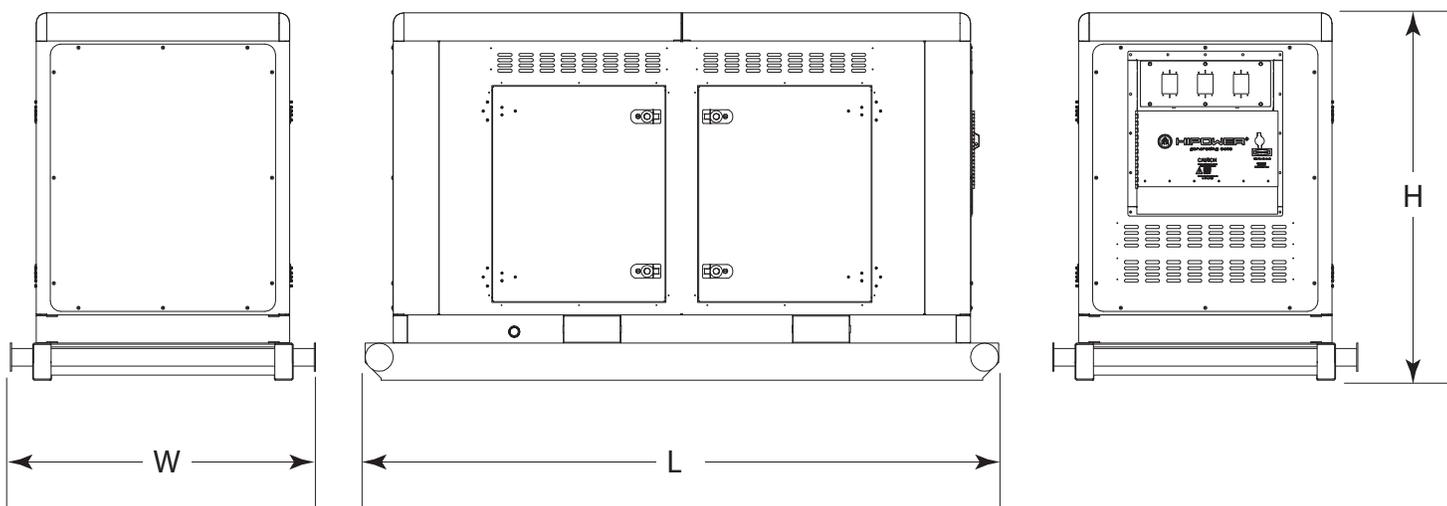
**Instrumentation and gauges included:** 3 ammeters, frequency meter, voltmeter plus selector, hour meter, fuel gauge, battery charger gauge, oil pressure gauge, water temperature gauge, siren and emergency stop button.



Pictures of Control Panel RH and Distribution Panel LH may include optional equipment and/or accessories

Model HRGM 30 T6

key dimensions and sound levels



Generator Data (L, W & H dimensions in inches)					
Configuration	L = Length	W = Width	H = Height	Net Weight lbs	dBA
Enclosed	82"	36"	47"	1525	73
Enclosed (with oil field heavy duty rental skid)	90"	43.5"	52.5"	1917	73

\* All measurements are approximate and for estimation purposes only. Sound levels measured at 23ft (7m) and does not account for ambient site conditions.

Codes and Standards Compliances used where applicable



- NFPA 99
- NFPA 110
- ISO 8528-5
- ISO 1708A.5
- ISO 3046
- BS5514
- SAE J1349
- DIN6271
- IEE C62.41 TESTING
- NEMA ICS 1

your partner for power™

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**HIPOWER®**  
your partner for power

Ref# 777-10030R-August 2013



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
2015 MODEL YEAR  
CERTIFICATE OF CONFORMITY  
WITH THE CLEAN AIR ACT**

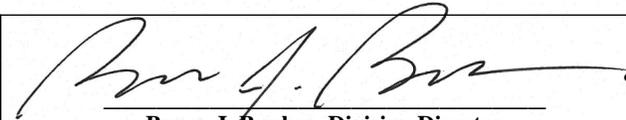
**OFFICE OF TRANSPORTATION  
AND AIR QUALITY  
ANN ARBOR, MICHIGAN 48105**

**Certificate Issued To: Power Solutions International, Inc.**  
(U.S. Manufacturer or Importer)

**Certificate Number: FPSIB2.97GLP-001**

Effective Date:  
**10/06/2014**

Expiration Date:  
**12/31/2015**

  
Byron J. Bunker, Division Director  
Compliance Division

Issue Date:  
**10/06/2014**

Revision Date:  
**N/A**

**Manufacturer:** Power Solutions International, Inc.

**Engine Family:** FPSIB2.97GLP

**Certification Type:** Mobile and Stationary

**Fuel :** Gasoline (up to and including 10% Ethanol)  
Natural Gas (CNG/LNG)  
LPG/Propane

**Emission Standards :** HC + NO<sub>x</sub> ( g/kW-hr ) : 2.7  
CO ( g/kW-hr ) : 4.4  
NMHC + NO<sub>x</sub> ( g/kW-hr ) : 2.7  
CO ( g/kW-hr ) : 4.4  
HC + NO<sub>x</sub> ( g/kW-hr ) : 2.7  
NMHC + NO<sub>x</sub> ( g/kW-hr ) : 2.7

**Emergency Use Only :** N

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 1048, 1065, 1068, and 60 ( stationary only and combined stationary and mobile ) and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 1048 and produced in the stated model year.

This certificate of conformity covers only those new nonroad spark-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 1048 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1048. This certificate of conformity does not cover nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1048. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1048.

This certificate does not cover large nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

**LAFAYETTE AREA LABORATORY**4790 N.E. EVANGELINE THRUWAY  
CARENCRO, LA 70520  
PHONE (337) 896-3055  
FAX (337) 896-3077

## Certificate of Analysis : 13090042-002A

<b>Company:</b>	Gas Analytical Services	<b>For:</b>	Gas Analytical Services
<b>Well:</b>	404 Flash Separator		Alan Ball
<b>Field:</b>	HG Energy		PO Box 1028
<b>Sample of:</b>	Liquid-Spot		
<b>Conditions:</b>	30 psi @ N.G. ° F		Bridgeport, WV, 26330
<b>Sampled by:</b>	RB-GAS		
<b>Sample date:</b>	8/28/2013	<b>Report Date:</b>	9/12/2013
<b>Remarks:</b>	Cylinder No.: GAS		
<b>Remarks:</b>			

<u>Analysis: ( GPA 2186M )</u>	<u>Mol. %</u>	<u>MW</u>	<u>Wt. %</u>	<u>Sp. Gravity</u>	<u>L.V. %</u>
Nitrogen	0.000	28.013	0.000	0.8094	0.000
Methane	0.180	16.043	0.031	0.3000	0.072
Carbon Dioxide	0.000	44.010	0.000	0.8180	0.000
Ethane	1.911	30.070	0.623	0.3562	1.206
Propane	5.848	44.097	2.797	0.5070	3.802
Iso-butane	2.865	58.123	1.806	0.5629	2.213
N-butane	7.746	58.123	4.884	0.5840	5.766
Iso-pentane	5.891	72.150	4.611	0.6244	5.090
N-pentane	6.320	72.150	4.946	0.6311	5.405
i-Hexanes	9.062	86.177	8.370	0.6795	8.701
n-Hexane	6.983	85.648	6.537	0.6640	6.749
2,2,4 trimethylpentane	0.034	114.231	0.043	0.6967	0.041
Benzene	0.179	78.114	0.114	0.8846	0.119
Heptanes	21.295	98.604	22.849	0.6986	22.548
Toluene	1.049	92.141	0.787	0.8719	0.831
Octanes	15.900	107.724	19.019	0.7525	17.319
E-benzene	0.115	106.167	0.080	0.8718	0.104
M-,O-,P-xylene	1.226	106.167	1.411	0.8731	1.124
Nonanes	4.317	119.706	5.856	0.7800	5.267
Decanes Plus	9.079	154.702	15.236	0.7701	13.643
	-----		-----		-----
	100.000		100.000		100.000

<b>Calculated Values</b>	<b>Total Sample</b>	<b>Decanes Plus</b>
Specific Gravity at 60 °F	0.6896	0.7701
Api Gravity at 60 °F	73.705	52.238
Molecular Weight	92.186	154.702
Pounds per Gallon (in Vacuum)	5.749	6.421
Pounds per Gallon (in Air)	5.743	6.414
Cu. Ft. Vapor per Gallon @ 15.025 psia	24.196	15.405



Southern Petroleum Laboratories, Inc.

**LAFAYETTE AREA LABORATORY**4790 N.E. EVANGELINE THRUWAY  
CARENCRO, LA 70520  
PHONE (337) 896-3055  
FAX (337) 896-3077

## Certificate of Analysis : 13090042-002A

<b>Company:</b>	Gas Analytical Services	<b>For:</b>	Gas Analytical Services
<b>Well:</b>	404 Flash Separator		Alan Ball
<b>Field:</b>	HG Energy		PO Box 1028
<b>Sample of:</b>	Liquid-Spot		
<b>Conditions:</b>	30 psi @ N.G. ° F		Bridgeport, WV, 26330
<b>Sampled by:</b>	RB-GAS		
<b>Sample date:</b>	8/28/2013	<b>Report Date:</b>	9/12/2013
<b>Remarks:</b>	Cylinder No.: GAS		
<b>Remarks:</b>			

<u>Analysis: ( GPA 2103M )</u>	<u>Mol. %</u>	<u>MW</u>	<u>Wt. %</u>	<u>Sp. Gravity</u>	<u>L.V. %</u>
Nitrogen	0.000	28.013	0.000	0.8094	0.000
Methane	0.180	16.043	0.031	0.3000	0.072
Carbon Dioxide	0.000	44.010	0.000	0.8180	0.000
Ethane	1.911	30.070	0.623	0.3562	1.206
Propane	5.848	44.097	2.797	0.5070	3.802
Iso-butane	2.865	58.123	1.806	0.5629	2.213
N-butane	7.746	58.123	4.884	0.5840	5.766
Iso-pentane	5.891	72.150	4.611	0.6244	5.090
N-pentane	6.320	72.150	4.946	0.6311	5.405
Hexanes	16.045	85.648	14.907	0.6653	15.450
Heptanes Plus	53.194	98.604	65.395	0.6986	60.996
	-----		-----		-----
	100.000		100.000		100.000

<b>Calculated Values</b>	<b>Total Sample</b>	<b>Heptanes Plus</b>
Specific Gravity at 60 °F	0.6896	0.7407
Api Gravity at 60 °F	73.705	59.525
Molecular Weight	92.186	113.329
Pounds per Gallon (in Vacuum)	5.749	6.176
Pounds per Gallon (in Air)	5.743	6.169
Cu. Ft. Vapor per Gallon @ 15.025 psia	24.196	21.143
Standing-Katz Density (lb. / ft <sup>3</sup> )		



Southern Petroleum Laboratories, Inc.



**Certificate of Analysis**  
 Number: 2030-13090042-002A

**Carencro Laboratory**  
 4790 NE Evangeline Thruway  
 Carencro, LA 70520

Alan Ball  
 Gas Analytical Services  
 PO Box 1028  
 Bridgeport, WV 26330

Sep. 12, 2013

Field: HG Energy  
 Station Name: 404 Flash Separator  
 Station Location:  
 Cylinder No: GAS

Sampled By: RB-GAS  
 Sample Of: Liquid Spot  
 Sample Date: 08/28/2013 11:00  
 Sample Conditions: 30 psig

**Analytical Data**

Test	Method	Result	Units	Detection Limit	Lab Tech.	Analysis Date
Color Visual	Proprietary	STRAW			AR	09/12/2013
API Gravity @ 60° F	ASTM D-5002	70.31	°		AR	09/12/2013
Specific Gravity @ 60/60° F	ASTM D-5002	0.7012			AR	09/12/2013
Density @ 60° F	ASTM D-5002	0.7005	g/ml		AR	09/12/2013
Shrinkage Factor	Proprietary	0.9700			AR	09/12/2013
Flash Factor	Proprietary	51.1707	Cu. Ft./S.T. Bbl		AR	09/12/2013

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

Attachment I - E&P Tanks Condensate Report.txt

\*\*\*\*\*

\* Project Setup Information \*

\*\*\*\*\*

Project File : M:\Projects\A\American Energy Partners\0293766 - AEP Permit  
 Modifications\6.0 Plans and Reports\WJ Criswell 405\Attachment I - Supporting Documents - E&P Tanks  
 - Condensate.ept  
 Flowsheet Selection : Oil Tank with Separator  
 Calculation Method : RVP Distillation  
 Control Efficiency : 100.0%  
 Known Separator Stream : High Pressure Oil  
 Entering Air Composition : No  
  
 Date : 2015.04.03

\*\*\*\*\*

\* Data Input \*

\*\*\*\*\*

Separator Pressure : 25.00[psi g]  
 Separator Temperature : 80.00[F]  
 Ambient Pressure : 14.70[psi a]  
 Ambient Temperature : 70.00[F]  
 C10+ SG : 0.7701  
 C10+ MW : 154.702

-- High Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0000
4	N2	0.0000
5	C1	0.1800
6	C2	1.9110
7	C3	5.8480
8	i-C4	2.8650
9	n-C4	7.7460
10	i-C5	5.8910
11	n-C5	6.3200
12	C6	9.0620
13	C7	21.2950
14	C8	15.9000
15	C9	4.3170
16	C10+	9.0790
17	Benzene	0.1790
18	Toluene	1.0490
19	E-Benzene	0.1150
20	Xylenes	1.2260
21	n-C6	6.9830
22	2,2,4-Trimethyl p	0.0340

Attachment I - E&P Tanks Condensate Report.txt

```
-- Sales Oil -----
Production Rate      : 70[bbl/day]
Days of Annual Operation : 365 [days/year]
API Gravity         : 73.7
Reid Vapor Pressure : 12.50[psi a]
```

```
*****
* Calculation Results *
*****
```

```
-- Emission Summary -----
Item                Uncontrolled      Uncontrolled
                   [ton/yr]           [lb/hr]
Total HAPs          3.130             0.715
Total HC            144.486           32.988
VOCs, C2+          143.503           32.763
Page 1----- E&P TANK

VOCs, C3+          124.174           28.350

Uncontrolled Recovery Info.
    Vapor          6.2000           [MSCFD]
    HC Vapor       6.2000           [MSCFD]
    GOR            88.57           [SCF/bbl]
```

```
-- Emission Composition -----
No Component        Uncontrolled      Uncontrolled
                   [ton/yr]           [lb/hr]
1  H2S              0.000             0.000
2  O2               0.000             0.000
3  CO2             0.000             0.000
4  N2              0.000             0.000
5  C1              0.983             0.224
6  C2             19.329            4.413
7  C3             52.453            11.976
8  i-C4           14.035            3.204
9  n-C4           26.674            6.090
10 i-C5           9.877             2.255
11 n-C5           7.801             1.781
12 C6             4.711             1.076
13 C7             4.203             0.960
14 C8             1.117             0.255
15 C9             0.119             0.027
16 C10+          0.051             0.012
17 Benzene       0.062             0.014
18 Toluene       0.119             0.027
19 E-Benzene     0.005             0.001
20 Xylenes       0.045             0.010
21 n-C6         2.895             0.661
```

Attachment I - E&P Tanks Condensate Report.txt

22 224Tri methyl p 0.006 0.001  
 Total 144.485 32.987

-- Stream Data

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	N2	28.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	C1	16.04	0.1800	0.0250	0.0000	4.1412	0.4803	2.0526
6	C2	30.07	1.9110	0.9572	0.0255	26.2809	17.9484	21.5272
7	C3	44.10	5.8480	4.7156	2.5811	34.7822	43.6408	39.8361
8	i-C4	58.12	2.8650	2.6807	2.3631	7.5735	8.4733	8.0868
9	n-C4	58.12	7.7460	7.4779	7.0133	14.5965	15.9508	15.3691
10	i-C5	72.15	5.8910	5.9487	6.0166	4.4163	4.7110	4.5844
11	n-C5	72.15	6.3200	6.4308	6.5794	3.4888	3.7207	3.6211
12	C6	86.16	9.0620	9.3459	9.7525	1.8072	1.9320	1.8784
13	C7	100.20	21.2950	22.0741	23.2024	1.3890	1.4981	1.4513
14	C8	114.23	15.9000	16.5097	17.3959	0.3205	0.3496	0.3371
15	C9	128.28	4.3170	4.4848	4.7288	0.0294	0.0345	0.0323
16	C10+	154.70	9.0790	9.4339	9.9506	0.0101	0.0115	0.0109
17	Benzene	78.11	0.1790	0.1850	0.1936	0.0257	0.0276	0.0268
18	Toluene	92.13	1.0490	1.0884	1.1457	0.0414	0.0449	0.0434
19	E-Benzene	106.17	0.1150	0.1194	0.1259	0.0015	0.0016	0.0015
20	Xylenes	106.17	1.2260	1.2735	1.3425	0.0135	0.0149	0.0143
21	n-C6	86.18	6.9830	7.2140	7.5461	1.0805	1.1582	1.1249
22	224Tri methyl p	114.24	0.0340	0.0353	0.0371	0.0018	0.0019	0.0018
	MW		92.05	93.82	96.24	46.77	49.60	48.39
	Stream Mole Ratio		1.0000	0.9623	0.9123	0.0377	0.0500	0.0877
	Heating Value	[BTU/SCF]				2655.57	2806.48	2741.67
	Gas Gravity	[Gas/Air]				1.61	1.71	1.67
	Bubble Pt. @ 100F	[psia]	35.59	23.66	13.71			
	RVP @ 100F	[psia]	24.68	18.85	12.48			
	Spec. Gravity @ 100F		0.660	0.663	0.667			

Attachment I - E&P Tanks PW Report.txt

\*\*\*\*\*  
 \* Project Setup Information \*

Project File : M:\Projects\A\American Energy Partners\0293766 - AEP Permit  
 Modifications\6.0 Plans and Reports\WJ Criswell 405\Attachment I - Supporting Documents - E&P Tanks  
 PW.ept  
 Flowsheet Selection : Oil Tank with Separator  
 Calculation Method : RVP Distillation  
 Control Efficiency : 100.0%  
 Known Separator Stream : High Pressure Oil  
 Entering Air Composition : No  
  
 Date : 2015.04.03

\*\*\*\*\*  
 \* Data Input \*

Separator Pressure : 25.00[psi g]  
 Separator Temperature : 80.00[F]  
 Ambient Pressure : 14.70[psi a]  
 Ambient Temperature : 70.00[F]  
 C10+ SG : 0.7701  
 C10+ MW : 154.702

-- High Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0000
4	N2	0.0000
5	C1	0.1800
6	C2	1.9110
7	C3	5.8480
8	i-C4	2.8650
9	n-C4	7.7460
10	i-C5	5.8910
11	n-C5	6.3200
12	C6	9.0620
13	C7	21.2950
14	C8	15.9000
15	C9	4.3170
16	C10+	9.0790
17	Benzene	0.1790
18	Toluene	1.0490
19	E-Benzene	0.1150
20	Xylenes	1.2260
21	n-C6	6.9830
22	2,2,4-Trimethyl p	0.0340

Attachment I - E&P Tanks PW Report.txt

```
-- Sales Oil -----
Production Rate      : 2[bbl/day]
Days of Annual Operation : 365 [days/year]
API Gravity         : 73.7
Reid Vapor Pressure  : 12.50[psi a]
```

```
*****
* Calculation Results *
*****
```

```
-- Emission Summary -----
Item                Uncontrolled      Uncontrolled
                   [ton/yr]           [lb/hr]
Total HAPs          0.090             0.021
Total HC            4.025             0.919
VOCs, C2+          3.998             0.913
Page 1----- E&P TANK
```

```
VOCs, C3+          3.459             0.790

Uncontrolled Recovery Info.
Vapor              172.7400 x1E-3 [MSCFD]
HC Vapor           172.7400 x1E-3 [MSCFD]
GOR                88.58      [SCF/bbl]
```

```
-- Emission Composition -----
No Component        Uncontrolled      Uncontrolled
                   [ton/yr]           [lb/hr]
1 H2S               0.000             0.000
2 O2                0.000             0.000
3 CO2               0.000             0.000
4 N2                0.000             0.000
5 C1                0.027             0.006
6 C2                0.538             0.123
7 C3                1.461             0.334
8 i-C4              0.391             0.089
9 n-C4              0.743             0.170
10 i-C5             0.275             0.063
11 n-C5             0.217             0.050
12 C6               0.131             0.030
13 C7               0.117             0.027
14 C8               0.031             0.007
15 C9               0.003             0.001
16 C10+            0.001             0.000
17 Benzene          0.002             0.000
18 Toluene          0.003             0.001
19 E-Benzene        0.000             0.000
20 Xylenes          0.001             0.000
21 n-C6             0.081             0.018
```

Attachment I - E&P Tanks PW Report.txt

22	224Tri methyl p	0.000	0.000
	Total	4.022	0.918

-- Stream Data

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	N2	28.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	C1	16.04	0.1800	0.0250	0.0000	4.1412	0.4803	2.0526
6	C2	30.07	1.9110	0.9572	0.0255	26.2809	17.9484	21.5272
7	C3	44.10	5.8480	4.7156	2.5811	34.7822	43.6408	39.8361
8	i-C4	58.12	2.8650	2.6807	2.3631	7.5735	8.4733	8.0868
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13	C7	100.20	21.2950	22.0741	23.2024	1.3890	1.4981	1.4513
14	C8	114.23	15.9000	16.5097	17.3959	0.3205	0.3496	0.3371
15	C9	128.28	4.3170	4.4848	4.7288	0.0294	0.0345	0.0323
16	C10+	154.70	9.0790	9.4339	9.9506	0.0101	0.0115	0.0109
17	Benzene	78.11	0.1790	0.1850	0.1936	0.0257	0.0276	0.0268
18	Toluene	92.13	1.0490	1.0884	1.1457	0.0414	0.0449	0.0434
19	E-Benzene	106.17	0.1150	0.1194	0.1259	0.0015	0.0016	0.0015
20	Xylenes	106.17	1.2260	1.2735	1.3425	0.0135	0.0149	0.0143
21	n-C6	86.18	6.9830	7.2140	7.5461	1.0805	1.1582	1.1249
22	224Tri methyl p	114.24	0.0340	0.0353	0.0371	0.0018	0.0019	0.0018
	MW		92.05	93.82	96.24	46.77	49.60	48.39
	Stream Mole Ratio		1.0000	0.9623	0.9123	0.0377	0.0500	0.0877
	Heating Value	[BTU/SCF]				2655.57	2806.48	2741.67
	Gas Gravity	[Gas/Air]				1.61	1.71	1.67
	Bubble Pt. @ 100F	[psia]	35.59	23.66	13.71			
	RVP @ 100F	[psia]	24.68	18.85	12.48			
	Spec. Gravity @ 100F		0.660	0.663	0.667			



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 70583-5301 USA

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 info.scott@element.com  
 element.com

GAS ANALYSIS REPORT NO.: 38-032615-42 (373502)

DATE: 03/26/15

FOR: AMERICAN ENERGY UTICA  
 ATTN: KEVIN ESHBAUGH  
 PO BOX 18756  
 OKLAHAMA CITY OK 73154

**SAMPLE IDENTIFICATION:**  
**COMPANY:** AMERICAN ENERGY UTICA  
**FIELD:** N/P  
**LEASE:** CRISWELL 1H  
**STA #:** N/P

**SAMPLE DATA:** DATE: 03/24/15  
 PSIG: 675

BY: REGGIE CRAIG

TEMP: 114 DEG.F.

DP: N/P LBS H2O

REMARKS: H2S (DETERMINED IN FIELD) = 0.0 PPM

CYL #69

SAMPLE TYPE: SPOT

HYDROCARBON ANALYSIS - METHOD GPA 2261-13

LAB ANALYST: MP

COMPONENT NAME	MOL PERCENT	GPM @ 15.025 PSIA			
CARBON DIOXIDE (CO2)	0.136				
NITROGEN ( N2)	0.284				
METHANE ( C1)	80.728				
ETHANE ( C2)	13.682	3.731			
PROPANE ( C3)	3.623	1.018			
ISO-BUTANE (IC4)	0.447	0.149			
N-BUTANE (NC4)	0.699	0.225			
ISO-PENTANE (IC5)	0.161	0.060			
N-PENTANE (NC5)	0.118	0.044			
HEXANES PLUS (C6+)	0.122	0.053			
TOTAL	100.000				
	ETHANE + GPM:	5.280			
MOL WEIGHT: 19.78	PROPANE + GPM:	1.549			
BTU/LB: 23085.0	ISO-PENTANE + GPM:	0.157			
	COMPRESSIBILITY FACTOR:	0.9968			
	SPECIFIC GRAVITY @ 60 DEG. F. (AIR = 1):	0.685			
BTU/CUFT. (REAL) 60 DEG.F. - PSIA:	14.650	14.696	14.730	15.025	
	DRY:	1203.4	1207.2	1210.0	1234.2
	SAT:	1182.4	1186.1	1188.9	1213.2

REVIEWED BY:

*Meghan Menard*

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2129 WEST WILLOW SCOTT LA 70583 337-232-3568

# **Attachment J**

## Attachment J

### AIR QUALITY PERMIT NOTICE Notice of Application

Notice is given that American Energy – Marcellus, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a General Permit G70-A Permit Modification application for a natural gas production operation located on Four Mile Road, Wileyville, in Wetzel County, West Virginia. The latitude and longitude coordinates are: 39.60737, -80.61828.

The applicant estimates the increased potential to discharge the following regulated air pollutants on a facility-wide basis will be:

Hazardous Air Pollutants (HAPs) = 0.09 tpy  
Volatile Organic Compounds (VOCs) = 0.12 tpy  
Carbon Monoxide (CO) = 1.62 tpy  
Nitrogen Oxides (NO<sub>x</sub>) = 1.96 tpy  
Particulate Matter (PM) = 3.50 tpy  
Sulfur Dioxide (SO<sub>2</sub>) = 0.01 tpy  
Carbon Dioxide Equivalents (CO<sub>2</sub>e) = 3,506 tpy

Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57<sup>th</sup> 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 1227, during normal business hours.

Dated this the XX day of April, 2015.

By: American Energy – Marcellus, LLC  
Tim Cummings  
Director – Operations, AEM  
301 NW 63<sup>rd</sup> St. Suite 600  
Oklahoma City, OK 73116

# **Attachment K**

**Attachment K**  
**G70-A General Permit Electronic Submittal**

American Energy – Marcellus, LLC has chosen not to submit this G70-A General Permit Application electronically. One (1) original copy and two (2) complete PDF versions on CD-ROM of this application have been delivered to the WVDEP Division of Air Quality.

# **Attachment L**

**Attachment L**  
**G70-A General Permit Application Fee**

An application fee of \$500 is being submitted by American Energy – Marcellus, LLC with this G70-A General Permit Application.

# **Attachment M**

**Attachment M**  
**G70-A General Permit Siting Criteria Waiver**

There are no dwellings within 300 ft of the proposed facility. A Siting Criteria Waiver is not applicable to the WJ Criswell 405 natural gas facility.

# **Attachment N**



AMERICAN ENERGY  
PARTNERS

# Natural Gas Liquids

## Safety Data Sheet

### Section 1: Identification of the substance or mixture and of the supplier

**Product Name:** Natural Gas Liquids  
**SDS Number:** 786340

**Synonyms/Other Means of Identification:** Natural Gas Liquids, Raw  
Natural Gas Liquids, Ethane Free  
Plant Condensate  
Raw NGL  
EPBC Mix  
PBC Mix  
Y-Grade  
Gas Liquids

**MARPOL Annex I Category:** Naphthas and Condensates  
**Intended Use:** Feedstock

**Manufacturer:** American Energy Partners  
301 N.W. 63rd  
Oklahoma City, OK 73116

**Emergency Health and Safety Number:** Chemtrec: 800-424-9300 (24 Hours)

**SDS Information:** Phone: 844-210-6000  
URL: [www.americanenergypartners.com](http://www.americanenergypartners.com)

### Section 2: Hazard(s) Identification

#### Classification

H224 -- Flammable liquids -- Category 1  
H315 -- Skin corrosion/irritation -- Category 2  
H304 -- Aspiration Hazard -- Category 1  
H336 -- Specific target organ toxicity (single exposure) -- Category 3  
H350 -- Carcinogenicity -- Category 1B  
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

#### Hazards not Otherwise Classified

May contain or release poisonous hydrogen sulfide gas

#### Label Elements



#### **DANGER**

Extremely flammable liquid and vapor. (H224)\*

Causes skin irritation. (H315)\*

May contain or release poisonous hydrogen sulfide gas

May be fatal if swallowed and enters airways. (H304)\*

May cause drowsiness or dizziness. (H336)\*

May cause cancer. (H350)\*

Toxic to aquatic life with long lasting effects. (H411)\*

**Precautionary Statement(s):**

Obtain special instructions before use. (P201)\*  
Do not handle until all safety precautions have been read and understood. (P202)\*  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)\*  
Keep container tightly closed. (P233)\*  
Ground/bond container and receiving equipment. (P240)\*  
Use with explosion-proof equipment. (P241)\*  
Use only non-sparking tools. (P242)\*  
Take precautionary measures against static discharge. (P243)\*  
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)\*  
Wash thoroughly after handling. (P264)\*  
Use only outdoors or in a well-ventilated area. (P271)\*  
Wear protective gloves / protective clothing / eye protection / face protection. (P280)\*  
IF ON SKIN: Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. (P303+P361+P353)\*  
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)\*  
If skin irritation occurs: Get medical advice/attention. (P313)\*  
Take off contaminated clothing and wash before reuse. (P362)\*  
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)\*  
Do NOT induce vomiting. (P331)\*  
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340)\*  
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)\*  
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)\*  
Store in a well-ventilated place. Keep cool.(P403+P235)\*  
Store locked up. (P405)\*  
Dispose of contents/container to approved disposal facility. (P501)\*

*\*(Applicable GHS hazard code.)*

**Section 3: Composition / Information on Ingredients**

Component	CASRN	Concentration <sup>1</sup>
Natural gas (petroleum), raw liq. mix	64741-48-6	100
n-Hexane	110-54-3	5-25
Benzene	71-43-2	0.1-5
Hydrogen Sulfide	7783-06-4	<1

**Total Sulfur:** > 0.5 wt%

<sup>1</sup> All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

**Section 4: First Aid Measures**

**Eye Contact:** If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

**Skin Contact:** Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

**Inhalation (Breathing):** If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

**Ingestion (Swallowing):** Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

### Most important symptoms and effects

**Acute:** Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

**Delayed:** Dry skin and possible irritation with repeated or prolonged exposure.

**Notes to Physician:** At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% NaNO<sub>2</sub> solution (0.5 gm NaNO<sub>2</sub> in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

**Other Comments:** Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

## Section 5: Fire-Fighting Measures



### NFPA 704 Hazard Class

**Health:** 1    **Flammability:** 4    **Instability:** 0    (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

**Unusual Fire & Explosion Hazards:** Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

**Extinguishing Media:** Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

**Fire Fighting Instructions:** For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

**Hazardous Combustion Products:** Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

## Section 6: Accidental Release Measures

**Personal Precautions:** Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H<sub>2</sub>S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

**Environmental Precautions:** Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

**Methods for Containment and Clean-Up:** Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

## Section 7: Handling and Storage

**Precautions for safe handling:** Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. May contain or release dangerous levels of hydrogen sulfide. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid breathing vapors or mists. Use only outdoors or in well-ventilated area. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

**Static Accumulation Hazard:** Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

**Conditions for safe storage:** This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H<sub>2</sub>S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

## Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Natural gas (petroleum), raw liq. mix	TWA: 300 ppm (as Gasoline)	TWA: 400 mg/m <sup>3</sup> TWA: 100 ppm	0.5 ppm TWA8hr (as benzene) 0.25 ppm TWA12hr (as benzene) 2.5 ppm STEL (as benzene) (American Energy Guidelines)
n-Hexane	TWA: 50 ppm Skin	TWA: 500 ppm TWA: 1800 mg/m <sup>3</sup>	---
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (American Energy Guidelines)

**Note:** State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

**Engineering controls:** If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

**Eye/Face Protection:** The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

**Skin/Hand Protection:** The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

**Respiratory Protection:** A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

**Other Protective Equipment:** Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

## Section 9: Physical and Chemical Properties

**Note:** Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

<b>Appearance:</b>	Colorless
<b>Physical Form:</b>	Liquid
<b>Odor:</b>	Gasoline; Rotten egg / sulfurous
<b>Odor Threshold:</b>	No data
<b>pH:</b>	Not applicable
<b>Vapor Pressure:</b>	150 - 200 psia (Reid VP) @ 100°F / 37.8°C
<b>Vapor Density (air=1):</b>	>1
<b>Initial Boiling Point/Range:</b>	No data
<b>Melting/Freezing Point:</b>	No data
<b>Solubility in Water:</b>	Negligible
<b>Partition Coefficient (n-octanol/water) (Kow):</b>	No data
<b>Specific Gravity (water=1):</b>	(estimated) 0.5 - 0.7 @ 68°F / 20°C
<b>Percent Volatile:</b>	100%
<b>Evaporation Rate (nBuAc=1):</b>	No data
<b>Flash Point:</b>	< -99 °F / < -73 °C
<b>Test Method:</b>	(estimate)
<b>Lower Explosive Limits (vol % in air):</b>	No data
<b>Upper Explosive Limits (vol % in air):</b>	No data
<b>Auto-ignition Temperature:</b>	No data

## Section 10: Stability and Reactivity

**Stability:** Stable under normal ambient and anticipated conditions of use.

**Conditions to Avoid:** Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

**Materials to Avoid (Incompatible Materials):** Avoid contact with strong oxidizing agents and strong reducing agents.

**Hazardous Decomposition Products:** Not anticipated under normal conditions of use.

**Hazardous Polymerization:** Not known to occur.

## Section 11: Toxicological Information

### Information on Toxicological Effects of Substance/Mixture

<u>Acute Toxicity</u>	<u>Hazard</u>	<u>Additional Information</u>	<u>LC50/LD50 Data</u>
Inhalation	Expected to have a low degree of toxicity by inhalation	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	> 5.2 mg/L (vapor)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

**Aspiration Hazard:** May be fatal if swallowed and enters airways.

**Skin Corrosion/Irritation:** Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

**Serious Eye Damage/Irritation:** Causes mild eye irritation. .

**Signs and Symptoms:** Effects of overexposure can include slight irritation of the respiratory tract, nausea, vomiting, and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued exposure to high concentrations can result in vomiting, cardiac irregularities and sudden loss of consciousness.

**Skin Sensitization:** Not expected to be a skin sensitizer.

**Respiratory Sensitization:** No information available.

**Specific Target Organ Toxicity (Single Exposure):** May cause drowsiness and dizziness.

**Specific Target Organ Toxicity (Repeated Exposure):** Not expected to cause organ effects from repeated exposure.

**Carcinogenicity:** May cause cancer Based on component information.

**Germ Cell Mutagenicity:** Not expected to cause heritable genetic effects.

**Reproductive Toxicity:** Not expected to cause reproductive toxicity.

**Other Comments:** This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

#### Information on Toxicological Effects of Components

##### Natural gas (petroleum), raw liq. mix

**Carcinogenicity:** Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow-up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional processes and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma, or kidney cancer from gasoline exposure. Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

**Target Organs:** Two year inhalation studies of wholly vaporized unleaded gasoline, and 90 days studies of various petroleum naphthas, did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rats, characterized by the accumulation of alpha-2-u-globulin in epithelial cells of the proximal tubules was observed, however follow-up studies suggest that these changes are unique to the male rat.

**Reproductive Toxicity:** No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two-generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.

##### n-Hexane

**Target Organs:** Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

**Reproductive Toxicity:** Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

##### Benzene

**Carcinogenicity:** Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

**Target Organs:** Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

**Reproductive Toxicity:** Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

**Germ Cell Mutagenicity:** Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

**Toluene**

**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

**Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

**Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

**Cyclohexane**

**Reproductive Toxicity:** Two-generation reproduction and developmental toxicity studies using rats and rabbits exposed (whole-body) to atmospheric concentrations up to 7000 ppm cyclohexane did not detect evidence of developmental toxicity in either species.

## Section 12: Ecological Information

**Toxicity:** Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition. These substances should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

**Persistence and Degradability:** The hydrocarbons in this material are not readily biodegradable but are regarded as inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.

**Persistence per IOPC Fund definition:** Non-Persistent

**Bioaccumulative Potential:** Log Kow values measured for the hydrocarbon components of this material range from 3 to greater than 6 and therefore are regarded as having the potential to bioaccumulate. In practice, metabolic processes or physical properties may prevent this effect or limit bioavailability.

**Mobility in Soil:** On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 6.5 days for benzene to 0.5 days for n-dodecane.

**Other Adverse Effects:** None anticipated.

## Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

**EPA Waste Number(s)**

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

## Section 14: Transport Information

### U.S. Department of Transportation (DOT)

<b>Shipping Description:</b>	<b>If vapor pressure is &gt; 300 kPa (43.5 psia) at 50° C (122° F) shipping description is:</b> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., 2.1; ; <b>If vapor pressure is &lt;= 300 kPa (43.5 psia) at 50° C (122° F) shipping description is:</b> UN3295, Hydrocarbons, liquid, n.o.s., 3, I or II [ I if BP < 95° F (35° C); II if BP > 95° F ]
<b>Non-Bulk Package Marking:</b>	<b>Must be consistent with shipping description, either:</b> Hydrocarbon gas mixture, liquefied, n.o.s., UN1965 <b>or</b> Hydrocarbons, liquid, n.o.s., UN3295
<b>Non-Bulk Package Labeling:</b>	<b>For UN1965:</b> Flammable gas <b>For UN3295:</b> Flammable liquid
<b>Bulk Package/Placard Marking:</b>	<b>For UN1965:</b> Flammable gas / 1965 <b>For UN3295:</b> Flammable / 3295
<b>Packaging - References:</b>	<b>For UN1965:</b> 49 CFR: 173.306; 173.304; 173.314 & .315 <b>For UN3295:</b> 49 CFR 173.150; 173.201; 173.243 [ <b>PG I</b> ] <b>-or-</b> 49 CFR 173.150; 173.202; 173.242 [ <b>PG II</b> ] <b>(Exceptions; Non-bulk; Bulk)</b>
<b>Hazardous Substance:</b>	See Section 15 for RQ's
<b>Emergency Response Guide:</b>	<b>UN1965</b> - 115; <b>UN3295</b> - 128;
<b>Note:</b>	<b>The following alternate shipping description order may be used until January 1, 2013:</b> <b>Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group</b> <b>Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable</b> <b>Other shipping description elements may be required for DOT compliance.</b>

### International Maritime Dangerous Goods (IMDG)

<b>Shipping Description:</b>	<b>If boiling point is &lt; 20° C shipping description is:</b> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., ( Propane , Butane ), 2.1 <b>If vapor pressure is &lt;= 300 kPa (43.5 psia) at 50° C (122° F) shipping description is:</b> UN3295, Hydrocarbons, liquid, n.o.s., 3, I or II (FP° C cc), [where FP is the material's flash point in degrees C cc.] [ I if BP < 95° F (35° C); II if BP > 95° F];
<b>Non-Bulk Package Marking:</b>	<b>Must be consistent with shipping description, either:</b> Hydrocarbon gas mixture, liquefied, n.o.s., (Propane, Butane), UN1965 <b>or</b> Hydrocarbons, liquid, n.o.s., UN3295
<b>Labels:</b>	<b>For UN1965:</b> Flammable gas <b>For UN3295:</b> Flammable liquid
<b>Placards/Marking (Bulk):</b>	<b>For UN1965:</b> Flammable gas / 1965 <b>For UN3295:</b> Flammable / 3295
<b>Packaging - Non-Bulk:</b>	<b>For UN1965:</b> P200 <b>For UN3295:</b> P001
<b>EMS:</b>	<b>For UN1965:</b> F-D, S-U <b>For UN3295:</b> F-E, S-D
<b>Note:</b>	<b>If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.</b>

**International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)**

**UN/ID #:** UN1965 or UN3295

**Proper Shipping Name:** *For UN1965:* Hydrocarbon gas mixture, liquefied, n.o.s. (Propane, Butane)  
*For UN3295:* Hydrocarbons, liquid, n.o.s.

**Hazard Class/Division:** *For UN1965:* 2.1  
*For UN3295:* 3

**Subsidiary risk:** None  
**Packing Group:** *For UN1965:* None  
*For UN3295:* I or II [ *Determined by IATA 3.3.2* ]

**Non-Bulk Package Marking:** *For UN1965:* Hydrocarbon gas mixture, liquefied, n.o.s. (Propane, Butane), UN1965  
*For UN3295:* Hydrocarbons, liquid, n.o.s., UN3295

**Labels:** *For UN1965:* Flammable gas , Cargo Aircraft Only  
*For UN3295:* Flammable liquid

**ERG Code:** *For UN1965:* 10L or *For UN3295:* 3H  
 LTD. QTY

		Passenger Aircraft	Cargo Aircraft Only
<b>Packaging Instruction #:</b>	<i>UN1965</i> - Forbidden <i>UN3295</i> - Forbidden - [ PG I ] Y341 - [ PG II ]	<i>UN1965</i> - Forbidden <i>UN3295</i> - 351 - [ PG I ] 353 - [ PG II ]	<i>UN1965</i> - 200 <i>UN3295</i> - 361 - [ PG I ] 364 - [ PG II ]
<b>Max. Net Qty. Per Package:</b>	<i>UN3295</i> - Forbidden - [ PG I ] 1L - [ PG II ]	<i>UN3295</i> - 1L - [ PG I ] 5 L - [ PG II ]	<i>UN1965</i> - 150 kg <i>UN3295</i> - 30 L - [ PG I ] 60 L - [ PG II ]

**Section 15: Regulatory Information**

**CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):**

This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

**CERCLA/SARA - Section 311/312 (Title III Hazard Categories)**

**Acute Health:** Yes  
**Chronic Health:** Yes  
**Fire Hazard:** Yes  
**Pressure Hazard:** No  
**Reactive Hazard:** No

**CERCLA/SARA - Section 313 and 40 CFR 372:**

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration <sup>1</sup>	de minimis
n-Hexane	5-25	1.0%
Toluene	1-5	1.0%
Benzene	0.1-5	0.1%
Cyclohexane	0-3	1.0%

**EPA (CERCLA) Reportable Quantity (in pounds):**

EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

**California Proposition 65:**

Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

#### International Hazard Classification

**Canada:**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

**WHMIS Hazard Class:**

B2 - Flammable Liquids  
D2A  
D2B

#### National Chemical Inventories

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA  
All components are either on the DSL, or are exempt from DSL listing requirements

**U.S. Export Control Classification Number:** EAR99

### Section 16: Other Information

<b>Date of Issue:</b>	20-Sep-2014
<b>Status:</b>	FINAL
<b>Previous Issue Date:</b>	20-Sep-2014
<b>Revised Sections or Basis for Revision:</b>	Identified Hazards (Section 2) Precautionary Statement(s) (Section 2) First Aid (Section 4)Exposure limits (Section 8) Shipping information (Section 14) Regulatory information (Section 15)
<b>SDS Number:</b>	786340

**Guide to Abbreviations:**

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

**Disclaimer of Expressed and implied Warranties:**

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.



AMERICAN ENERGY  
PARTNERS

# Crude Condensate

## Safety Data Sheet

### Section 1: Identification of the substance or mixture and of the supplier

<b>Product Name:</b>	Crude Condensate
<b>SDS Number:</b>	730370
<b>Synonyms/Other Means of Identification:</b>	Natural Gas Condensates, Petroleum Crude Oil Condensate Gas Drips
<b>MARPOL Annex I Category:</b>	Naphthas and Condensates
<b>Intended Use:</b>	Feedstock
<b>Manufacturer:</b>	American Energy Partners 301 N.W. 63rd Oklahoma City, OK 73116
<b>Emergency Health and Safety Number:</b>	Chemtrec: 800-424-9300 (24 Hours)
<b>SDS Information:</b>	Phone: 844-210-6000 URL: <a href="http://www.americanenergypartners.com">www.americanenergypartners.com</a>

### Section 2: Hazard(s) Identification

#### Classification

H224 -- Flammable liquids -- Category 1  
H304 -- Aspiration Hazard -- Category 1  
H315 -- Skin corrosion/irritation -- Category 2  
H332 -- Acute toxicity, Inhalation -- Category 4  
H336 -- Specific target organ toxicity (single exposure) -- Category 3  
H350 -- Carcinogenicity -- Category 1B  
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

#### Hazards not Otherwise Classified

May contain or release poisonous hydrogen sulfide gas

#### Label Elements



#### **DANGER**

**Extremely flammable liquid and vapor. (H224)\***  
**Causes skin irritation. (H315)\***  
**May be fatal if swallowed and enters airways. (H304)\***  
**Contains poisonous hydrogen sulfide gas**  
**Harmful if inhaled. (H332)\***  
**May cause drowsiness or dizziness. (H336)\***  
**May cause cancer. (H350)\***  
**Toxic to aquatic life with long lasting effects. (H411)\***

**Precautionary Statement(s):**

Obtain special instructions before use. (P201)\*  
Do not handle until all safety precautions have been read and understood. (P202)\*  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)\*  
Keep container tightly closed. (P233)\*  
Keep cool. (P235)\*  
Ground/bond container and receiving equipment. (P240)\*  
Use with explosion-proof equipment. (P241)\*  
Use only non-sparking tools. (P242)\*  
Take precautionary measures against static discharge. (P243)\*  
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)\*  
Wash thoroughly after handling. (P264)\*  
Use only outdoors or in a well-ventilated area. (P271)\*  
Avoid release to the environment. (P273)\*  
Wear protective gloves / protective clothing / eye protection / face protection. (P280)\*  
IF ON SKIN: Remove/Take off immediately all contaminated clothing. (P361)\* Wash with plenty of soap and water. (P352)\*  
If skin irritation occurs: Get medical advice/attention. (P313)\*  
Take off contaminated clothing and wash before reuse. (P362)\*  
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P340)\*  
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)\*  
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)\*  
Do NOT induce vomiting. (P331)\*  
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)\*  
Collect spillage. (P391)\*  
Store locked up. (P405)\*  
Store in a well-ventilated place. Keep container tightly closed. (P403+P233)\*  
Dispose of contents/container to approved disposal facility. (P501)\*

*\*(Applicable GHS hazard code.)*

**Section 3: Composition / Information on Ingredients**

Component	CASRN	Concentration <sup>1</sup>
Natural Gas Condensate ..C2-20	64741-47-5	100
Toluene	108-88-3	1-7
Hydrogen Sulfide	7783-06-4	0.1-5
Benzene	71-43-2	<5

<sup>1</sup> All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Crude oil, natural gas and natural gas condensate can contain minor amounts of sulfur, nitrogen and oxygen containing organic compounds as well as trace amounts of heavy metals like mercury, arsenic, nickel, and vanadium. Composition can vary depending on the source of crude.

**Section 4: First Aid Measures**

**Eye Contact:** If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

**Skin Contact:** Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

**Inhalation (Breathing):** Immediately move victim away from exposure and into fresh air in a position comfortable for breathing. If respiratory symptoms or other symptoms of exposure develop, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

**Ingestion (Swallowing):** Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

#### Most important symptoms and effects

**Acute:** Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

**Delayed:** Dry skin and possible irritation with repeated or prolonged exposure.

**Notes to Physician:** At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% NaNO<sub>2</sub> solution (0.5 gm NaNO<sub>2</sub> in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

**Other Comments:** Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

## Section 5: Fire-Fighting Measures



### NFPA 704 Hazard Class

**Health:** 2    **Flammability:** 4    **Instability:** 0    (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

**Unusual Fire & Explosion Hazards:** Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

**Extinguishing Media:** Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

**Fire Fighting Instructions:** For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

**Hazardous Combustion Products:** Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

## Section 6: Accidental Release Measures

**Personal Precautions:** Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Contains poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H<sub>2</sub>S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

**Environmental Precautions:** Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

**Methods for Containment and Clean-Up:** Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

## Section 7: Handling and Storage

**Precautions for safe handling:** Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Wear protective gloves/clothing and eye/face protection. May contain or release dangerous levels of hydrogen sulfide. Use only outdoors or in well-ventilated area. Avoid breathing vapors or mists. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas, and condensates. Production and processing of these materials can lead to "drop-out" of elemental mercury in enclosed vessels and pipe work, typically at the low point of any process equipment because of its density. Mercury may also occur in other process system deposits such as sludges, sands, scales, waxes, and filter media. Personnel engaged in work with equipment where mercury deposits might occur (confined space entry, sampling, opening drain valves, draining process lines, etc), may be exposed to a mercury hazard (see sections 3 and 8).

Static Accumulation Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

**Conditions for safe storage:** This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H<sub>2</sub>S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

## Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Natural Gas Condensate ..C2-20	TWA: 300 ppm (as Gasoline)	TWA: 400 mg/m <sup>3</sup> TWA: 100 ppm	0.5 ppm TWA8hr (as benzene) 0.25 ppm TWA12hr (as benzene) 2.5 ppm STEL (as benzene) (American Energy Guidelines)
Toluene	TWA: 20 ppm	Ceiling: 300 ppm TWA: 200 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (American Energy Guidelines)
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---

**Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.**

**Engineering controls:** If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

**Eye/Face Protection:** The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

**Skin/Hand Protection:** The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

**Respiratory Protection:** A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in processing vessels and equipment presenting the possibility of exposure during various sampling and maintenance operations. Implement appropriate respiratory protection and the use of other protective equipment as dictated by monitoring results (See Sections 2 and 7).

**Other Protective Equipment:** Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

**Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.**

## Section 9: Physical and Chemical Properties

**Note:** Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

<b>Appearance:</b>	Amber to dark brown
<b>Physical Form:</b>	Liquid
<b>Odor:</b>	Rotten egg / sulfurous; Petroleum.
<b>Odor Threshold:</b>	No data
<b>pH:</b>	Not applicable
<b>Vapor Pressure:</b>	5-15 psia (Reid VP) @ 100°F / 37.8°C
<b>Vapor Density (air=1):</b>	1
<b>Initial Boiling Point/Range:</b>	-20 to 800 °F / -29 to 427 °C
<b>Melting/Freezing Point:</b>	No data
<b>Solubility in Water:</b>	Negligible
<b>Partition Coefficient (n-octanol/water) (Kow):</b>	No data
<b>Specific Gravity (water=1):</b>	0.6 - 0.8 @ 60°F (15.6°C)
<b>Bulk Density:</b>	6.25 lbs/gal
<b>VOC Content(%):</b>	50
<b>Evaporation Rate (nBuAc=1):</b>	1
<b>Flash Point:</b>	-51 °F / -46 °C
<b>Test Method:</b>	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
<b>Lower Explosive Limits (vol % in air):</b>	1.1
<b>Upper Explosive Limits (vol % in air):</b>	6.0
<b>Auto-ignition Temperature:</b>	590 °F / 310 °C

## Section 10: Stability and Reactivity

**Stability:** Stable under normal ambient and anticipated conditions of use.

**Conditions to Avoid:** Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

**Materials to Avoid (Incompatible Materials):** Avoid contact with strong oxidizing agents and strong reducing agents.

**Hazardous Decomposition Products:** Not anticipated under normal conditions of use.

**Hazardous Polymerization:** Not known to occur.

## Section 11: Toxicological Information

### Information on Toxicological Effects of Substance/Mixture

<u>Acute Toxicity</u>	<u>Hazard</u>	<u>Additional Information</u>	<u>LC50/LD50 Data</u>
Inhalation	Harmful if inhaled	Contains poisonous hydrogen sulfide gas. See Signs and Symptoms.	10 mg/L (vapor, estimated)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

**Aspiration Hazard:** May be fatal if swallowed and enters airways.

**Skin Corrosion/Irritation:** Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

**Serious Eye Damage/Irritation:** Causes mild eye irritation. .

**Signs and Symptoms:** Effects of overexposure can include slight irritation of the respiratory tract, nausea, vomiting, and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued exposure to high concentrations can result in vomiting, cardiac irregularities and sudden loss of consciousness.

This material contains hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

**Skin Sensitization:** Not expected to be a skin sensitizer.

**Respiratory Sensitization:** No information available.

**Specific Target Organ Toxicity (Single Exposure):** May cause drowsiness and dizziness.

**Specific Target Organ Toxicity (Repeated Exposure):** Not expected to cause organ effects from repeated exposure.

**Carcinogenicity:** May cause cancer

**Germ Cell Mutagenicity:** Not expected to cause heritable genetic effects.

**Reproductive Toxicity:** Not expected to cause reproductive toxicity.

## Information on Toxicological Effects of Components

### Natural Gas Condensate ..C2-20

**Carcinogenicity:** Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow-up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional processes and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma, or kidney cancer from gasoline exposure. Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

**Target Organs:** Two year inhalation studies of wholly vaporized unleaded gasoline, and 90 days studies of various petroleum naphthas, did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rats, characterized by the accumulation of alpha-2-u- globulin in epithelial cells of the proximal tubules was observed, however follow-up studies suggest that these changes are unique to the male rat.

**Reproductive Toxicity:** No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two-generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.

### Xylenes

**Target Organs:** Rats exposed to xylenes at 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

**Reproductive Toxicity:** Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

### Toluene

**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

**Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

**Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

### Cyclohexane

**Reproductive Toxicity:** Two-generation reproduction and developmental toxicity studies using rats and rabbits exposed (whole-body) to atmospheric concentrations up to 7000 ppm cyclohexane did not detect evidence of developmental toxicity in either species.

### Benzene

**Carcinogenicity:** Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

**Target Organs:** Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

**Reproductive Toxicity:** Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

**Germ Cell Mutagenicity:** Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

### n-Hexane

**Target Organs:** Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

**Reproductive Toxicity:** Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

### **Ethyl Benzene**

**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

**Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilic foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

## **Section 12: Ecological Information**

**Toxicity:** Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition. These substances should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

**Persistence and Degradability:** The hydrocarbons in this material are not readily biodegradable but are regarded as inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.

**Bioaccumulative Potential:** Log Kow values measured for the hydrocarbon components of this material range from 3 to greater than 6 and therefore are regarded as having the potential to bioaccumulate. In practice, metabolic processes or physical properties may prevent this effect or limit bioavailability.

**Mobility in Soil:** On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 6.5 days for benzene to 0.5 days for n-dodecane.

**Other Adverse Effects:** None anticipated.

## **Section 13: Disposal Considerations**

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

### **EPA Waste Number(s)**

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

## Section 14: Transport Information

### U.S. Department of Transportation (DOT)

<b>Shipping Description:</b>	<p><i>If vapor pressure is &gt; 300 kPa (43.5 psia) at 50° C (122° F) and H2S is &gt; 8.8 molar % shipping description is:</i> UN3160, Liquefied gas, toxic, flammable, n.o.s., ( Hydrogen sulfide; ; Liquefied Petroleum Gas ), 2.3; , (2.1), Inhalation Hazard Zone <b>X</b> <i>If vapor pressure is &gt; 300 kPa (43.5 psia) at 50° C (122° F) and H2S is &lt; 8.8 molar % shipping description is:</i> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., 2.1 <i>If vapor pressure is ≤ 300 kPa (43.5 psia) at 50° C (122° F) and H2S is &lt; 8.8 molar % shipping description is:</i> UN1267, Petroleum crude oil, 3, I <b>or</b> II [ I if BP &lt; 35° C (95° F); II if BP &gt; 35° C]</p>
<b>Non-Bulk Package Marking:</b>	<p><i>Must be consistent with shipping description, either:</i> Liquefied gas, toxic, flammable, n.o.s., (Hydrogen sulfide, Liquefied petroleum gas), UN3160 <i>or</i> Hydrocarbon gas mixture, liquefied, n.o.s., UN1965 <i>or</i> Petroleum crude oil, UN1267</p>
<b>Non-Bulk Package Labeling:</b>	<p><i>For UN3160:</i> Poison gas and Flammable gas <i>For UN1965:</i> Flammable gas <i>For UN1267:</i> Flammable liquid</p>
<b>Bulk Package/Placard Marking:</b>	<p><i>For UN3160:</i> Poison gas / 3160 and Flammable gas <i>For UN1965:</i> Flammable gas / 1965 <i>For UN1267:</i> Flammable / 1267</p>
<b>Packaging - References:</b>	<p><i>For UN3160:</i> None; 49 CFR 173.304; 173.314 &amp; .315 <i>For UN1965:</i> 49 CFR: 173.306; 173.304; 173.314 &amp; .315 <i>For UN1267:</i> 49 CFR 173.150; 173.201; 173.243 [ <b>PG I</b> ] <i>-or-</i> 49 CFR 173.150; 173.202; 173.242 [ <b>PG II</b> ] <i>(Exceptions; Non-bulk; Bulk)</i></p>
<b>Hazardous Substance:</b>	<p>The EPA's Petroleum Exclusion applies to Section 2 and/or 15 components which are listed in 49 CFR 172.101, Table 1 to Appendix A.</p>
<b>Emergency Response Guide:</b>	<p><b>UN3160</b> - 119; <b>UN1965</b> - 115; <b>UN1267</b> - 128;</p>
<b>Note:</b>	<p>Replace <b>X</b> in shipping description with: <b>D</b> if Molar % H2S is from 8.8% to 14.8% <b>C</b> if Molar % H2S is from 14.9% to 44.4% <b>B</b> if Molar % H2S is from 44.5% to 100.0% <i>Container(s) greater than 5 liters (liquids) or 5 kilograms (solids), shipped by water mode and ALL bulk shipments may require the shipping description to contain the "Marine Pollutant" notation [49 CFR 172.203(I)] and the container(s) to display the [Marine Pollutant Mark] [49 CFR 172.322].</i>  <i>The following alternate shipping description order may be used until January 1, 2013:</i> Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group <i>Other shipping description elements may be required for DOT compliance.</i> <i>Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable</i></p>

### International Maritime Dangerous Goods (IMDG)

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<b>Shipping Description:</b>	<i>If vapor pressure is &gt; 300 kPa (43.5 psia) at 50° C (122° F) and H2S is &gt; 8.8 molar % shipping description is:</i> UN3160, Liquefied gas, toxic, flammable, n.o.s ( Hydrogen sulphide , Liquefied Petroleum Gas ), 2.3,; , (2.1) <i>If vapor pressure is &gt; 300 kPa (43.5 psia) at 50° C (122° F) and H2S is &lt; 8.8 molar % shipping description is:</i> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., (Hydrogen sulphide, Liquefied petroleum gas), 2.1; <i>If vapor pressure is &lt;= 300 kPa (43.5 psia) at 50° C (122° F) and H2S is &lt; 8.8 molar % shipping description is:</i> UN1267, Petroleum crude oil, 3, I or II [ I if IBP < 35° C (95° F); II if IBP > 35° C ] (-46° C);
<b>Non-Bulk Package Marking:</b>	<i>Must be consistent with shipping description, either:</i> Liquefied gas, toxic, flammable, n.o.s., (Hydrogen sulphide, Liquefied petroleum gas), UN3160 <i>or</i> Hydrocarbon gas mixture, liquefied, n.o.s., (Hydrogen sulphide, Liquefied petroleum gas), UN1965 <i>or</i> Petroleum crude oil, UN1267
<b>Labels:</b>	<i>For UN3160:</i> Toxic gas and Flammable gas <i>For UN1965:</i> Flammable gas <i>For UN1267:</i> Flammable liquid
<b>Placards/Marking (Bulk):</b>	<i>For UN3160:</i> Toxic gas / 3160 and Flammable gas <i>For UN1965:</i> Flammable gas / 1965 <i>For UN1267:</i> Flammable / 1267
<b>Packaging - Non-Bulk:</b>	<i>For UN3160 &amp; UN1965:</i> P200 <i>For UN1267:</i> P001
<b>EMS:</b>	<i>For UN3160 &amp; UN1965:</i> F-D, S-U <i>For UN1267:</i> F-E, S-E
<b>Note:</b>	<i>If container(s) is greater than 5 liters (liquids) or 5 kilograms (solids), shipment may require the shipping description to contain the "Marine Pollutant" description [IMDG 5.4.1.4.3.5] and the container(s) to display the Marine Pollutant mark [IMDG 5.2.1.6]. U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 &amp; 25. If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.</i>
<b><u>International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)</u></b>	
<b>UN/ID #:</b>	UN3160 - <i>Forbidden</i> UN1965 <i>or</i> UN1267
<b>Proper Shipping Name:</b>	<i>For UN1965:</i> Hydrocarbon gas mixture, liquefied, n.o.s. (Liquefied petroleum gas, Hydrogen sulphide) <i>For UN1267:</i> Petroleum crude oil
<b>Hazard Class/Division:</b>	<i>For UN1965:</i> 2.1 <i>For UN1267:</i> 3
<b>Subsidiary risk:</b>	None
<b>Packing Group:</b>	<i>For UN1965:</i> None <i>For UN1267:</i> I or II [ <i>Determined by IATA 3.3.2</i> ]
<b>Non-Bulk Package Marking:</b>	<i>For UN1965:</i> Hydrocarbon gas mixture, liquefied, n.o.s. (Liquefied petroleum gas, Hydrogen sulphide), UN1965 <i>For UN1267:</i> Petroleum crude oil, UN1267
<b>Labels:</b>	<i>For UN1965:</i> Flammable gas , Cargo Aircraft Only <i>For UN1267:</i> Flammable liquid
<b>ERG Code:</b>	<i>For UN1965:</i> 10L <i>or For UN1267:</i> 3L LTD. QTY      Passenger Aircraft      Cargo Aircraft Only

<b>Packaging Instruction #:</b>	<i>UN1965</i> - Forbidden <i>UN1267</i> - Forbidden - [ PG I ] Y341 - [ PG II ]	<i>UN1965</i> - Forbidden <i>UN1267</i> - 351 - [ PG I ] 353 - [ PG II ]	<i>UN1965</i> - 200 <i>UN1267</i> - 361 - [ PG I ] 364 - [ PG II ]
<b>Max. Net Qty. Per Package:</b>	<i>UN1267</i> - None (PG I); 1L (PG II)	<i>UN1267</i> - 1L - [ PG I ] 5 L - [ PG II ]	<i>UN1965</i> - 150 kg <i>UN1267</i> - 30 L - [ PG I ] 60 L - [ PG II ]

## Section 15: Regulatory Information

### CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

### CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No
Reactive Hazard:	No

### CERCLA/SARA - Section 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration <sup>1</sup>	de minimis
Xylenes	1-8	1.0%
Toluene	1-7	1.0%
Cyclohexane	1-5	1.0%
Benzene	<5	0.1%
n-Hexane	2-4	1.0%
Ethyl Benzene	1-3	0.1%

### EPA (CERCLA) Reportable Quantity (in pounds):

EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

### California Proposition 65:

Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant
Ethyl Benzene	Cancer

### International Hazard Classification

#### Canada:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

#### WHMIS Hazard Class:

B2 - Flammable Liquids  
 D2A  
 D2B

**National Chemical Inventories**

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA  
All components are either on the DSL, or are exempt from DSL listing requirements

**U.S. Export Control Classification Number:** 1C981

**Section 16: Other Information**

<b>Date of Issue:</b>	20-Sep-2014
<b>Status:</b>	FINAL
<b>Previous Issue Date:</b>	20-Sep-2014
<b>Revised Sections or Basis for Revision:</b>	Identified Hazards (Section 2) Precautionary Statement(s) (Section 2) First Aid (Section 4) Exposure limits (Section 8) Shipping information (Section 14) Regulatory information (Section 15)
<b>SDS Number:</b>	730370

**Guide to Abbreviations:**

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

**Disclaimer of Expressed and implied Warranties:**

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.



AMERICAN ENERGY  
PARTNERS

## Produced Brine Water

### Safety Data Sheet

#### Section 1: Identification of the substance or mixture and of the supplier

**Product Name:** Produced Brine Water  
**SDS Number:** 401320  
**Intended Use:** Process Water  
**Manufacturer:** American Energy Partners  
301 N.W. 63rd  
Oklahoma City, OK 73116  
**Emergency Health and Safety Number:** Chemtrec: 800-424-9300 (24 Hours)  
**SDS Information:** Phone: 844-210-6000  
URL: [www.americanenergypartners.com](http://www.americanenergypartners.com)

#### Section 2: Hazard(s) Identification

##### Classification

H302 -- Harmful if swallowed -- Category 1  
H319 -- Eye damage/irritation -- Category 2  
H316 -- Causes mild skin irritation -- Category 1  
H332 -- Harmful if inhaled -- Category 1  
H350 -- Carcinogenicity -- Category 1A  
H412 -- May cause chronic harmful effects to aquatic life -- Category 2

##### Label Elements



##### **DANGER**

**Causes serious eye irritation. (H319)\***  
**Harmful if swallowed. (H302)\***  
**Harmful if inhaled. (H332)\***  
**May cause cancer. (H350)\***  
**Toxic to aquatic life with long lasting effects. (H412)\***

**Precautionary Statement(s):**

Obtain special instructions before use. (P201)\*  
Do not handle until all safety precautions have been read and understood. (P202)\*  
Do not breathe dust/fume/gas/mist/vapours/spray. (P261)  
Wash thoroughly after handling. (P264)\*  
Do not eat, drink, or smoke when using this product. (P270)\*  
Avoid release to the environment. (P273)\*  
Use outdoors in a well ventilated space (P271)  
Wear protective gloves / protective clothing / eye protection. (P281)\*  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+P338\*)  
If eye irritation persists: Get medical advice/attention. (P313)\*  
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P312)\*  
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304 + P340)\*  
Get medical advice/attention if you feel unwell. (P314)\*  
Collect spillage. (P391)\*  
Store locked up. (P405)\*  
Store in a well-ventilated place. Keep container tightly closed. (P403+P233)\*  
Dispose of contents/container to approved disposal facility. (P501)\*

*\*(Applicable GHS hazard code.)*

**Section 3: Composition / Information on Ingredients**

Component	CAS#	Concentration <sup>1</sup>
Water	7732-18-5	80-100%
Sodium chloride	91-20-3	<20%
Benzene	71-43-2	<2%

All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

**Section 4: First Aid Measures**

**Eye Contact:** For direct contact, remove contact lenses if present and easy to do. Immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 20 minutes. Seek immediate medical attention.

**Skin Contact:** Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

**Inhalation (Breathing):** If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If breathing is difficult, oxygen or artificial respiration should be administered by qualified personnel. If symptoms persist, seek medical attention.

**Ingestion (Swallowing):** First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

**Most important symptoms and effects**

**Acute:** Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

**Delayed:** Dry skin and possible irritation with repeated or prolonged exposure.

**Notes to Physician:** Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

## Section 5: Fire-Fighting Measures



### NFPA 704 Hazard Class

**Health:** 1   **Flammability:** 1   **Instability:** 0   (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

**Unusual Fire & Explosion Hazards:** This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

**Extinguishing Media:** Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

**Fire Fighting Instructions:** For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

**Hazardous Combustion Products:** Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

## Section 6: Accidental Release Measures

**Personal Precautions:** This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

**Environmental Precautions:** Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

**Methods for Containment and Clean-Up:** Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

## Section 7: Handling and Storage

**Precautions for safe handling:** Keep away from flames and hot surfaces. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe vapors or mists. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

**Conditions for safe storage:** Keep container(s) tightly closed and properly labeled. This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H<sub>2</sub>S, and flammability prior to entry. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

## Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	NIOSH
Water (7732-18-5)	Not established	Not established	Not established
Sodium chloride (7647-14-5)	Not established	Not established	Not established
Benzene (71-43-2)	STEL: 2.5 ppm TWA: 0.5 ppm  Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 1 ppm	STEL: 5 ppm TWA: 0.1 ppm

**Note:** State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

**Engineering controls:** If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

**Eye/Face Protection:** The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is potential liquid contact to the eye. Depending on conditions of use, a face shield may be necessary.

**Skin/Hand Protection:** The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

**Respiratory Protection:** Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

**Other Protective Equipment:** Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

**Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.**

## Section 9: Physical and Chemical Properties

**Note:** Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

<b>Appearance:</b>	Varies (clear / amber / brown)
<b>Physical Form:</b>	Liquid
<b>Odor:</b>	Petroleum
<b>Odor Threshold:</b>	No data
<b>pH:</b>	4.9-8.5
<b>Vapor Pressure:</b>	No data available
<b>Vapor Density (air=1):</b>	>1
<b>Initial Boiling Point/Range:</b>	212 °F / 100 °C
<b>Melting/Freezing Point:</b>	32 °F / 0 °C
<b>Pour Point:</b>	No data
<b>Solubility in Water:</b>	Infinintely
<b>Partition Coefficient (n-octanol/water) (Kow):</b>	>10
<b>Specific Gravity (water=1):</b>	1.0 -1.1 °API
<b>Viscosity:</b>	No data available
<b>Evaporation Rate (nBuAc=1):</b>	No data available
<b>Flash Point:</b>	No data available
<b>Test Method:</b>	Not applicable
<b>Lower Explosive Limits (vol % in air):</b>	1%
<b>Upper Explosive Limits (vol % in air):</b>	46%
<b>Auto-ignition Temperature:</b>	No data available

## Section 10: Stability and Reactivity

**Stability:** Stable under normal ambient and anticipated conditions of use.

**Conditions to Avoid:** Avoid all possible sources of ignition. Prevent vapor accumulation.

**Materials to Avoid (Incompatible Materials):** Avoid contact with strong oxidizing and reducing agents.

**Hazardous Decomposition Products:** Not anticipated under normal conditions of use.

**Hazardous Polymerization:** Not known to occur.

## Section 11: Toxicological Information

### Information on Toxicological Effects of Substance/Mixture

<u>Acute Toxicity</u>	<u>Hazard</u>	<u>Additional Information</u>	<u>LC50/LD50 Data</u>
Inhalation	Expected to have a low degree of toxicity by inhalation		No data
Skin Absorption	Unlikely to be harmful		No data
Ingestion (Swallowing)	Unlikely to be harmful		No data

**Aspiration Hazard:** Not expected to be an aspiration hazard.

**Skin Corrosion/Irritation:** Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

**Serious Eye Damage/Irritation:** Causes serious eye irritation.

**Signs and Symptoms:** Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

**Skin Sensitization:** Not expected to be a skin sensitizer.

**Respiratory Sensitization:** No information available.

**Specific Target Organ Toxicity (Single Exposure):** May cause drowsiness and dizziness.

**Specific Target Organ Toxicity (Repeated Exposure):** May cause damage to organs through prolonged or repeated exposure. Laboratory animal studies of hydrocarbon products by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus

**Carcinogenicity:** May cause cancer, based on component information.

**Germ Cell Mutagenicity:** Inadequate information available.

**Reproductive Toxicity:** Inadequate information available.

**Other Comments:** This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

## Information on Toxicological Effects of Components

### Water

**Carcinogenicity:** No data available

**Target Organs:** No data available

**Reproductive Toxicity:** No data available

**Germ Cell Mutagenicity:** No data available

### Sodium chloride

**Carcinogenicity:** No data available but sodium chloride has not been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

**Target Organs:** Eyes, respiratory system, central nervous system

**Reproductive Toxicity:** No data available

**Germ Cell Mutagenicity:** No data available

### **Benzene**

**Carcinogenicity:** Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

**Target Organs:** Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

**Reproductive Toxicity:** Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

**Germ Cell Mutagenicity:** Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

## **Section 12: Ecological Information**

**Toxicity:** Not evaluated

**Persistence and Degradability:** Not evaluated

**Persistence per IOPC Fund definition:** Not evaluated

**Bioaccumulative Potential:** Not evaluated although the solubility and log KOW would indicate it has little bioaccumulative potential.

**Mobility in Soil:** Not evaluated although the solubility properties indicate produced water would be highly mobile throughout a system.

**Other Adverse Effects:** None anticipated.

## **Section 13: Disposal Considerations**

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

### **EPA Waste Number(s)**

- D018 - Toxicity characteristic (Benzene)

## **Section 14: Transport Information**

### **U.S. Department of Transportation (DOT)**

**Shipping name:** *Not regulated*

**Note:** Some states may require specific shipping labels. Contact each jurisdiction for more information.

## Section 15: Regulatory Information

### CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

### CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health: Yes  
Chronic Health: Yes  
Fire Hazard: No  
Pressure Hazard: No  
Reactive Hazard: No

### CERCLA/SARA - Section 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration <sup>1</sup>	de minimis
Benzene	<2	0.1%

### EPA (CERCLA) Reportable Quantity (in pounds):

EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

Warning: This material may contain detectable quantities of the following chemicals identified on federal and individual state hazardous substances list. Contact each jurisdiction for more information.

Component	Type of Toxicity
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

### International Hazard Classification:

#### Canada:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

#### WHMIS Hazard Class:

D2A  
D2B

### National Chemical Inventories

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA  
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: 1C981

## Section 16: Other Information

Date of Issue:  
Status:

20-Sep-2014  
FINAL

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**Revised Sections or Basis for Revision:**

Identified Hazards (Section 2)  
Precautionary Statement(s) (Section 2)  
First Aid (Section 4)  
Shipping information (Section 14)  
Regulatory information (Section 15)

**SDS Number:**

401320

**Guide to Abbreviations:**

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

**Disclaimer of Expressed and implied Warranties:**

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

# **Attachment O**

**Attachment O**  
**G70-A EMISSION SUMMARY SHEET**

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type <sup>1</sup>	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		All Regulated Pollutants - Chemical Name/CAS <sup>3</sup>  (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions <sup>4</sup>		Maximum Potential Controlled Emissions <sup>5</sup>		Emission Form or Phase  (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>6</sup>
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
1E	Upward Vertical Stack	GPU-1	Line Heater	N/A	N/A	Total VOCs	0.006	0.03	0.006	0.03	Gas/Vapor	AP-42
						NO <sub>x</sub>	0.12	0.51	0.12	0.51		
						CO	0.10	0.43	0.10	0.43		
						PM <sub>10</sub>	0.009	0.04	0.009	0.04		
						SO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						Pb	<0.001	<0.001	<0.001	<0.001		
						Total HAPs	0.002	0.01	0.002	0.01		
						Benzene	<0.001	<0.001	<0.001	<0.001		
						Toluene	<0.001	<0.001	<0.001	<0.001		
						Formaldehyde	<0.001	<0.001	<0.001	<0.001		
						Hexane	0.002	0.009	0.002	0.009		
						CO <sub>2</sub>	175.47	768.54	175.47	768.54		
						CH <sub>4</sub>	0.003	0.01	0.003	0.01		
N <sub>2</sub> O	<0.001	0.001	<0.001	0.001								
CO <sub>2e</sub>	175.65	769.33	175.65	769.33								
2E	Upward Vertical Stack	GPU-2	Line Heater	N/A	N/A	Total VOCs	0.006	0.03	0.006	0.03	Gas/Vapor	AP-42
						NO <sub>x</sub>	0.12	0.51	0.12	0.51		
						CO	0.10	0.43	0.10	0.43		
						PM <sub>10</sub>	0.009	0.04	0.009	0.04		
						SO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						Pb	<0.001	<0.001	<0.001	<0.001		
						Total HAPs	0.002	0.01	0.002	0.01		
						Benzene	<0.001	<0.001	<0.001	<0.001		
						Toluene	<0.001	<0.001	<0.001	<0.001		
						Formaldehyde	<0.001	<0.001	<0.001	<0.001		
						Hexane	0.002	0.009	0.002	0.009		
						CO <sub>2</sub>	175.47	768.54	175.47	768.54		
						CH <sub>4</sub>	0.003	0.01	0.003	0.01		
N <sub>2</sub> O	<0.001	0.001	<0.001	0.001								
CO <sub>2e</sub>	175.65	769.33	175.65	769.33								

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type <sup>1</sup>	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		All Regulated Pollutants - Chemical Name/CAS <sup>3</sup>  (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions <sup>4</sup>		Maximum Potential Controlled Emissions <sup>5</sup>		Emission Form or Phase  (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>6</sup>
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
3E	Upward Vertical Stack	GPU-3	Line Heater	N/A	N/A	Total VOCs	0.006	0.03	0.006	0.03	Gas/Vapor	AP-42
						NO <sub>x</sub>	0.12	0.51	0.12	0.51		
						CO	0.10	0.43	0.10	0.43		
						PM <sub>10</sub>	0.009	0.04	0.009	0.04		
						SO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						Pb	<0.001	<0.001	<0.001	<0.001		
						Total HAPs	0.002	0.01	0.002	0.01		
						Benzene	<0.001	<0.001	<0.001	<0.001		
						Toluene	<0.001	<0.001	<0.001	<0.001		
						Formaldehyde	<0.001	<0.001	<0.001	<0.001		
						Hexane	0.002	0.009	0.002	0.009		
						CO <sub>2</sub>	175.47	768.54	175.47	768.54		
						CH <sub>4</sub>	0.003	0.01	0.003	0.01		
						N <sub>2</sub> O	<0.001	0.001	<0.001	0.001		
CO <sub>2e</sub>	175.65	769.33	175.65	769.33								
4E	Upward Vertical Stack	HTR-1	Line Heater	N/A	N/A	Total VOCs	0.006	0.03	0.006	0.03	Gas/Vapor	AP-42
						NO <sub>x</sub>	0.12	0.51	0.12	0.51		
						CO	0.10	0.43	0.10	0.43		
						PM <sub>10</sub>	0.009	0.04	0.009	0.04		
						SO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						Pb	<0.001	<0.001	<0.001	<0.001		
						Total HAPs	0.002	0.01	0.002	0.01		
						Benzene	<0.001	<0.001	<0.001	<0.001		
						Toluene	<0.001	<0.001	<0.001	<0.001		
						Formaldehyde	<0.001	<0.001	<0.001	<0.001		
						Hexane	0.002	0.009	0.002	0.009		
						CO <sub>2</sub>	175.47	768.54	175.47	768.54		
						CH <sub>4</sub>	0.003	0.01	0.003	0.01		
						N <sub>2</sub> O	<0.001	0.001	<0.001	0.001		
CO <sub>2e</sub>	175.65	769.33	175.65	769.33								
5E	Upward Vertical Stack	HTR-2	Line Heater	N/A	N/A	Total VOCs	0.006	0.03	0.006	0.03	Gas/Vapor	AP-42
						NO <sub>x</sub>	0.12	0.51	0.12	0.51		
						CO	0.10	0.43	0.10	0.43		
						PM <sub>10</sub>	0.009	0.04	0.009	0.04		
						SO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						Pb	<0.001	<0.001	<0.001	<0.001		
						Total HAPs	0.002	0.01	0.002	0.01		
						Benzene	<0.001	<0.001	<0.001	<0.001		
						Toluene	<0.001	<0.001	<0.001	<0.001		
						Formaldehyde	<0.001	<0.001	<0.001	<0.001		
						Hexane	0.002	0.009	0.002	0.009		
						CO <sub>2</sub>	175.47	768.54	175.47	768.54		
						CH <sub>4</sub>	0.003	0.01	0.003	0.01		
						N <sub>2</sub> O	<0.001	0.001	<0.001	0.001		
CO <sub>2e</sub>	175.65	769.33	175.65	769.33								

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type <sup>1</sup>	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		All Regulated Pollutants - Chemical Name/CAS <sup>3</sup>  (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions <sup>4</sup>		Maximum Potential Controlled Emissions <sup>5</sup>		Emission Form or Phase  (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>6</sup>
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
6E	Upward Vertical Stack	HTR-3	Line Heater	N/A	N/A	Total VOCs	0.006	0.03	0.006	0.03	Gas/Vapor	AP-42
						NO <sub>x</sub>	0.12	0.51	0.12	0.51		
						CO	0.10	0.43	0.10	0.43		
						PM <sub>10</sub>	0.009	0.04	0.009	0.04		
						SO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						Pb	<0.001	<0.001	<0.001	<0.001		
						Total HAPs	0.002	0.01	0.002	0.01		
						Benzene	<0.001	<0.001	<0.001	<0.001		
						Toluene	<0.001	<0.001	<0.001	<0.001		
						Formaldehyde	<0.001	<0.001	<0.001	<0.001		
						Hexane	0.002	0.009	0.002	0.009		
						CO <sub>2</sub>	175.47	768.54	175.47	768.54		
						CH <sub>4</sub>	0.003	0.01	0.003	0.01		
						N <sub>2</sub> O	<0.001	0.001	<0.001	0.001		
CO <sub>2e</sub>	175.65	769.33	175.65	769.33								
9E	Upward Vertical Stacks	ENG-2	HiPower Compressor Engine	N/A	None	Total VOCs	0.37	1.63	0.37	1.63	Gas/Vapor	AP-42 / EPA Cert.
						NO <sub>x</sub>	0.37	1.63	0.37	1.63		
						CO	0.61	2.68	0.61	2.68		
						PM <sub>10</sub>	0.01	0.02	0.01	0.02		
						SO <sub>2</sub>	<0.001	0.001	<0.001	0.001		
						Total HAPs	0.03	0.12	0.03	0.12		
						Benzene	<0.001	<0.001	<0.001	<0.001		
						Toluene	<0.001	<0.001	<0.001	<0.001		
						Ethylbenzene	<0.001	<0.001	<0.001	<0.001		
						Xylenes	<0.001	<0.001	<0.001	<0.001		
						Formaldehyde	0.03	0.12	0.03	0.12		
						Hexane	<0.001	0.002	<0.001	0.002		
						CO <sub>2</sub>	57.77	253.03	57.77	253.03		
						CH <sub>4</sub>	0.001	0.005	0.001	0.005		
N <sub>2</sub> O	<0.001	<0.001	<0.001	<0.001								
CO <sub>2e</sub>	57.83	253.30	57.83	253.30								
10E	Upward Vertical Stack	PTK-1 PTK-2 PTK-3 CTK-1 CTK-2 CTK-3 TRL-1 TRL-2 CTRL-1	Enclosed Combustion Device	N/A	N/A	Total VOCs	29.86	130.80	0.68	2.96	Gas/Vapor	E&P Tanks, 40CFR98 Subpart W
						Total HAPs	0.75	3.31	0.04	0.18		
						CO	<0.001	<0.001	1.21	5.28		
						NO <sub>x</sub>	<0.001	<0.001	1.43	6.28		
						PM <sub>10</sub>	<0.001	<0.001	0.11	0.48		
						SO <sub>2</sub>	<0.001	<0.001	0.01	0.04		
						CO <sub>2</sub>	<0.001	<0.001	2,071	9,072		
						CH <sub>4</sub>	0.25	1.10	0.04	0.19		
						N <sub>2</sub> O	<0.001	<0.001	0.004	0.02		
						CO <sub>2e</sub>	6.26	27.43	2,073	9,082		

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type <sup>1</sup>	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		All Regulated Pollutants - Chemical Name/CAS <sup>3</sup>  (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions <sup>4</sup>		Maximum Potential Controlled Emissions <sup>5</sup>		Emission Form or Phase  (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>6</sup>
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
11E	Upward Vertical Stacks	TRL-1	Condensate - Truck Loading	N/A	N/A	Total VOCs	0.31	1.36	0.31	1.36	Gas/Vapor	AP-42
						Total HAPs	0.008	0.03	0.008	0.03		
						CO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						CH <sub>4</sub>	0.009	0.04	0.009	0.04		
						CO <sub>2e</sub>	0.22	0.95	0.22	0.95		
12E	Upward Vertical Stacks	TRL-2	Produced Water - Truck Loading	N/A	N/A	Total VOCs	<0.001	0.002	<0.001	0.002	Gas/Vapor	AP-42
						Total HAPs	<0.001	<0.001	<0.001	<0.001		
						CO <sub>2</sub>	<0.001	<0.001	<0.001	<0.001		
						CH <sub>4</sub>	<0.001	<0.001	<0.001	<0.001		
						CO <sub>2e</sub>	0.003	0.01	0.003	0.01		

The EMISSION 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 EMISSIONS 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.

<sup>1</sup> Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

<sup>2</sup> List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, all applicable Greenhouse Gases (including CO<sub>2</sub> and methane), etc. **DO NOT LIST** H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases

<sup>3</sup> 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).

<sup>4</sup> 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).

<sup>5</sup> Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; M = modeling; O = other (specify).

### G70-A FUGITIVE EMISSIONS SUMMARY SHEET

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS <sup>1</sup>	Maximum Potential Uncontrolled Emissions <sup>2</sup>		Maximum Potential Controlled Emissions <sup>3</sup>		Est. Method Used <sup>4</sup>
		lb/hr	ton/yr	lb/hr	ton/yr	
<b>Haul Road/Road Dust Emissions Paved Haul Roads</b>	<b>NA</b>	--	--	--	--	--
<b>Unpaved Haul Roads</b>	<b>PM PM-10 PM-2.5</b>	<b>9.02 2.30 0.23</b>	<b>3.46 0.88 0.09</b>	<b>9.02 2.30 0.23</b>	<b>3.46 0.88 0.09</b>	<b>AP-42</b>
<b>Equipment Leaks</b>	<b>Total VOC Total HAPs CO<sub>2</sub> CH<sub>4</sub> CO<sub>2</sub>e</b>	<b>0.06 0.002 0.001 0.30 7.48</b>	<b>0.26 0.01 0.01 1.31 32.78</b>	<b>0.06 0.002 0.001 0.30 7.48</b>	<b>0.26 0.01 0.01 1.31 32.78</b>	<b>40CFR98 Subpart W</b>
<b>Other</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

<sup>1</sup> List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, all applicable Greenhouse Gases (including CO<sub>2</sub> and methane), etc. DO NOT LIST H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases.

<sup>2</sup> 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).

<sup>3</sup> 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).

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