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Submittal Date: 04/08/2015

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Noble Energy, Inc

G-70A General Permit Application
Pennsboro 2 Production Facility

Ritchie County, West Virginia

April 2015

Submittal Date: 04/08/2015

TABLE OF CONTENTS

1.0 Introduction Narrative

2.0 G70-A General Permit Application

Attachments:

A – Current Business Certificate

B – Process Description

C – Description of Fugitive Emissions

D – Process Flow Diagram

E – Plot Plan

F – Area Map

G – Equipment Data Sheets and Applicability Form

H – Air Pollution Control Device Sheets

I – Emissions Calculations

J – Class I Legal Advertisement

L – General Permit Registration Application Fee

O – Emissions Summary Sheet

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

1.0 INTRODUCTION NARRATIVE

Noble Energy, Inc. (Noble) is preparing to construct an oil and natural gas production facility at the Pennsboro 2 well pad. The well pad consists of twelve (12) Natural Gas Wells, twelve (12) Gas Production Units and Heaters, twenty (20) Condensate Tanks, twenty (20) Produced Water Tanks, two (2) Truck Loadouts, one (1) Vapor Combustor with natural gas-fired pilots to ensure constant flame for the combustion, One (1) Caterpillar G3508B LE compressor rated at 690 hp, and one (1) Vapor Recovery Unit powered by one (1) Gas Jack GJ230 compressor rated at 46 hp. Additionally, Noble is proposing to install one (1) Emergency Flare.

Noble has estimated that uncontrolled VOC emissions from this facility exceed major source thresholds. Therefore, Noble is installing a Vapor Recovery Unit and a Vapor Combustor to control emissions to below major source levels. Noble Energy, Inc. is estimating production of 488 barrels per day (bpd) of condensate and 2995 bpd of produced water to the tanks. The vapors generated from truck loading of condensate and produced water will be routed to the vapor combustor for destruction.

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

2.0 G70-A Class II Oil and Natural Gas Production Facility Air Quality General Permit Application

	WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF AIR QUALITY 601 57th Street, SE Charleston, WV 25304 Phone: (304) 926-0475 · www.dep.wv.gov/daq	**APPLICATION FOR GENERAL PERMIT REGISTRATION** CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE A STATIONARY SOURCE OF AIR POLLUTANTS

☑ CONSTRUCTION ☐ MODIFICATION ☐ RELOCATION ☐ CLASS I ADMINISTRATVE UPDATE
☐ CLASS I ADMINISTRATVE UPDATE

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

☐ G10-D – Coal Preparation and Handling	☐ G40-C – Nonmetallic Minerals Processing
☐ G20-B– Hot Mix Asphalt	☐ G50-B - Concrete Batch
☐ G30-D – Natural Gas Compressor Stations	☐ G60-C – Class II Emergency Generator
☐ G33-A – Spark Ignition Internal Combustion Engines	☐ G65-C – Class I Emergency Generator
☐ G35-A – Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit)	☑ G70-A – 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):	2. Federal Employer ID No. (FEIN):
Noble Energy, Inc	**73-0785597**
3. Applicant's mailing address: **c/o Clayton Murral** **1000 Noble Energy Drive** **Canonsburg, PA 15317**	4. Applicant's Physical Address **2795 Taylors Ridge Rd** **Moundsville, West Virginia**

5. If applicant is a subsidiary corporation, please provide the name of parent corporation:

6. WV BUSINESS REGISTRATION. Is the applicant a resident of the State of West Virginia? ☐ YES ☑ NO

- IF YES, provide a copy of the Certificate of Incorporation/ Organization / Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A.

- IF NO, provide a copy of the Certificate of Authority / Authority of LLC / Registration (one page) including any name change amendments or other Business Certificate as Attachment A.

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.):	8a. Standard Industrial Classification (SIC) code:	8b. North American Industry Classification System (NAICS) code:
Oil and Gas Production Facility	**1311**	**211111**
9. DAQ Plant ID No. (for existing facilities only):	10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):	

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A: PRIMARY OPERATING SITE INFORMATION	
11A. Facility name of primary operating site: **Pennsboro 2 Production Facility**	12A. Address of primary operating site: Mailing: Physical: **See Section 14A**

13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☑ YES ☐ NO

- IF **YES**, please explain: Lease

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

14A. - 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**.

Take I-79 to exit 119, follow Rt. 50 for 39.8 miles. Make a right onto WV-74 (N/Pullman Dr.) and follow for 0.4 miles. Make a left onto E Myles Ave./Old US 50 E and follow for 0.6 miles. Turn right onto Grey St. and then sharp left onto E Penn Ave. Take the second right onto 1st St and continue onto WV-74 N/Mountain Dr for 3 miles. Turn Left onto Bonds Creek Rd. and follow for 3.5 miles then make a right onto Branch Bonds Creek Rd then continue onto Stone Rd.

15A. Nearest city or town:	16A. County	17A. UTM Coordinates
Moundsville	**Ritchie County**	Northing (KM) **4354.14** Easting (KM): **498.94** Zone: **17S**

18A. Briefly describe the proposed new operation or change (s) to the facility:	19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Oil and gas production facility	Latitude: **39.33664** Longitude: **-81.01235**

B: 1st ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)

11B. Name of 1st alternate operating site:	12B. Address of 1st alternate operating site: Mailing: Physical:

13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☐ YES ☐ NO

- IF **YES**, please explain:

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

14B. - 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**.		
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: 2nd ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)

11C. Name of 1st alternate operating site:	12C. Address of 1st alternate operating site: Mailing: _____ Physical: _____
13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? ☐ YES ☐ 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:
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:

20. Provide the date of anticipated installation or change:	21. Date of anticipated Start-up if registration is granted:
5/31/2015 If this is an after the fact permit application, provide the date upon which the proposed change did happen: ____/____/____	7/1/2015

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.

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

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 _____

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

Signature (Please use blue ink) _____ Responsible Official — Date 4/9/15

Name & Title (Please print or type) RJ Moses — Operations Manager — Marcellus Business Unit

Signature (Please use blue ink) _____ Authorized Representative (if applicable) — Date

Applicant's Name Noble Energy, Inc

Phone & Fax (724) 820-3010 — Phone — Fax

Email rjmoses@nblenergy.com

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DIV OF AIR QUALITY

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Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT A

Noble Energy, Inc.

Certificate of Authority for West Virginia

State of West Virginia

Certificate

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

by the provisions of the West Virginia Code, Articles of Merger were received and filed,

MERGING NOBLE ENERGY MARKETING, INC. , A QUALIFIED DE ORGANIZATION, WITH AND INTO NOBLE ENERGY, INC., A QUALIFIED DE ORGANIZATION.

Therefore, I hereby issue this

CERTIFICATE OF MERGER

Given under my hand and the Great Seal of the State of West Virginia on this day of December 15, 2010

Natalie E. Tennant

Secretary of State

State of Delaware
Secretary of State
Division of Corporations
Delivered 06:59 PM 12/17/2009
FILED 06:59 PM 12/17/2009
SRV 091114165 - 0738126 FILE

CERTIFICATE OF MERGER
OF
NOBLE ENERGY MARKETING, INC.
(a Delaware corporation)
WITH AND INTO
NOBLE ENERGY, INC.
(a Delaware corporation)

Pursuant to Title 8, Section 251(c) of the Delaware General Corporation Law, the undersigned corporation hereby certifies the following:

1. The name of the surviving corporation is Noble Energy, Inc., a Delaware corporation, and the name of the corporation being merged into the surviving corporation is Noble Energy Marketing, Inc., a Delaware corporation.

2. The Agreement of Merger has been approved, adopted, certified, executed, and acknowledged by each of the constituent corporations.

3. The name of the surviving corporation is Noble Energy, Inc., a Delaware corporation.

4. The Certificate of Incorporation of Noble Energy, Inc. shall be the Certificate of Incorporation of the surviving corporation.

5. The merger is to become effective at 11:59 p.m. Eastern time on December 31, 2009.

6. A copy of the Agreement of Merger is on file at the place of business of Noble Energy, Inc., which is located at 100 Glenborough Drive, Suite 100, Houston, Texas 77067.

7. Upon request, a copy of the Agreement of Merger will be furnished by Noble Energy, Inc., without cost, to any stockholder of the constituent corporations.

IN WITNESS WHEREOF, the undersigned has caused this Certificate of Merger to be executed by its duly authorized officer as of the 16th day of December, 2009.

NOBLE ENERGY, INC.

By: /s/ David L. Stover
Name: David L. Stover
Title: Vice President

6707152

Delaware

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF MERGER, WHICH MERGES:

"NOBLE ENERGY MARKETING, INC.", A DELAWARE CORPORATION,

WITH AND INTO "NOBLE ENERGY, INC." UNDER THE NAME OF "NOBLE ENERGY, INC.", A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF THE STATE OF DELAWARE, AS RECEIVED AND FILED IN THIS OFFICE THE SEVENTEENTH DAY OF DECEMBER, A.D. 2009, AT 6:59 O'CLOCK P.M.

AND I DO HEREBY FURTHER CERTIFY THAT THE EFFECTIVE DATE OF THE AFORESAID CERTIFICATE OF MERGER IS THE THIRTY-FIRST DAY OF DECEMBER, A.D. 2009, AT 11:59 O'CLOCK P.M.

FILED

DEC 15 2010

IN THE OFFICE OF
SECRETARY OF STATE

Jeffrey W. Bullock, Secretary of State

0738126 8100M

101192174

AUTHENTICATION: 8430215

DATE: 12-15-10

You may verify this certificate online at corp.delaware.gov/authver.shtml

State of West Virginia

Certificate

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

NOBLE ENERGY MARKETING, INC.

Control Number: 99D1Z

a corporation formed under the laws of Delaware has filed its "Application for Certificate of Authority" to transact business in West Virginia as required by the provisions of the West Virginia Code. I hereby declare the organization to be registered as a foreign corporation from its effective date of January 29, 2009.

Therefore, I issue this

CERTIFICATE OF AUTHORITY

to the corporation 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 January 29, 2009

Natalie E Tennant

Secretary of State

Stamper

FILED

JAN 29 2009

IN THE OFFICE OF
SECRETARY OF STATE
WEST VIRGINIA

Natalie E. Tennant
Secretary of State
State Capitol
1900 Kanawha Blvd. E.
Charleston, WV 25305
FILE ONE ORIGINAL
FEES PER SCHEDULE

CERTIFICATE OF AUTHORITY

Penny Bailey, Manager
Corporations Division
Tel. (304) 558-8000
Fax (304) 558-8381
www.wvsos.com
Hours: 8:30am-5:00pm
PLEASE READ INSTRUCTIONS

CTRL # _____

1. **HOME STATE INFORMATION:**

a. The name of the corporation as it is registered in its home state is: Noble Energy Marketing, Inc.

b. State of Delaware Date of Incorp. January 16, 1984 Duration (if yes, or perpetual) Perpetual
Warning: Tax reporting requirements in West Va. will not end until a withdrawal is filed.

c. NAIC # _____ (If an insurance company)

2. **PRINCIPAL OFFICE INFORMATION:**

a. Address of the principal office of the corporation: No. & Street 100 Glenborough Drive, Suite 100
City/State/Zip Houston, TX 77067

b. Mailing address, if different, from above address: Street/PO Box _____
City/State/Zip _____

3. **WEST VIRGINIA INFORMATION:**

a. Corporate name to be used in W. Va.: (check one, follow instructions)
☑ Home state name as listed on line 1.a. above, if available.
☐ DBA name

b. Address of registered office in West Virginia, if any: No. & Street 707 Virginia Street East
City/State/Zip Charleston, WV 25301

c. Mailing address in WV, if different, from above: Street/PO Box _____
City/State/Zip _____

d. Proposed purpose(s) for transaction of business in WV: Oil & gas

4. **AGENT OF PROCESS:** Properly designated person to whom notice of process may be sent, if any:
Name CT Corporation System
Address 707 Virginia Street East, Charleston, WV 25301

5. **CORPORATE STATUS INFORMATION:**

a. Corporation is organized as (check one): ☑ For profit

☐ Non-profit

b. Directors and Officers: (Add extra page if necessary; please list all officers)

Office	Name	Address
Please see attached list.		

6. The number of acres of land it holds or expects to hold in West Virginia is: None

7. Contact and Signature Information

a. Janet Pagan — Contact Name; 301.571.2030 — Phone Number

b. Kirk A. Moore — Print or type name of signer; Assistant Secretary — Title or Capacity of Signer

c. Signature of Signer: Kirk A Moore Date: Jan 28, 2009

NOBLE ENERGY MARKETING, INC.
a Delaware corporation

Directors

Charles D. Davidson
100 Glenborough Drive, Suite 100
Houston, Texas 77067

Chris Tong
100 Glenborough Drive, Suite 100
Houston, Texas 77067

Arnold J. Johnson
100 Glenborough Drive, Suite 100
Houston, Texas 77067

Officers

Name	Title(s)	Address
Charles D. Davidson	Chief Executive Officer	100 Glenborough Drive, Suite 100 Houston, Texas 77067
David L. Stover	Vice President	100 Glenborough Drive, Suite 100 Houston, Texas 77067
Arnold J. Johnson	Vice President, General Counsel, and Secretary	100 Glenborough Drive, Suite 100 Houston, Texas 77067
Chris Tong	Vice President - Finance and Treasurer	100 Glenborough Drive, Suite 100 Houston, Texas 77067
Kirk A. Moore	Assistant Secretary	100 Glenborough Drive, Suite 100 Houston, Texas 77067

Delaware

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "NOBLE ENERGY MARKETING, INC." IS DULY INCORPORATED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL CORPORATE EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE TWENTY-NINTH DAY OF JANUARY, A.D. 2009.

AND I DO HEREBY FURTHER CERTIFY THAT THE SAID "NOBLE ENERGY MARKETING, INC." WAS INCORPORATED ON THE EIGHTEENTH DAY OF JANUARY, A.D. 1994.

AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL REPORTS HAVE BEEN FILED TO DATE.

AND I DO HEREBY FURTHER CERTIFY THAT THE FRANCHISE TAXES HAVE BEEN PAID TO DATE.

2372438 8300

090081032

You may verify this certificate online at corp.delaware.gov/authver.shtml

Jeffrey W. Bullock, Secretary of State

AUTHENTICATION: 7106879

DATE: 01-29-09

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT B

Noble Energy, Inc.

Process Description

The Pennsboro 2 is an oil and natural gas production facility. Condensate, gas and water come from Twelve (12) Natural Gas Wells and go to Twelve (12) Gas Production Units and Heaters (4S-GPU1-4S-GPU12) where the first separation occurs. The gas from the GPUs will exit the facility via a gas sales pipeline. The flash gas compressor is powered by one (1) Caterpillar G3508B LE compressor engine rated at 690 hp (3S-ENG1).

Produced water from the separators flows into Twenty (20) Produced Water Tanks (2S-TK21-40). Condensate flows through One (1) Low Pressure Separator and Heater (5S-LP) and through One (1) Line Heater (11S-LH) to Twenty (20) Condensate Tanks (1S-TK1-20). Condensate and produced water are transported off-site via tanker truck (6S-TL1 and 7S-TL2). Working, breathing and flash emissions from the condensate and produced water storage tanks will be routed to One (1) Vapor Recovery Unit (14S-VRU) which is powered by One (1) Gas Jack GJ230 compressor rated at 46 hp.

The gases from the condensate truck loading and produced water loading will be routed to One (1) Vapor Combustor (8S-COMB1). The vapor combustor will have One (1) natural gas-fired pilot light (9S-PILOT1). During VRU downtime, the Emergency Flare (12S-FLARE) will control emissions from the LP separator and the tanks.

Source Aggregation Determination

Building, structure, facility, or installation are defined as all pollutant emitting activities which belong to the same industrial grouping, are located on one or more contiguous and adjacent properties, and are under common control.

The Pennsboro 2 will operate under SIC code 1311. There are no other Noble Energy, Inc. facilities located on contiguous or adjacent properties to the site.

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT C

Description of Fugitive Emissions

The Pennsboro 2 production facility will have fugitive emissions from component fugitive emissions. A fugitive emissions summary sheet is attached.

G70-A FUGITIVE EMISSIONS SUMMARY SHEET

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions						
Paved Haul Roads						
Unpaved Haul Roads						
Equipment Leaks	VOC	Does not apply	31.28	Does not apply	31.28	AP-42
Equipment Leaks	Total HAPs	Does not apply	3.88	Does not apply	3.88	AP-42
Blowdown Emissions						
Other						

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

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

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

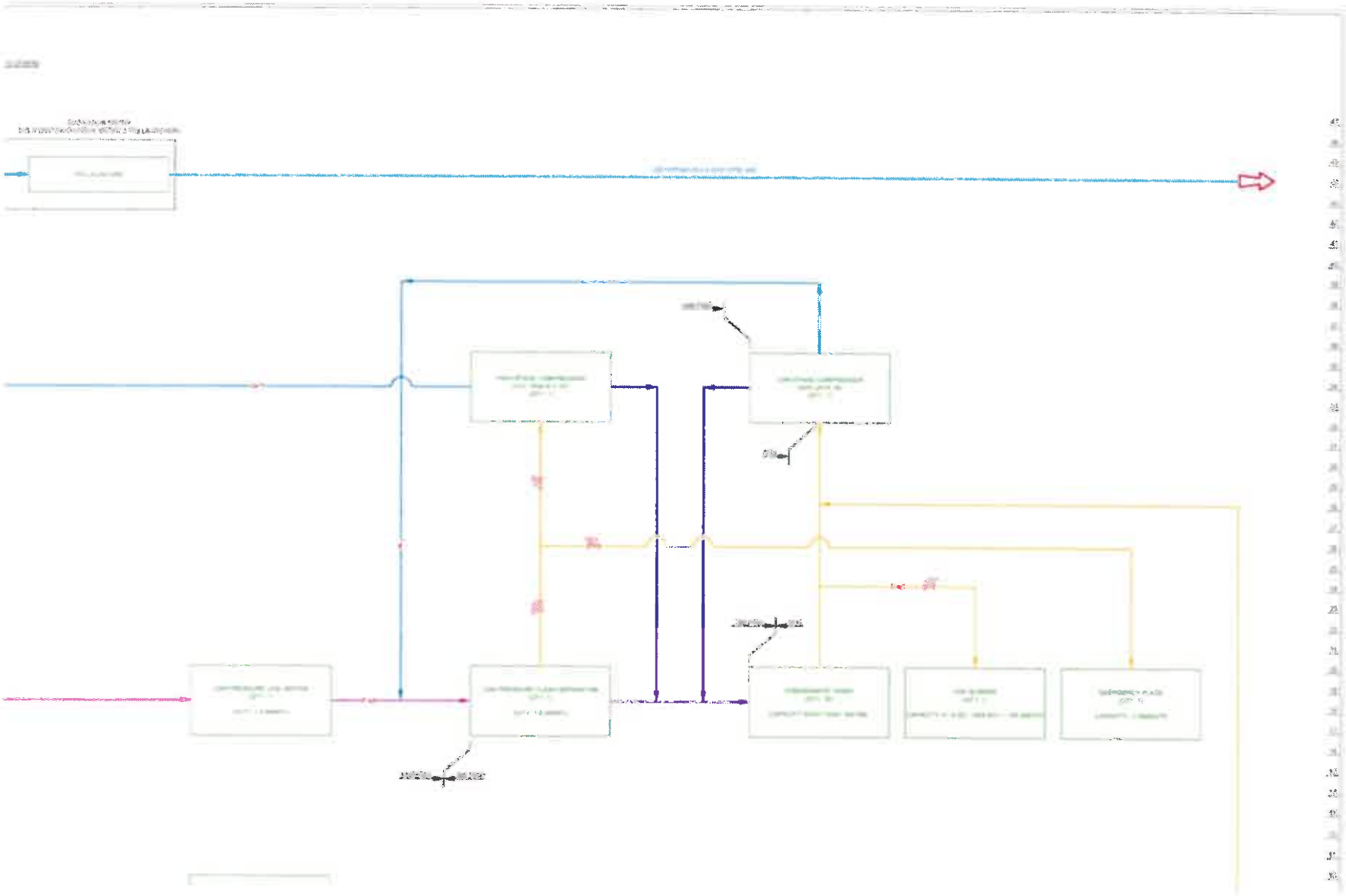
[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; M = modeling; O = other (specify).

Submittal Date: 04/08/2015

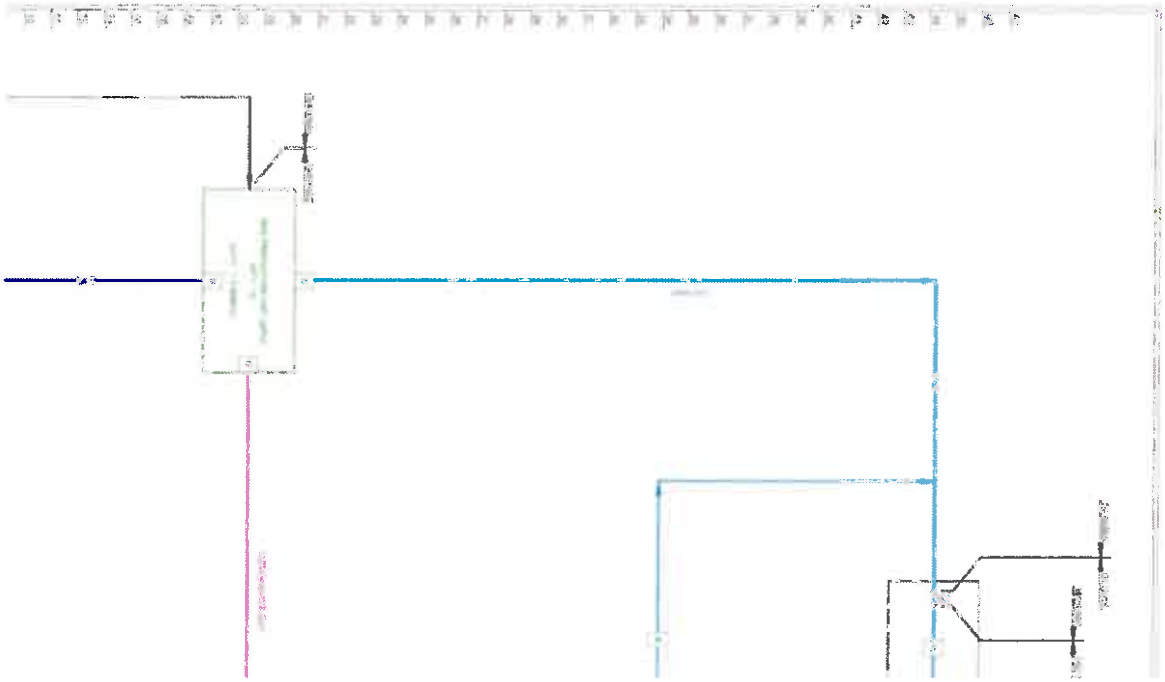
Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT D

Process Flow Diagram



JRFACE FACILITY DRAWINGS\PEN2\PERMITTING\PEN2 AIR PERMIT APPLICATION.DWG



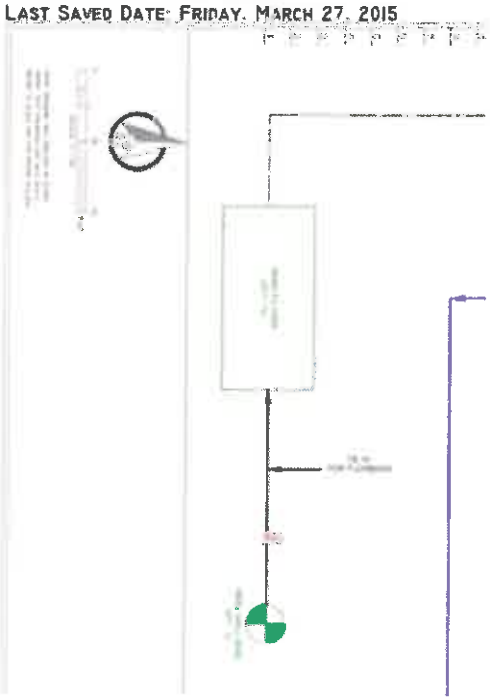
noble energy

MARCELLUS SHALE DEVELOPMENT
SENSENBRIG 2 WELL PAD
AIR PERMIT

BLOCK FLOW DIAGRAM

[redacted]

FILE NAME AND PATH: G:\APPALACHIAN\WELL FILES\SU
LAST SAVED BY: JUSTINHOLMES
LAST SAVED DATE: FRIDAY, MARCH 27, 2015



Submittal Date: 04/08/2015

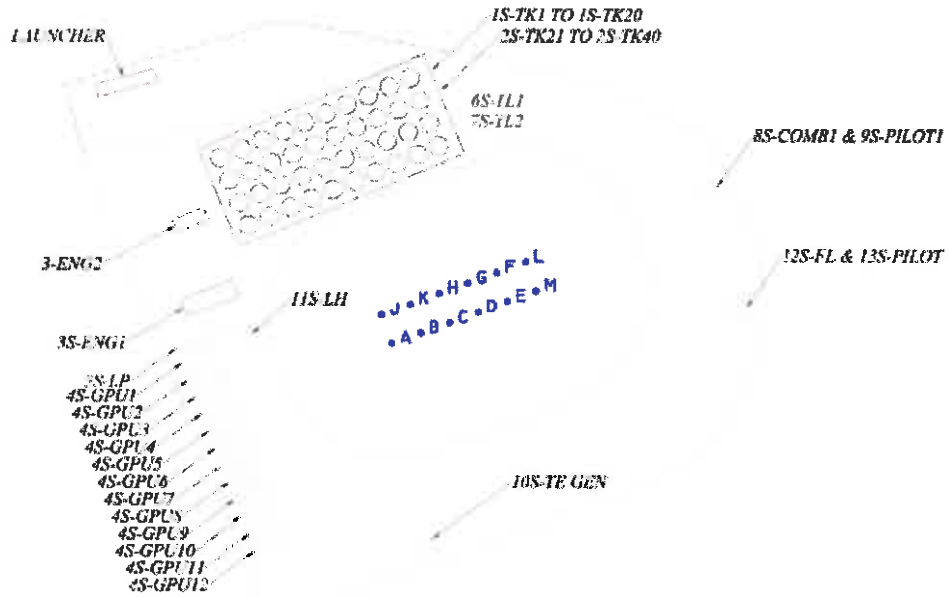
Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT E

Plot Plan

noble energy

MARCELLUS SHALE DEVELOPMENT
PENNSBORO 2 WELL PAD
AIR PERMIT PLOT PLAN



Emission Unit ID	Emission Unit Description
1S-TK1 THRU 1S-TK20	400 BBL CONDENSATE TANK
2S-TK21 THRU 2S-TK40	400 BBL PRODUCED WATER TANK
3S-ENG1	CAT 3508
3S-ENG2	GAS JACK
4S-GPU1	1.0 MMBTU/HR HEATER
4S-GPU2	1.0 MMBTU/HR HEATER
4S-GPU3	1.0 MMBTU/HR HEATER
4S-GPU4	1.0 MMBTU/HR HEATER
4S-GPU5	1.0 MMBTU/HR HEATER
4S-GPU6	1.0 MMBTU/HR HEATER
4S-GPU7	1.0 MMBTU/HR HEATER
4S-GPU8	1.0 MMBTU/HR HEATER
4S-GPU9	1.0 MMBTU/HR HEATER
4S-GPU10	1.0 MMBTU/HR HEATER
4S-GPU11	1.0 MMBTU/HR HEATER
4S-GPU12	1.0 MMBTU/HR HEATER
5S-LP	1.0 MMBTU/HR HEATER
6S-TL1	CONDENSATE TRUCK LOADING
7S-TL2	PRODUCED WATER TRUCK LOADING
8S-COMB1	VAPOR COMBUSTOR
9S-PILOT1	COMBUSTOR PILOT EMISSIONS
10S-TE GEN	THERMO ELECTRIC GENERATOR
11S-LH	2.0 MMBTU/HR LINE HEATER
12S-FL	EMERGENCY FLARE
13S-PILOT	FLARE PILOT EMISSIONS
FUG	EQUIPT COMPONENT FUGITIVES ESTIMATE

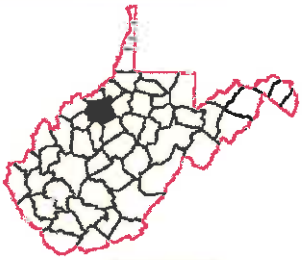
noble energy

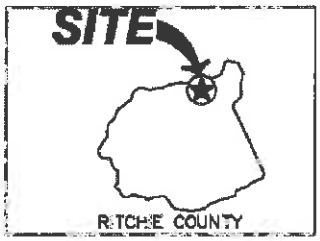
Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

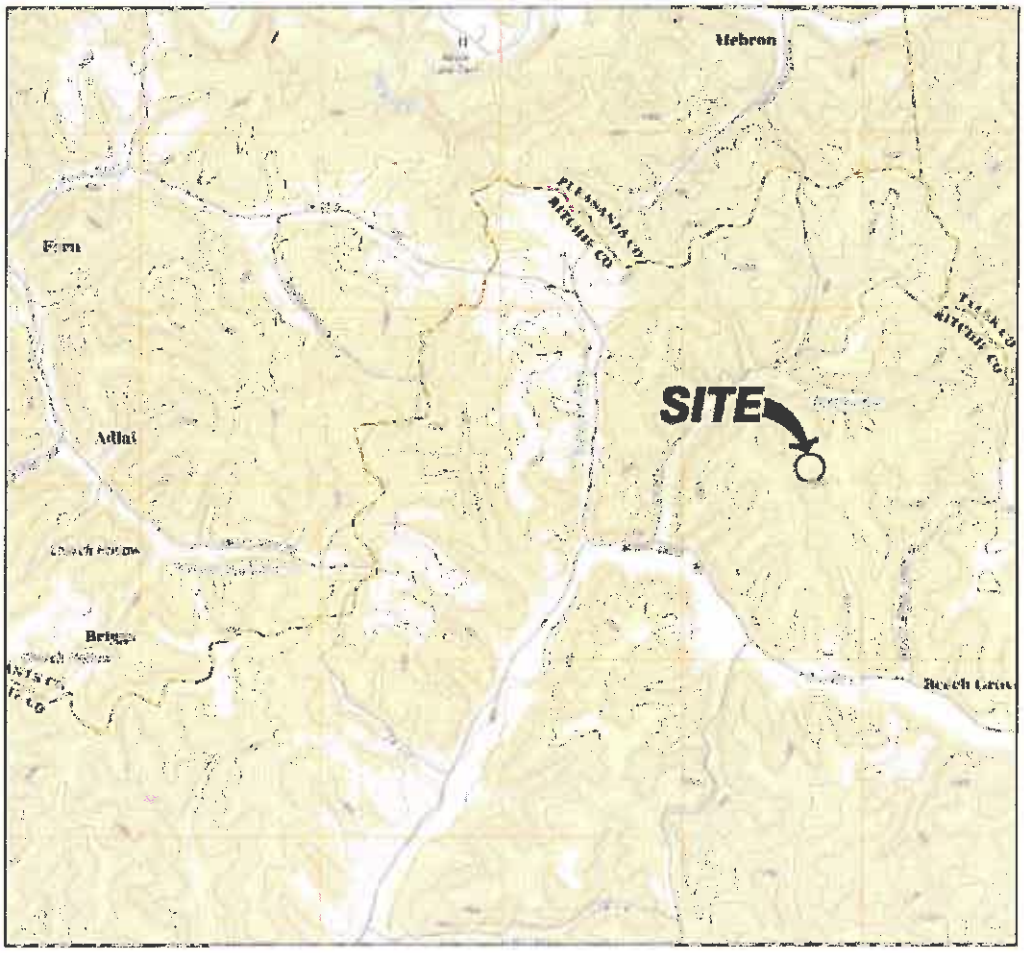
ATTACHMENT F

Area Map





LAT. 39.3366 LON. -81.0123
CITY OF PENNSBORO
RITCHIE COUNTY
WEST VIRGINIA



ADAPTED FROM USGS
ELLENBORO

REVISIONS ARE TO BE MADE ON THE CADD FILE ONLY

FRM	NOBLE ENERGY, INC. PEN2 PENNSBORO, WEST VIRGINIA	CADD Review CHK'D KB 0264911
Drawn By EA	Environmental Resources Management	1 OF 1

N:\Noble Energy\AR\WV Permit Application\PEN2\Attachment F\Figure 1-PEN2 Site Location Map.dwg

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT G

Equipment Data Sheets and Registration Section Applicability Form

Attachment I
Emission Units Table
(includes all emission units and air pollution control devices

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
1S-TK1-20	14E-VRU	Twenty (20) Condensate Tanks	2015	400 bbl each	New	14E-VRU
2S-TK21-40	14E-VRU	Twenty (20) Produced Water Tanks	2015	400 bbl each	New	14E-VRU
3S-ENG1	3E-ENG1	Caterpillar G3508B LE	2015	690 hp	New	3C-Oxy-cat
3S-ENG2	3E-ENG2	Gas Jack GJ230	2015	46 hp	New	3C-NSCR
4S-GPU1	4E-GPU1	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU2	4E-GPU2	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU3	4E-GPU3	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU4	4E-GPU4	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU5	4E-GPU5	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU6	4E-GPU6	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU7	4E-GPU7	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU8	4E-GPU8	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU9	4E-GPU9	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU10	4E-GPU10	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU11	4E-GPU11	GPU Burner	2015	1 MMBtu/hr	New	None
4S-GPU12	4E-GPU12	GPU Burner	2015	1 MMBtu/hr	New	None
5S-LP	5E-LP	Low Pressure Separator Heater	2015	1 MMBtu/hr	New	None
6S-TL1	8E-COMB1	Condensate Truck Loadout	2015	178120. bbl/yr	New	8C-COMB1
7S-TL2	8E-COMB1	Produced water truck loadout	2015	1093100.3 bbl/yr	New	8C-COMB1
8S-COMB1	8E-COMB1	One (1) Vapor Combustor	2015	7000 scf/hr	New	None
9S-PILOT1	9E-PILOT1	One (1) Vapor Combustor Pilot	2015	12.5 scf/hr	New	N/A
10S-TE Gen	10E-TE Gen	Thermo Electric Generator	2015	7.4 gal propane/day	New	None
11S-LH	11E-LH	Line Heater	2015	1 MMBtu/hr	New	None
12S-FLARE	12E-FLARE	Emergency Flare	2015	16,417 scf/hr	New	None
13S-PILOT	13E-PILOT	Combustor Pilot Emissions	2015	12.5 scf/hr	New	None
14S-VRU	14E-VRU	Vapor Recovery Unit	2015	40 BHP @ RPM	New	None

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

General Permit G70-A Registration
Section Applicability Form

General Permit G70-A was developed to allow qualified applicants to seek registration for a variety of sources. These sources include natural gas well affected facilities, storage tanks, natural gas-fired compressor engines (RICE), natural gas producing units, natural gas-fired in-line heaters, pneumatic controllers, heater treaters, tank truck loading, glycol dehydration units, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G70-A allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

Section 5	Natural Gas Well Affected Facility	☑
Section 6	Storage Vessels*	☑
Section 7	Gas Producing Units, In-Line Heaters, Heater Treaters, and Glycol Dehydration Reboilers	☑
Section 8	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO)	☐
Section 9	*Reserved*	☐
Section 10	Natural gas-fired Compressor Engine(s) (RICE)**	☑
Section 11	Tank Truck Loading Facility ***	☑
Section 12	Standards of Performance for Storage Vessel Affected Facilities (NSPS, Subpart OOOO)	☐
Section 13	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (NSPS, Subpart JJJJ)	☑
Section 14	Control Devices not subject to NSPS, Subpart OOOO	☑
Section 15	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (40CFR63, Subpart ZZZZ)	☑
Section 16	Glycol Dehydration Units	☐
Section 17	Dehydration Units With Exemption from NESHAP Standard, Subpart HH § 63.764(d) (40CFR63, Subpart HH)	☐
Section 18	Dehydration Units Subject to NESHAP Standard, Subpart HH and Not Located Within an UA/UC (40CFR63, Subpart HH)	☐
Section 19	Dehydration Units Subject to NESHAP Standard, Subpart HH and Located Within an UA/UC (40CFR63, Subpart HH)	☐

* Applicants that are subject to Section 6 may also be subject to Section 12 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 14.

** Applicants that are subject to Section 10 may also be subject to the applicable RICE requirements of Section 13 and/or Section 15.

*** Applicants that are subject to Section 11 may also be subject to control device requirements of Section 14.

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:	
47-085-10055	47-085-10071
47-085-10066	47-085-10072
47-085-10067	47-085-10073
47-085-10068	47-085-10074
47-085-10069	47-085-10075
47-085-10070	47-085-10076

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.

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	2. Tank Name
Pennsboro 2 Pad Tank Battery	20-400 bbl Condensate Tanks
3. Emission Unit ID number	4. Emission Point ID number
1S-TK1-20	14S-VRU
5. Date Installed or Modified *(for existing tanks)*	6. Type of change:
	☑ New Construction ☐ New Stored Material ☐ Other
7A. Description of Tank Modification *(if applicable)*	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☑ No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

I. TANK INFORMATION (required)

8. Design Capacity *(specify barrels or gallons)*. Use the internal cross-sectional area multiplied by internal height.
400 bbl

9A. Tank Internal Diameter (ft.)	12	9B. Tank Internal Height (ft.)	20
10A. Maximum Liquid Height (ft.)	19.5	10B. Average Liquid Height (ft.)	10
11A. Maximum Vapor Space Height (ft.)	18.3	11B. Average Vapor Space Height (ft.)	10
12. Nominal Capacity *(specify barrels or gallons)*. This is also known as "working volume.		393 bbl	
13A. Maximum annual throughput (gal/yr) per tank	374,052	13B. Maximum daily throughput (gal/day) per tank	1,025
14. Number of tank turnovers per year	23 per tank	15. Maximum tank fill rate (gal/min)	2211

16. Tank fill method ☑ Submerged ☐ Splash ☐ Bottom Loading

17. Is the tank system a variable vapor space system? ☐ Yes ☑ No
If yes (A) What is the volume expansion capacity of the system (gal)?
(B) What are the number of transfers into the system per year?

18. Type of tank (check all that apply):
- ☑ Fixed Roof _X_ vertical ___ horizontal ___ flat roof _X_ cone roof ___ dome roof ___ other (describe)
- ☐ External Floating Roof ___ pontoon roof ___ double deck roof
- ☐ Domed External (or Covered) Floating Roof
- ☐ Internal Floating Roof ___ vertical column support ___ self-supporting
- ☐ Variable Vapor Space ___ lifter roof ___ diaphragm
- ☐ Pressurized ___ spherical ___ cylindrical
- ☐ Underground
- ☐ Other (Describe)

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

- ☑ Refer to enclosed TANKS Summary Sheets
- ☐ Refer to the responses to items 19-26 in section VII

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

- ☑ Refer to enclosed TANKS Summary Sheets
- ☐ Refer to the responses to items 27-33 in section VII

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

- [x] Refer to enclosed TANKS Summary Sheets
- [ ] Refer to the responses to Items 34-39 in section VII

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):

- [ ] Does Not Apply
- [ ] Rupture Disc (psig)
- [ ] Carbon Adsorption 1
- [ ] Inert Gas Blanket of _____
- [ ] Vent to Vapor Combustion Device 1 (vapor combustors, flares, thermal oxidizers)
- [ ] Condenser 1
- [ ] Conservation Vent (psig)
- [x] Other 1 (describe) - Vapor Recovery Unit — Vacuum Setting 0.4 oz — Pressure Setting 16 oz
- [ ] Emergency Relief Valve (psig)

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name and Cas No.	Flashing Loss Uncontrolled		Breathing Loss Uncontrolled		Working Loss Uncontrolled		Total uncont. Emissions Loss		Estimation Method[1]
	lb/hr	tpy	lb/hr	Tpy	lb/hr	tpy	lb/hr	tpy	
Total uncontrolled VOC emissions for all tanks	165.22	723.65	5.28	23.11	8.52	37.33	179.01	784.08	EPA TANKS 4.0 & HYSYS

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

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

SECTION VII (required if did not provide TANKS Summary Sheets)

TANK CONSTRUCTION AND OPERATION INFORMATION

19. Tank Shell Construction:

- [ ] Riveted
- [ ] Gunite Lined
- [ ] Epoxy Covered rivets
- [ ] Other (describe)

20A. Shell Color:	20B. Roof Color:	20C. Year Last Painted:

21. Shell Condition (if metal and unlined):

- [ ] Riveted
- [ ] Light Rust
- [ ] Dense Rust
- [ ] Not Applicable

22A. Is the tank heated? [ ] Yes [ ] No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig):

24. Is the tank a **Vertical Fixed Roof Tank**? [ ] Yes [ ] No	24A. If yes, for dome roof provide radius (ft):	24B. If yes, for cone roof, provide slop (ft/ft):

25. Complete item 25 for **Floating Roof Tanks** [x] Does not apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type *(check one)*:

- [ ] Metallic (mechanical)
- [ ] Liquid mounted resilient seal
- [ ] Vapor mounted resilient seal
- [ ] Other (Describe):

25C. Is the Floating Roof equipped with a secondary seal? [ ] Yes [ ] No

25D. If yes, how is the secondary seal mounted? *(check one)*	☐ Shoe ☐ Rim Other (describe):		
25E. Is the floating roof equipped with a weather shield?	☐ Yes ☐ No		
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks**	☑ Does not apply		
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:		
26C. Deck seam. Continuous sheet construction. ☐ 5 ft wide ☐ 6 ft wide ☐ 7 ft wide ☐ 5 x 7.5 ft wide ☐ 5 x 12 ft wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks: # of columns:	26G. For column supported tanks, diameter of column:
SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based:			
28. Daily Avg. Ambient Temperature (°F):	29. Annual Avg. Maximum Temperature (°F):		
30. Annual Avg. Minimum Temperature (°F):	31. Avg. Wind Speed (mph):		
32. Annual Avg. Solar Insulation Factor (BTU/ft^2-day).	33. Atmospheric Pressure (psia):		
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F):	34A. Minimum (°F):	34B. Maximum (°F):	
35. Avg. operating pressure range of tank (psig):	35A. Minimum (psig):	35B. Maximum (psig):	
36A. Minimum liquid surface temperature (°F):	36B. Corresponding vapor pressure (psia):		
37A. Avg. liquid surface temperature (°F):	37B. Corresponding vapor pressure (psia):		
38A. Maximum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):		
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:			
39B. CAS number:			
39C. Liquid density (lb/gal):			
39D. Liquid molecular weight (lb/lb-mole):			
39E. Vapor molecular weight (lb/lb-mole):			
39F. Maximum true vapor pressure (psia):			
39G. Maxim. Reid vapor pressure (psia):			
39H. Months Storage per year. From:			
To.			

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	2. Tank Name
Pennsboro 2 Produced Water Tank Battery	20-400 bbl Produced Water Tanks
3. Emission Unit ID number	4. Emission Point ID number
2S-TK21-40	14S-VEU
5. Date Installed or Modified *(for existing tanks)*	6. Type of change:
	☑ New Construction ☐ New Stored Material ☐ Other
7A. Description of Tank Modification *(if applicable)*	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☑ No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

I. TANK INFORMATION (required)

8. Design Capacity *(specify barrels or gallons)*. Use the internal cross-sectional area multiplied by internal height. 400 bbl			
9A. Tank Internal Diameter (ft.)	12	9B. Tank Internal Height (ft.)	20
10A. Maximum Liquid Height (ft.)	19.5	10B. Average Liquid Height (ft.)	10
11A. Maximum Vapor Space Height (ft.)	18.3	11B. Average Vapor Space Height (ft.)	10
12. Nominal Capacity *(specify barrels or gallons)*. This is also known as "working volume.		393 bbl	
13A. Maximum annual throughput (gal/yr) per tank	2,295,511	13B. Maximum daily throughput (gal/day) per tank	6,289
14. Number of tank turnovers per year	137 per tank	15. Maximum tank fill rate (gal/min)	1171.8
16. Tank fill method ☑ Submerged ☐ Splash ☐ Bottom Loading			
17. Is the tank system a variable vapor space system? ☐ Yes ☑ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?			
18. Type of tank (check all that apply): ☑ Fixed Roof X vertical ___ horizontal ___ flat roof X cone roof ___ dome roof ___ other (describe) ☐ External Floating Roof ___ pontoon roof ___ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ___ vertical column support ___ self-supporting ☐ Variable Vapor Space ___ lifter roof ___ diaphragm ☐ Pressurized ___ spherical ___ cylindrical ☐ Underground ☐ Other (Describe)			

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

☐ Refer to enclosed TANKS Summary Sheets
☐ Refer to the responses to items 19-26 in section VII

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

☑ Refer to enclosed TANKS Summary Sheets
☐ Refer to the responses to items 27-33 in section VII

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

- [x] Refer to enclosed TANKS Summary Sheets
- [ ] Refer to the responses to items 34-39 in section VII

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):

- [ ] Does Not Apply
- [ ] Rupture Disc (psig)
- [ ] Carbon Adsorption 1
- [ ] Inert Gas Blanket of _____
- [ ] Vent to Vapor Combustion Device 1 (vapor combustors, flares, thermal oxidizers)
- [ ] Condenser 1
- [ ] Conservation Vent (psig)
- [x] Other 1 (describe) - Vapor Recovery Unit — Vacuum Setting 0.4 oz — Pressure Setting 16 oz
- [ ] Emergency Relief Valve (psig)

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name and Cas No.	Flashing Loss Uncontrolled		Breathing Loss Uncontrolled		Working Loss Uncontrolled		Total uncont. Emissions Loss		Estimation Method[1]
	lb/hr	tpy	lb/hr	Tpy	lb/hr	tpy	lb/hr	tpy	
Total uncontrolled VOC emissions for all tanks	2.30	10.09	0.26	1.16	0.04	0.19	2.57	11.24	Flash Study and TANKS 4.0.9d

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

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

SECTION VII (required if did not provide TANKS Summary Sheets)

TANK CONSTRUCTION AND OPERATION INFORMATION

19. Tank Shell Construction:

- [ ] Riveted
- [ ] Gunite Lined
- [ ] Epoxy Covered rivets
- [ ] Other (describe)

20A. Shell Color: | 20B. Roof Color: | 20C. Year Last Painted:

21. Shell Condition (if metal and unlined):

- [ ] Riveted
- [ ] Light Rust
- [ ] Dense Rust
- [ ] Not Applicable

22A. Is the tank heated? [ ] Yes [ ] No | 22B. If yes, operating temperature: | 22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig):

24. Is the tank a **Vertical Fixed Roof Tank**? [ ] Yes [ ] No | 24A. If yes, for dome roof provide radius (ft): | 24B. If yes, for cone roof, provide slop (ft/ft):

25. Complete item 25 for **Floating Roof Tanks** [x] Does not apply

25A. Year Internal Floaters Installed:

25B. Primary Seal Type *(check one)*:

- [ ] Metallic (mechanical)
- [ ] Liquid mounted resilient seal
- [ ] Vapor mounted resilient seal
- [ ] Other (Describe):

25C. Is the Floating Roof equipped with a secondary seal? [ ] Yes [ ] No

25D. If yes, how is the secondary seal mounted? *(check one)*	☐ Shoe ☐ Rim
25E. Is the floating roof equipped with a weather shield?	☐ Yes ☐ No
25F. Describe deck fittings:	
26. Complete the following section for **Internal Floating Roof Tanks**	☑ Does not apply
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:
26C. Deck seam. Continuous sheet construction: ☐ 5 ft wide ☐ 6 ft wide ☐ 7 ft wide ☐ 5 x 7.5 ft wide ☐ 5 x 12 ft wide ☐ other (describe)	

26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:

SITE INFORMATION:	
27. Provide the city and state on which the data in this section are based:	
28. Daily Avg. Ambient Temperature (°F):	29. Annual Avg. Maximum Temperature (°F):
30. Annual Avg. Minimum Temperature (°F):	31. Avg. Wind Speed (mph):
32. Annual Avg. Solar Insulation Factor (BTU/ft^2-day):	33. Atmospheric Pressure (psia):

LIQUID INFORMATION:		
34. Avg. daily temperature range of bulk liquid (°F):	34A. Minimum (°F):	34B. Maximum (°F):
35. Avg. operating pressure range of tank (psig):	35A. Minimum (psig):	35B. Maximum (psig):

36A. Minimum liquid surface temperature (°F):	36B. Corresponding vapor pressure (psia):
37A. Avg. liquid surface temperature (°F):	37B. Corresponding vapor pressure (psia):
38A. Maximum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):

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:			
39B. CAS number:			
39C. Liquid density (lb/gal):			
39D. Liquid molecular weight (lb/lb-mole):			
39E. Vapor molecular weight (lb/lb-mole):			
39F. Maximum true vapor pressure (psia):			
39G. Maxim. Reid vapor pressure (psia):			
39H. Months Storage per year. From:			
To:			

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 #[1]	Emission Point ID#[2]	Emission Unit Description (Manufacturer / Model #)	Year Installed/ Modified	Type[3] and Date of Change	Control Device[4]	Design Heat Input (mmBtu/hr)[5]	Fuel Heating Value (Btu/scf)[6]
4S-GPU1	4E-GPU1	Heater	2015	New	None	1.0	1220
4S-GPU2	4E-GPU2	Heater	2015	New	None	1.0	1220
4S-GPU3	4E-GPU3	Heater	2015	New	None	1.0	1220
4S-GPU4	4E-GPU4	Heater	2015	New	None	1.0	1220
4S-GPU5	4E-GPU5	Heater	2015	New	None	1.0	1220
4S-GPU6	4E-GPU6	Heater	2015	New	None	1.0	1220
4S-GPU7	4E-GPU7	Heater	2015	New	None	1.0	1220
4S-GPU8	4E-GPU8	Heater	2015	New	None	1.0	1220
4S-GPU9	4E-GPU9	Heater	2015	New	None	1.0	1220
4S-GPU10	4E-GPU10	Heater	2015	New	None	1.0	1220
4S-GPU11	4E-GPU11	Heater	2015	New	None	1.0	1220
4S-GPU12	4E-GPU12	Heater	2015	New	None	1.0	1220
5S-LP	5E-LP	Heater	2015	New	None	1.0	1220
11S-LH	11E-LH	Heater	2015	New	None	1.0	1220

[1] 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.

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

[3] New, modification, removal

[4] Complete appropriate air pollution control device sheet for any control device.

[5] Enter design heat input capacity in mmBtu/hr.

[6] 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.[1]		3S-ENG1		3S-ENG2	
Emission Point ID No. [2]		3E-ENG1A		3S-ENG-2A	
Engine Manufacturer and Model		Caterpillar		Gas Jack	
Manufacturer's Rated bhp/rpm		690/1400		46/2000	
Source Status[3]		NS		NS	
Date Installed/Modified/Removed[4]		05/31/15		05/31/15	
Engine Manufactured Reconstruction Date[5]		TBD		TBD	
Is this engine subject to 40CFR60, Subpart JJJJ?		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60,		Yes		No	
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		Yes		TBD	
Engine, Fuel and Consumption Data	Engine Type[7]	LB4S		RB4S	
	APCD Type[8]	Oxidation Catalyst		NSCR Catalyst	
	Fuel Type[9]	RG		RG	
	H_2S (gr/100 scf)	<0.2		<0.2	
	Operating bhp/rpm	690/1800		46/2000	
	BSFC (Btu/bhp-hr)	7254		10.7775	
	Fuel throughput (ft^3/hr)	4102.7		0.4	
	Fuel throughput (MMft^3/yr)	35.94		3.62E-03	
	Operation (hrs/yr)	8760		8760	
Reference[10]	Potential Emissions[11]	lbs/hr	tons/yr	lbs/hr	tons/yr
	NO_x	0.76	3.33	0.20	0.89
	CO	3.04	13.33	0.41	1.78
	VOC	0.84	3.66	0.10	0.44
	SO_2	0.00	0.01	0.00	0.00
	PM_{10}	0.00	0.00	0.00	0.00
	Formaldehyde	0.26	1.16	0.00	0.00
MRR[12]	Proposed Monitoring:	Track hrs. of operation		Track hrs. of operation	
	Proposed Recordkeeping:	Record hours of operation		Record hours of operation	

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:	2. Emission Point ID:	3. Year Installed/ Modified:
6S-TL1	8E-COMB1	2015

4. Emission Unit Description:

6S-TL1-Condensate Truck Loadout

5. Loading Area Data:

5A. Number of pumps:	5B. Number of liquids loaded:	5C. Maximum number of tank trucks loading at one time:
	1	1

6. Describe cleaning location, compounds and procedure for tank trucks:

N/A

7. Are tank trucks pressure tested for leaks at this or any other location?

☐ Yes ☑ No

If YES, describe:

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

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7

9. Bulk Liquid Data *(add pages as necessary):*

Liquid Name	Condensate		
Max. daily throughput (1000 gal/day) (per tank)	1.02		
Max. annual throughput (1000 gal/yr) (per tank)	374		
Loading Method [1]	SUB		
Max. Fill Rate (gal/min)	TBD		
Average Fill Time (min/loading)	TBD		
Max. Bulk Liquid Temperature (°F)	102.3		
True Vapor Pressure [2]	12		
Cargo Vessel Condition[3]	TBD		
Control Equipment or Method [4]	Enclosed Flare		
Minimum collection efficiency (%)	70%		
Minimum control	98%		

* *Continued on next page*

Maximum Emission Rate	Loading (lb/hr)	0.11 controlled		
	Annual (ton/yr)	0.48 controlled		
Estimation Method [5]		EPA		

Notes:

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheet* as Attachment "H"):

CA = Carbon Adsorption

VB = Dedicated Vapor Balance (closed system)

LCD = Enclosed Combustion Device

F = Flare

TO = Thermal Oxidation or Incineration

[5] EPA = EPA Emission Factor as stated in AP-42

MB = Material Balance

TM = Test Measurement based upon test data submittal

O = other (describe)

10. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**

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

MONITORING *Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment operation/air pollution control device.*	RECORDKEEPING *Please describe the proposed recordkeeping that will accompany the monitoring.*
Track Loading Throughput	Maintain loading throughput records.
REPORTING *Please describe the proposed frequency of reporting of the recordkeeping.*	TESTING *Please describe any proposed emissions testing for this process equipment/air pollution control device.*

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

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:	2. Emission Point ID:	3. Year Installed/ Modified:
7S-TL2	8E-COMB1	2015

4. Emission Unit Description:

7S-TL2-Produced water truck loadout

5. Loading Area Data:

5A. Number of pumps:	5B. Number of liquids loaded:	5C. Maximum number of tank trucks loading at one time:
	1	1

6. Describe cleaning location, compounds and procedure for tank trucks:

N/A

7. Are tank trucks pressure tested for leaks at this or any other location?

☐ Yes ☑ No

If YES, describe:

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

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7

9. Bulk Liquid Data *(add pages as necessary)*:

Liquid Name	Produced Water		
Max. daily throughput (1000 gal/day) (per tank)	6.3		
Max. annual throughput (1000 gal/yr) (per tank)	2,296		
Loading Method [1]	SUB		
Max. Fill Rate (gal/min)	TBD		
Average Fill Time (min/loading)	TBD		
Max. Bulk Liquid Temperature (°F)	102.3		
True Vapor Pressure [2]	12		
Cargo Vessel Condition [3]	TBD		
Control Equipment or Method [4]	Enclosed Flare		
Minimum collection efficiency (%)	70%		
Minimum control	98%		

* *Continued on next page*

Maximum Emission Rate	Loading (lb/hr)	0.01 controlled		
	Annual (ton/yr)	0.05 controlled		
Estimation Method [5]		EPA		

Notes:

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets as Attachment "H"*):

CA = Carbon Adsorption

VB = Dedicated Vapor Balance (closed system)

ECD = Enclosed Combustion Device

F = Flare

TO = Thermal Oxidation or Incineration

[5] EPA = EPA Emission Factor as stated in AP-42

MB = Material Balance

TM = Test Measurement based upon test data submittal

O = other (describe)

10. Proposed Monitoring, Recordkeeping, Reporting, and Testing

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

MONITORING *Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment operation/ air pollution control device.*	RECORDKEEPING *Please describe the proposed recordkeeping that will accompany the monitoring.*
Track Loading Throughput	Maintain loading throughput records.
REPORTING *Please describe the proposed frequency of reporting of the recordkeeping.*	TESTING *Please describe any proposed emissions testing for this process equipment/ air pollution control device.*

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

LEAK SOURCE DATA SHEET (Please see attached fugitive emissions spreadsheet)

Source Category	Pollutant	Number of Source Components[1]	Number of Components Monitored	Average Time to Repair	Estimated Annual Emission
Pumps[5]	light liquid VOC[6,7]	42			10545
	heavy liquid VOC[8]				
	Non-VOC[9]				
Valves[10]	Gas VOC	423			6617
	Light Liquid VOC	234			11295
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves[11]	Gas VOC				
	Non VOC				
Open-ended Lines[12]	VOC	3			20
	Non-VOC				
Sampling Connections[13]	VOC	2010			5081
Connectors	Non-VOC				
Compressors	VOC	2			
	Non-VOC				
Flanges	VOC	390			649
	Non-VOC				
Other	VOC	172			21077
	Non-VOC				

[1 - 13] See notes on the following page.

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT H

Air Pollution Control Device Sheets

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#: 8S-COMB1	2. Installation Date: 5/31/2015	
3. Maximum Rated Total Flow Capacity: 168000 scfd 7000 scfh	4. Maximum Design Heat Input: 10.5 MMBtu/hr	5. Design Heat Content: 1500 Btu/scf

Control Device Information

6. Select the type of vapor combustion control device being used: ☑ New

☐ Elevated Flare ☐ Ground Flare ☐ Thermal Oxidizer ☐ Completion Combustion ☑ Enclosed Combustion Device

7. Manufacturer: Leed	8. Hours of operation per year:
Model No.: LDF1350 Dual Stage Combustor	8760

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

(Emission Point ID#: 8E-Comb)

10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
6S-TL1	Condensate Truck Loadout		
7S-TL2	Produced water truck loadout		

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?
☐ Steam ☐ Air ☐ Pressure ☑ Non	25	ft	☐ Yes ☐ 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)
42	1500	TBD	TBD

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	1	12.5	20,000	☐ Yes ☐ No

25. If automatic re-ignition will be used, describe the method:

Piezoelectric Inspirating Ignitor

26. Describe the method of controlling flame:

27. Is pilot flame equipped with a monitor to detect the presence of the flame?

☑ Yes ☐ No

28. If yes, what type? ☐ Thermocouple ☐ Infra-red ☐ Ultra Violet

Camera with monitoring control room 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? Yes. The control device has been guaranteed by the manufacturer. Please see attached report.

33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty:

TBD

34. Additional Information Attached? ☐ Yes ☐ No

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.

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

Environmental Control Equipment Data Sheet

Item/Tag No.:		Page	6 of 2		
Project No.:		Revision:	B		
		Date:	[illegible]		
Project:		By:	[illegible]		
P.O. No.:		Checked:	[illegible]		
RFQ No.:		Approved:	[illegible]		
Client:		RFQ PERIOD			
Site:				Supplier:	LEED / ABECATCHER
Unit/Process:		Remarks:		Model No.:	LEED-[illegible]-100

GENERAL

1	Design Code:	NDE:	LEED Fabrication Standards
2	Service:	Customer Spec:	☐ Yes
3	Description: Standard and Stage 4 High Efficiency Combustor		☒ No

PROCESS DATA

	Gas Composition:	mol%	Process Conditions: Variable	Value	Units
4	Methane		Flow Rate	[illegible]	Mscf/
5	Ethane		Pressure	[illegible]	psig
6	Propane		Temperature		°F
7	i-Butane		Molecular Weight		
8	n-Butane		Process/Waste Stream	☒ Gas	☐ Liquid
9	i-Pentane		Detailed Process Description / Process Notes:		
10	n-Pentane		1. [illegible]		
11	n-Hexane		2. [illegible]		
12	CO2		3. [illegible]		
13	N2				
14	Helium				
15	H2O				
16	C7				
17	C8				
18	C9				
19	C10				
20	C11+				
21	TOTAL				

	Other Components:	ppmW	Availabilities:	
22	H2S		Fuel / Pilot Gas	[illegible]
23	Benzene		Instrument Air	[illegible]
24	Toluene		Power	[illegible]
25	Ethylbenzene		Steam	[illegible]
26	Xylene		Purge Gas	

DESIGN DATA

27	Ambient Temperature:		Noise Performance Requirements:	Under 80 dBA
28	Low, °F	[illegible]	Structural Design Code:	
29	High, °F	[illegible]	Wind Design Code:	[illegible]
30	Design Conditions: Pressure/Temperature			
31	Max. Relative Humidity, %	[illegible]	Pressure/Speed	[illegible]
32	Elevation (ASL), ft		Category	
33	Area Classification:	Class I Div 2	Seismic Design Code:	
34	Electrical Design Code:	NEC	Location:	

EQUIPMENT SPECIFICATION

35	Type:	☐ Vertical ☒ Horizontal	Equipment Design	
36		☐ Stage 4 Burner	Component	Material / Size / Rating / Other
37		☐ Flat ☐ Multi-Flat	Burner	
38		☐ Rectangular ☐ Round	Burner Type / Area Gas Burner	[illegible]
39			Burner Walls	Carbon Steel
40	Smokeless By:	☐ Design ☐ Pilot Gas	Pilot	
41		☐ Combustion ☒ Stages	Pilot Tip	[illegible]
42			Pilot Housing	Carbon Steel
43	Stack:	☒ Self Supporting	Flange / Stack	
44	Gas Burner:	☐ Non-Premix ☒ Premix ☐ Combustion	Stack	Carbon Steel
45	Fan:	☒ Integrated ☐ Centrifugal	Flange	Carbon Steel
46	Pilot Air Blower:	☒ Lubed ☐ Oil-Free	Blower	Carbon Steel
47	Pilot Flame Control:	☐ Yes ☒ Not Applicable	Flange	Carbon Steel
48			Insulation	Blanket
49	Ignition:	☐ Pilot Gas Ignition ☒ Electrical Spark	Ignition Pilot	[illegible]
50		☐ Electric ☐ Automatic ☐ Manual	Pilot Gas	[illegible]
51		☐ Multi-Port Burner Control	Control Panel Enclosure	[illegible]
52		☐ Multi-Port Burner Control	Control and Distribution	[illegible]
53			Stack Support Construction	[illegible]
54	Stack Ignition Package:	☐ Manual ☐ Remote Actuation	Stack Pilot	
55		☐ Pilot Gas	Pilot	

Environmental Control Equipment
Data Sheet

Item/Tag No.:		Page	1 of 1
Project No.:		Revision:	0
		Date:	27 February 2014
Project:		By:	[illegible]
P.O. No.:		Checked:	[illegible]
RFQ No.:		Approved:	[illegible]
Client:		Ref. [illegible]:	
Site:		Supplier:	[illegible]
Unit/Lease:		Remarks:	Model No.: [illegible]

EQUIPMENT SPECIFICATION

Flame Detection:	☐ Thermocouple ☐ Infrared	Auxiliary Equipment	
	☐ UV Burner	Pumps	N/A
General Configuration:		Blowers	N/A
		Demisters	N/A
		[illegible]	N/A
		Flame / Detonation Arrestor	N/A
		Instrumentation & Controls	
		Controls (Local / IT Wires)	Check with Sales for available configs.
		Flow Meters	N/A
		Calibration	N/A
		Pressure Control / Transmitters	N/A
		Thermocouples	Check with Sales for available configs.
		Temperature Switch / Transmitters	N/A
		BMS	Check with Sales for available configs.
		Other	N/A
		Other	N/A

FABRICATION AND INSPECTION

Special requirements	☐ Lifting Lugs ☐ Concrete Pad	Equipment Info	
	☐ Other	Component	Weight / Dimensions
		Pumps	
Inspection	☐ Vendor Standard	Engine / Assembly	
	☐ Other, Specify:	Stack	
Material Certification	☐ Vendor Standard	Stack Assembly	[illegible]
	☐ Other	Pipe [illegible]	
	☐ Certificate of Compliance	Pipe [illegible]	
	☐ Other (Specify):	[illegible]	
NDE	☐ Vendor Standard	Auxiliary Equipment	
	☐ Radiography, Specify:	Blowers	
	☐ Ultrasonic, Specify:	[illegible]	
	☐ Liquid Penetrant	Flame / Detonation Arrestor	
	☐ Magnetic Particles	Skid	
	☐ Other, Specify:	Instrumentation & Controls	
	☐ Other, Specify:	CMS	
Surface Preparation	☐ Vendor Standard	Control Panel	
	☐ Other, Specify:		
Paint System	☐ Vendor Standard		
	☐ Other, Specify:		
Finished Color	☐ Vendor Standard		
	☐ Other, Specify:		

Additional Notes:

Environmental Control Equipment Data Sheet	Item/Tag No.:	Page	1 of 3
	Project No.:	Revision:	0
		Date:	[illegible]
	Project:	By:	[illegible]
	P.O. No.:	Checked:	[illegible]
	RFQ No.:	Approved:	[illegible]
Client:	Ref. P&ID:		
Site:		Supplier:	[illegible]
Unit/Area:	Remarks:	Model No.:	[illegible]

GENERAL ARRANGEMENT

AIR POLLUTION TESTING, INC.
DENVER, SALT LAKE CITY

Source Emissions Test Report
Leed Fabrication

Combustor

Milliken, Colorado

Test Dates:
October 27- 28, 2011

Report prepared for:
Leed Fabrication
12535 Weld County Rd. #2
Brighton, Colorado 80601

Report prepared by:
Air Pollution Testing, Inc.
5530 Marshall St.
Arvada, CO 80002

APT Project: LDF1350

DENVER OFFICE
5530 Marshall Street
Arvada, CO 80002
[illegible]
FAX: [illegible]
[illegible]

Certification

Team Leader Certification:

I certify that all of the sampling and analytical procedures and data presented in this report are authentic and accurate.

Dane Murray
Field Team Leader

Reviewer Certification:

I certify that all of the testing details and conclusions are accurate and valid.

Marty Willinger
Technical Writer

Table of Contents

1. Introduction 1
2. Methods 1
3. Test Program Summary 2
4. Test Results Summary 2
5. Test Method Details 4
6. Conclusion 5

Tables

Table 1.1 : Contact Personnel 1
Table 3.1 : Test Results Summary 2
Table 4.1 : Sampling and Analytical Methods Summary 3

Appendices

Testing Parameters / Sample Calculations ..... Appendix 1
Field Data ..... Appendix 2
Laboratory Data ..... Appendix 3
Calibration Information ..... Appendix 4
Schematics ..... Appendix 5

1. Introduction

Air Pollution Testing, Inc. (APT) was contracted by Lead Fabrication (LDF) to conduct source emissions testing services at a facility near Milliken, CO

The purpose of the testing program was to determine the concentrations and mass emission rates of non-methane/non-ethane organic compounds (NMEOC) from the exhaust stack of one (1) enclosed flare in service at the facility. Data collected was used to determine the unit's NMEOC destruction removal efficiency (DRE). Concurrent gas velocity and concentration measurements of moisture (H_2O), oxygen (O_2), carbon monoxide (CO) and carbon dioxide (CO_2) were conducted at the exhaust sampling location for the determination of mass emission rates.

The emissions testing program contact personnel are shown in Table 1.1 below.

Lead Fabrication Incinerator DRE Testing Emissions Testing Program Contact Personnel		
Name, Title	*Company, Affiliation Address*	*Phone, FAX*
Mr. Jim Glick Senior Engineer	Lead Fabrication Services, Inc. 12535 Weld County Road #2 Brighton, Colorado 80601	303-659-6801 ext. 152, 303-558-8909
Mr. Dave Meiers, Operations Director	Air Pollution Testing, Inc. 5930 Marshall Street Arvada, Colorado 80002	303-420-5949 ext. 33, 303-420-5920

Table 1.1: Emissions Testing Program Contact Personnel

2. Methods

APT tested in accordance with the following United States Environmental Protection Agency (EPA) source emissions test methods (referenced in *40 CFR Part 60, Appendix A*)

- *Method 1 – Sample and Velocity Traverses for Stationary Sources*
- *Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate*
- *Method 3A – Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)*
- *Method 4 – Determination of Moisture Content of Stack Gases*
- *Method 10 – Determination of Carbon Monoxide Emissions from Stationary Sources*

- *Method 18 – Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*
- *Method 25A – Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer*

3. Test Program Summary

APT provided all necessary equipment and labor for the determination of all emission parameters detailed in Table 3.1. All gaseous emission parameters were determined using on-site gas analyzers housed in a mobile, analytical trailer to provide a temperature controlled environment for stable accurate analyzer response.

Triplicate 60-minute test runs were conducted at the unit exhaust stack for the determination of O_2, CO_2, NO_X, CO and NMOC (non-methane organic compounds) concentrations as well as volumetric flow. Concurrent with emissions sampling, integrated samples of outlet gas were collected in clean, leak-free Tedlar bags which were analyzed for speciated hydro-carbon content. NMEOC DRE was determined using a carbon balance on exhaust pollutant mass emission rates.

Lead Fabrication Incinerator DRE Testing Sampling and Analytical Methods			
Gas Parameter	*Sampling Method*	*Analytical Method*	*Laboratory*
gas flow	Methods 1, 2	draft gauge, thermocouple, pitot tube	APT, on-site
O_2, CO_2	Method 3A	paramagnetic and non-dispersive infrared analyzers	
H_2O	Method 4	gravimetric	
CO	Method 10	gas filter correlation, infrared analyzer	
NMOC	Method 25A	flame ionization detector	
C_xH_y	Method 18	gas chromatography	APT, off site

Table 3.1 Emissions Sampling Methods

4. Test Results Summary

The results of the testing are summarized in Tables 4.1 and 4.2. Any emission parameters not found in the tables may be found in *Appendix 1 – Testing Parameters : Sample Calculations*. The following terms are used in the tables:

- %vd – diluent concentration, dry volume percent
- %vw – moisture content, wet volume percent

- dscfm – stack gas flow rate, dry standard (one atmosphere, 68 °F) cubic feet per minute
- lb/hr – pollutant mass emission rate, pounds per hour
- ppmvd – parts per million, dry basis
- NMOC – non-methane organic compounds
- NMEOC – non-methane / non-ethane organic compounds
- % DRE – destruction removal efficiency
- C_3H_8 – propane

Lead Fabrication - Combustor DRE Testing Test Results Summary – 10/27/2010				
	Run #1	***Run #2***	***Run #3***	**Average**
Start Time	11:35	13:43	14:58	
Stop Time	12:35	14:43	15:58	
Stack Temp (°F)	82	89	84	**85**
Stack Exhaust Flow (dscfm)	1,880	1,779	1,063	**1,574**
O_2 (%vd)	19.9	20.2	19.5	**19.9**
CO_2 (%vd)	0.8	0.5	1.0	**0.8**
H_2O (%vw)	1.4	1.5	1.4	**1.4**
CO (ppmvd)	14.5	8.2	14.2	**12.3**
NMOC (ppmvd as C_3H_8)	22.1	24.3	19.2	**21.9**
NMEOC (ppmvd as C_3H_8)	12.7	21.3	17.3	**17.1**
Exhaust Emission Data				
CO (lb/hr)	0.1	0.1	0.1	***0.1***
NMOC (lb/hr as C_3H_8)	0.3	0.3	0.1	***0.2***
NMEOC (lb/hr as C_3H_8)	0.2	0.3	0.1	***0.2***
% DRE (NMOC carbon balance)	99.1	98.7	99.4	***99.1***
% DRE (NMEOC carbon balance)	99.5	98.8	99.5	**99.3**

Table 4.1: Test Results Summary

Lead Fabrication : Combustor DRE Testing Test Results Summary – 10/28/2010		
	Run #1	***Run #2***
Start Time	10:20	12:29
Stop Time	11:20	12:47
Stack Temp (°F)	72	71
Stack Exhaust Flow (dscfm)	3,591	3,459
O_2 (%vd)	18.6	15.9
CO_2 (%vd)	1.4	3.2
H_2O (%vw)	1.6	N/A
CO (ppmvd)	19.7	10.5
NMOC (ppmvd as C_1H_4)	19.2	2.2
Exhaust Emission Data		
CO (lb/hr)	0.1	0.2
NMOC (lb/hr as C_1H_4)	0.2	0.1
% DRE (NMOC carbon balance)	99.6	100.0
Inlet Data		
Inlet fuel (oz.)	3.0	13.1

Table 4.2: Test Results Summary

5. Test Method Details

5.1. Stack Gas Velocity, Volumetric Flow Rate and Moisture

Stack gas velocity, volumetric flow rate and moisture (H_2O) content were measured in accordance with EPA Methods 1, 2 and 4.

Each sampling period consisted of conducting a temperature and differential pressure traverse of the stack using a K-type thermocouple and an S-type pitot tube. Concurrent with the traverse, a sample of gas for moisture determination was extracted from the stack at a constant flow rate of no more than 0.75 cubic feet per minute (cfm). The gas sample passed through a stainless steel probe, through a series of four (4) chilled glass impingers and through a calibrated dry gas meter. See *Appendix 5 –Schematics* for a diagram of the EPA Methods 1, 2 and 4 sampling train.

Prior to sampling, the first two impingers were each seeded with 100 milliliters of water. The third impinger was empty. The fourth impinger was seeded with 250 grams of dried silica gel. Following sampling, the moisture gain in the impingers was measured

gravimetrically to determine the moisture content of the gas

All of the above data were combined with concurrently collected diluent data to calculate the stack gas velocity and volumetric flow rate in units of feet per second (ft/sec) actual cubic feet per minute (acfm), dry standard (1 atmosphere and 68°F) cubic feet per minute (dscfm), and pounds per hour (lb/hr)

5.2 Diluent (O_2 and CO_2) and Carbon Monoxide

O_2, CO_2, and CO emission concentrations were measured in accordance with EPA Methods 3A (O_2 and CO_2) and 10 (CO). Each sampling period consisted of extracting a gas sample from the stack at a constant flow rate of approximately three liters per minute (lpm). The sample passed through a refrigeration-type gas conditioner to remove moisture and into the sampling port of a TECO Model 48H gas filter correlation infrared CO analyzer, and a Servomex Series 1400 paramagnetic O_2 / non-dispersive infrared CO_2 analyzer. The gas concentrations were displayed on the analyzer front panels in units of either parts per million, dry volume basis (ppmvd – CO) or percent, dry volume basis (%vd – O_2 and CO_2) and logged to a computerized data acquisition system (CDAS). Please see *Appendix 5 – Schematics* for a diagram of the EPA Methods 3A and 10 sampling train

Before and after each sampling period, the analyzers were challenged with calibration gases to calibrate the instruments, to verify linearity of response, and to quantify zero and span drift for the previous sampling period. The calibration gases were prepared and certified in accordance with EPA Protocol 1. To ensure no system bias, the analyzer calibrations were conducted by introducing all gases to the analyzers at the sampling probe tip at stack pressure. Following sampling, the CDAS data was averaged in one-minute increments, corrected for instrumental drift, and reported as average O_2, CO_2, and CO emission concentrations for each sampling period in units of %vd or ppmvd. The concentration data was combined with concurrently collected stack gas flow data to calculate the CO mass emission rates in units of lb/hr and tpy.

5.3. NMOC Emissions

NMOC concentrations were measured in accordance with EPA Methods 25A. A flame ionization detector (FID) was used to determine NMOC levels. The FID was housed in a mobile analytical trailer to provide a temperature-controlled environment for stable, accurate response.

Each sampling period consisted of extracting a gas sample from the stack at a constant flow rate of approximately three liters per minute using a heated Teflon line. The gas was directed into the sampling port of a TECO Model 55i flame ionization analyzer. NMOC concentrations were displayed on the analyzer front panel in units of parts per million, wet volume basis (ppmvw) and logged to a CDAS (see *Appendix 5 – Schematics*).

Before and after each sampling period, the analyzer was challenged with EPA Protocol 1

calibration gases to calibrate the instrument, to verify linearity of response, and to quantify zero and span drift for the previous sampling period. To ensure no system bias, the analyzer calibrations were conducted by introducing all gases to the analyzer at the sampling probe tip at stack pressure. Following sampling, the CDAS data was averaged in one-minute increments, corrected for instrumental drift, and reported as average emission concentrations for each sampling period.

Concurrent with each NMOC sampling run, APT personnel collected an integrated sample of inlet gas for subsequent speciated TVOC analysis by the APT lab in Arvada, CO. The above data was combined with concurrently collected volumetric flow data to calculate NMOC and NMEOC emissions in units of lb/hr, and the system DRE.

6. Conclusion

The results of the testing demonstrate that the combustor in service at the facility operates at >99 % DRE NMEOC.

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#: 12S-FLARE	2. Installation Date: 5/11/2015	
3. Maximum Rated Total Flow Capacity: 394000 scfd 16416.7 scfh	4. Maximum Design Heat Input: 19.7 MMBtu/hr	5. Design Heat Content: 1200 Btu/scf

Control Device Information

6. Select the type of vapor combustion control device being used: ☑ New

☑ Elevated Flare ☐ Ground Flare ☐ Thermal Oxidizer ☐ Completion Combustion ☐ Enclosed Combustion Device

7. Manufacturer: Leed	8. Hours of operation per year:
Model No.: LDF1350 Dual Stage Combustor	8760

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

(Emission Point ID#: 12E-FLARE)

10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
12E-FLARE	LP Separator Condensate Stabilizer		

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?
☐ Steam ☐ Air ☐ Pressure ☑ Non	25	ft	☐ Yes ☐ 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)
274	1200	TBD	4.76

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	1	12.5	20,000	☐ Yes ☐ No

25. If automatic re-ignition will be used, describe the method:

Piezoelectric Inspirating Ignitor

26. Describe the method of controlling flame:

27. Is pilot flame equipped with a monitor to detect the presence of the flame? ☑ Yes ☐ No	28. If yes, what type? ☐ Thermocouple ☐ Infra-red ☐ Ultra Violet Camera with monitoring control room Other, describe:

29. Pollutant(s) Controlled	30. % Capture Efficiency	31. Manufacturer's Guaranteed Control Efficiency (%)
VOC	100	98

32. Has the control device been tested by the manufacturer and certified? Yes. The control device has been guaranteed by the manufacturer. Please see attached report.

33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty:

TBD

34. Additional Information Attached? ☐ Yes ☐ No

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.

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

AIR POLLUTION CONTROL DEVICE
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): 3C-NSCR

Equipment Information	
1. Manufacturer: TBD	2. Control Device Name: 3C-NSCR
	Type: NSCR Catalyst
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: 100%	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: SCFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.	
N/A	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment. N/A	
13. Description of method of handling the collected material(s) for reuse of disposal. N/A	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☑ No
Are particulates present? ☑ Yes ☐ No
Are metals present? ☐ Yes ☑ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):	Not Specified	
Heat Content (BTU/scf):	1400	1220
Oxygen Content (%):	Not Specified	
Moisture Content (%):	Not Specified	
Relative Humidity (%):	Not Specified	

16. Type of pollutant(s) controlled: SO_x Odor Particulate (type): Other NOx	
17. Inlet gas velocity: TBD ft/sec	18. Pollutant specific gravity: N/A
19. Gas flow into the collector: ACF @ °F and PSIA	20. Gas stream temperature: Inlet: °F Outlet: 960 °F
21. Gas flow rate: Design Maximum: ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: N/A Inlet: Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency	OUT Pollutant		Control Efficiency
	lb/hr	grains/acf	%	lb/hr	grains/acf	%
A NOx	0.20		100	0.02		88
B VOC	0.10		100	0.10		0
C CO	0.41		100	0.40		78.3
D						
E						

24. Dimensions of stack: Height ft. Diameter ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

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

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): N/A	
28. Describe the collection material disposal system: Catalyst elements can be cleaned and/or replaced; materials are not disposed of on site.	
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet?	
30. Proposed Monitoring, Recordkeeping, Reporting, and Testing	
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING:	RECORDKEEPING: All maintenance records will be maintained.
REPORTING: All required emissions test reports will be submitted to appropriate agencies	TESTING: All testing requirements will be performed to ensure catalyst performance.
MONITORING: Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.	
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.	
REPORTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.	
TESTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.	
31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.	
See NGSG operations and maintenance plan submitted with the permit application.	

COMPRESSCO PARTNERS, GP

GJ230 — Natural Gas Engine Performance With Emission Control Package

Maximum Engine Speed (RPM)	2000	Fuel	Nat Gas
Compression Ratio	10:1	Ignition System	CD
Bore	4.360 in. (110.74mm)	Fuel System	NG IMPCO
Stroke	3.850 in. (97.79mm)	Jacket Water Outlet Temperature	180°F (82.2°C)
Displacement	230 c.i. (3.8L)	Minimum Fuel Pressure (psig)	2 oz

Engine Rating Data	% Load	100%	50%	10%
Engine Power	bhp	46 (34.3kw)	26 (19.39kw)	10 (7.46 kw)

Engine Data				
Specific Fuel Consumption (BSFC)	Btu/bhp-hr	10.7773	10.3792	9.91443
Intake Manifold Pressure	"Hg	-0.2	-8.9	-12.3
Timing	°BTDC	38	38	38
Exhaust Stack Temperature	°F	960	N/A	N/A
Stack Flow Rate	SCFM	3965.27	N/A	N/A
Stack Height	94"			
Stack Diameter	2.0"			

Engine Emissions Data	% Load	g/bhp-hr	lb/hr	TPY
Nitrous Oxides (NOx)	100	< 2.0	< 0.20	< 0.88
Carbon Monoxide (CO)	100	< 4.0	< 0.37	< 1.78
Volatile Organic Compounds (VOC)	100	< 1.0	< 0.24	< 0.44
CO2	100	(avg %)		11.73%

Test Gas Data			
Methane	94.8277%	Btu	1014.8

CGJ230 FI Low Pressure

Displacement	230 c.i. (3.8L)	Maximum Discharge Pressure	125 psig (861.8kPaG)
Bore	4.360 in. (110.74mm)	Maximum Suction Pressure	12 psig (82.7kPaG)
Stroke	3.850 in. (97.79mm)	Maximum Compression Ratio	12: 1
Number of Throws	4	Valves	Concentric

Compression on Head End Only

CGJ170 MP Medium Pressure

Displacement	170 c.i. (3.8L)	Maximum Discharge Pressure	450 psig (3447kPaG)
Bore	3.750 in. (95.25mm)	Maximum Suction Pressure	60 psig (423.7kPaG)
Stroke	3.850 in. (97.79mm)	Maximum Compression Ratio	18: 1
Number of Throws	4	Valves	Concentric

Compression on Head End Only

The GJ230 complies with 40 CFR 60 Subpart JJJJ for the current model year.

CPE-GJNE-004	Effective Date: May 23, 2015	Supersedes: January 15, 2012

AIR POLLUTION CONTROL DEVICE
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): **3C-Oxy-cat**

Equipment Information

1. Manufacturer: TBD	2. Control Device Name:	3C-Oxy-cat
	Type:	Oxidation Catalyst
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.		
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.		
5. Provide a scale diagram of the control device showing internal construction.		
6. Submit a schematic and diagram with dimensions and flow rates.		
7. Guaranteed minimum collection efficiency for each pollutant collected: 100%		
8. Attached efficiency curve and/or other efficiency information.		
9. Design inlet volume: SCFM	10. Capacity:	
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.		
N/A		
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment. N/A		
13. Description of method of handling the collected material(s) for reuse of disposal. N/A		

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☑ No
Are particulates present? ☑ Yes ☐ No
Are metals present? ☐ Yes ☐ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):	Not Specified	
Heat Content (BTU/scf):	1400	1220
Oxygen Content (%):	Not Specified	
Moisture Content (%):	Not Specified	
Relative Humidity (%):	Not Specified	

16. Type of pollutant(s) controlled: SO_x Odor Particulate (type): Other NOx	
17. Inlet gas velocity: TBD ft/sec	18. Pollutant specific gravity: N/A
19. Gas flow into the collector: ACF @ °F and PSIA	20. Gas stream temperature: Inlet: °F Outlet: 973 °F
21. Gas flow rate: Design Maximum: ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: N/A Inlet: Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency	OUT Pollutant		Control Efficiency
	lb/hr	grains/acf	%	lb/hr	grains/acf	%
A NOx	0.76		100	0.76		0%
B VOC	0.84		100	0.84		0%
C CO	3.92		100	3.04		22%
D						
E						

24. Dimensions of stack: Height ft. Diameter ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

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

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): N/A	
28. Describe the collection material disposal system: Catalyst elements can be cleaned and/or replaced; materials are not disposed of on site.	
29. Have you included ***Other Collectors Control Device*** in the Emissions Points Data Summary Sheet?	
30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**	
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING:	RECORDKEEPING: All maintenance records will be maintained.
REPORTING: All required emissions test reports will be submitted to appropriate agencies	TESTING: All testing requirements will be performed to ensure catalyst performance.
MONITORING: Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.	
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.	
REPORTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.	
TESTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.	
31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.	

CATERPILLAR®

G3508B LE GAS PETROLEUM ENGINE

515 bkW (690 bhp)

TECHNICAL DATA

G3508B Gas Petroleum Engine — 1400 rpm

Fuel System		0.5 g NOx NTE Rating DM8828-00	1.0 g NOx NTE Rating DM8827-00
Engine Power			
@ 100% Load	bkW (bhp)	514.53 (690)	514.53 (690)
Engine Speed	rpm	1400	1400
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	1524 (5000)	1828.8 (6000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	36	36
Aftercooler Temperature			
Stage 1 (JW)	°C (°F)	95.0 (203)	95.0 (203)
Stage 2 (SCAC)	°C (°F)	54.44 (130)	54.44 (130)
Compression Ratio		8.0:1	8.0:1
Emissions*			
NOx	g/bkW-hr (g/bhp-hr)	0.67 (0.50)	1.34 (1.00)
CO	g/bkW-hr (g/bhp-hr)	3.46 (2.58)	4.01 (2.99)
CO_2	g/bkW-hr (g/bhp-hr)	639.67 (477)	610.17 (455)
VOC**	g/bkW-hr (g/bhp-hr)	0.74 (0.55)	0.58 (0.43)
Fuel Consumption***			
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10.26 (7254)	10.09 (7058)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	10.89 (7700)	10.68 (7549)
Heat Balance			
Heat Rejection to Jacket Water			
@ 100% Load			
JW	bkW (Btu/min)	190.24 (10,819)	1953.81 (111,111)
OC	bkW (Btu/min)	46.16 (2625)	46.16 (2625)
Heat Rejection to Aftercooler			
@ 100% Load			
1st Stage AC	bkW (Btu/min)	88.13 (5012)	74.28 (4224)
2nd Stage AC	bkW (Btu/min)	53.63 (3050)	48.62 (2765)
Heat Rejection to Exhaust			
@ 100% Load	bkW (Btu/min)	526.70 (29,953)	502.00 (28,548)
Heat Rejection to Atmosphere			
@ 100% Load	bkW (Btu/min)	61.51 (3498)	61.51 (3498)
Exhaust System			
Exhaust Gas Flow Rate			
@ 100% Load	m³/min (cfm)	126.15 (4455)	120.37 (4251)
Exhaust Stack Temperature			
@ 100% Load	°C (°F)	499.44 (931)	512.78 (955)
Intake System			
Air Inlet Flow Rate			
@ 100% Load	m³/min (scfm)	45.17 (1595)	42.28 (1493)
Gas Pressure	kPag (psig)	48-345 (7-50)	48-345 (7-50)

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

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

***ISO 3046/1

Kristin Budden (Contractor)

From: Brown, Thomas W <Thomas.Brown2@nov.com>
Sent: Monday, March 30, 2015 1:47 PM
To: Bob Olech
Cc: Kristin Budden; Kristin Budden (Contractor)
Subject: EXTERNAL: PEN1 Stick Flare Information for AQ Permit

Bob,

Once we install the new nozzle with the smaller orifice the flare will operate properly at 30psi and it will ensure that we get good entrainment of oxygen and a clean burn.

1. **Inlet pressure 30psi**
   - **Flow rate (MSCFD) = 394 MSCFD**
   - **Gas Exit velocity (ft/sec) =4.76 ft/sec**
   - **19.7 million btu/hr**

Please let me know if you have any other questions. Thanks again, - Tom

Sincerely,

Tom Brown | *Northeast Area Sales Representative*

NOV Completion & Production Solutions
Process and Flow Technologies
100 Beta Drive | Cannonsburg, Pa 15317
T 724-745-6001
M 412-737-0459
E Thomas.Brown2@nov.com

nov.com
Connect with us on Facebook | LinkedIn | Twitter

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Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT I

Emissions Calculations

Noble Energy, Inc; Pennsboro 2 Production Facility
Emission Summary Sheet

Emission Unit ID Number	Source Description	Potential Emissions (tpy) NOx	CO	VOC	SOx	PM	PM10	Formaldehyde	Total HAPS	CH_4	CO_2	CO_2e
1S-TK1-20	20-400 bbl Condensate Tanks	---	---	VRU	---	---	---	---	VRU	---	---	---
2S-TK21-40	20-400 bbl Produced Water Tanks	---	---	VRU	---	---	---	---	VRU	---	---	---
3S-ENG1	690 hp CAT G3508B LE	3.33	13.33	3.66	0.01	0.00	0.00	1.16	0.02	5.04	3,178	3,304
3S-ENG2	46 hp Gas Jack	0.89	1.78	0.44	0.00	0.00	0.00	0.00	0.09	0.00	229	229
4S-GPU1	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU2	**1.0 MMBtu/hr Heater**	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU3	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU4	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU5	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU6	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU7	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU8	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU9	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU10	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU11	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
4S-GPU12	1.0 MMBtu/hr Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
5S-LP	Low Pressure Separator Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
6S-TL1	Condensate Truck Loadout	---	---	10.20	---	---	---	---	2.57	---	---	---
7S-TL2	Produced Water Truck Loadout	---	---	1.10	---	---	---	---	0.03	---	---	---
8S-COMB1	Vapor Combustor	3.13	17.02	0.53	---	---	---	---	0.12	0.00	5411	5425
9S-PILOT1	Combustor Pilot Emissions	0.01	0.01	0.00	0.00	0.00	0.00	---	---	---	---	13.14
10S-TE Gen	Thermo Electric Generator	0.02	0.01	0.00	0.00	0.00	0.00	---	---	0.00	16.88	16.89
11S-LH	Line Heater	0.36	0.30	0.02	0.00	0.03	0.03	0.00	0.01	0.01	431	431
12S-FLARE	Emergency Flare	5.87	31.93	18.50	---	---	---	---	0.05	0.00	10152	10178
13S-PILOT	Combustor Pilot Emissions	0.54	0.45	0.03	0.01	0.04	0.04	---	---	---	---	643.86
14S-VRU	Vapor Recovery (VRU)	---	---	39.78	---	---	---	---	0.16	---	---	---
FUG	Equipt Component Fugitives Estimate	---	---	31.28	---	---	---	---	3.88	---	---	3.01
Total Facility Emissions (tpy)		**18.81**	**68.74**	**105.81**	**0.05**	**0.43**	**0.43**	**1.16**	**7.02**	**5.16**	**25,018**	**25,847**
Total Facility Emissions (lb/hr)		**4.29**	**15.69**	**24.16**	**0.01**	**0.10**	**0.10**	**0.27**	**1.60**	**1.18**	**5711.77**	**5901.11**
Total Facility Emissions for Major Source Threshold*		**18.81**	**68.74**	**74.53**	**0.05**	**0.43**	**0.43**	**1.16**	**3.14**	**5.16**	**25017.54**	**25843.85**

*Excludes fugitive emissions per 45 CSR 14-2.43.e.

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU1	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU2	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU3	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU4	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU5	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU6	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU7	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU8	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU9	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU10	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU11	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	4S-GPU12	
SCC		
Emission Unit Description	GPU Burner	
Equipment Usage	1.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	11S-LH	
SCC		
Emission Unit Description	Line Heater	
Equipment Usage	2.0 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120000.00	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Heater Detail Sheet

Source ID Number		
Equipment ID	5S-LP	
SCC		
Emission Unit Description	Low Pressure Separator Heater	
Equipment Usage	1 MMBtu/hr Heater	
Equipment Make	Unknown	
Equipment Model	Unknown	
Serial Number	Unknown	
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value	1,220	Btu/scf
Design Heat Rate*	1.00	MMBtu/hr
Site Heat Rate*	1.00	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.18	MMscf/yr

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	100.00	1.000	8760	0.08	0.36	AP-42[1]
CO	84.00	1.000	8760	0.07	0.30	AP-42[1]
VOC	5.50	1.000	8760	0.00	0.02	AP-42[2]
SO2	0.60	1.000	8760	0.00	0.00	AP-42[2]
PM10	7.60	1.000	8760	0.01	0.03	AP-42[2]
Formaldehyde	0.08	1.000	8760	0.00	0.00	AP-42[3]
Total HAPs	1.89	1.000	8760	0.00	0.01	AP-42[3]
CO_2	120,000	1.000	8760	98.36	430.82	AP-42[2]
CH_4	2.30	1.000	8760	0.00	0.01	AP-42[2]
CO_2e					431.03	

[1] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Engine Detail Sheet

Emission Unit Number	3S-ENG1			
Equipment ID		Source Location	Zone:	
Source Description	690 hp CAT G3508B LE		Horizontal:	
Engine Usage	LP Separator VRU		Vertical:	
Engine Make	Caterpillar	Potential operation		8760 hr/yr
Engine Model	G3508B LE			
Serial Number				
Manufacture Date				
NSPS Applicability		Potential fuel usage		35.94 MMscf/yr
Engine Configuration	4 cycle, lean burn			
Emission Controls	Oxidation Catalyst			
ISO Rating	690 BHP	Stack ID		3S-ENG1
Site Rating	BHP			
Fuel Heating Value	1220 Btu/scf			
Heat Rate	5.01 MMBtu/hr			
Engine Heat Rate	7254 Btu/hp-hr			
Permit Status	Permit Pending			

Potential Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (g/hp-hr)	Nominal Rating (hp)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx		0.50	690	8760	0.76	3.33	Mfr Factors
CO		2.00	690	8760	3.04	13.33	Mfr Factors
VOC[2]		0.55	690	8760	0.84	3.66	Mfr Factors
CO_2		477.00	690	8760	725.61	3178.16	Mfr Factors
SOx	5.88E-04		690	8760	0.00	0.01	AP-42 Ch. 3.2, table 3.2-2
PM	7.71E-05		690	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-2
PM10	7.71E-05		690	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-2
Formaldehyde	5.28E-02		690	8760	0.26	1.16	AP-42 Ch. 3.2, table 3.2-2
Benzene	4.40E-04		690	8760	0.00	0.01	AP-42 Ch. 3.2, table 3.2-2
Toluene	4.08E-04		690	8760	0.00	0.01	AP-42 Ch. 3.2, table 3.2-2
Ethylbenzene	3.97E-05		690	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-2
Xylene	1.84E-04		690	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-2
CH_4	0.23		690	8760	1.15	5.04	API[1]
CO_2e						3304.22	

[1]API Compendium of Greenhouse Gas Emissions Methodoligies for the Oil and Natural Gas Industry, Table 4-9

[2]Includes total hydrocarbons

Notes

Noble Energy, Inc; Pennsboro 2 Production Facility
Engine Detail Sheet

Emission Unit Number	3S-ENG2				
Equipment ID			Source Location	Zone:	
Source Description	46 hp Gas Jack			Horizontal:	
Engine Usage	Storage Tank VRU			Vertical:	
Engine Make	Gas Jack		Potential operation		8760 hr/yr
Engine Model					
Serial Number					
Manufacture Date					
NSPS Applicability	N/A		Potential fuel usage		3.62E-03 MMscf/yr
Engine Configuration	4 cycle, rich				
Emission Controls	NSCR				
ISO Rating		46 BHP	Stack ID		3S-ENG2
Site Rating		BHP			
Fuel Heating Value		1200 Btu/scf			
Heat Rate		0.00 MMBtu/hr			
Engine Heat Rate		11 Btu/hp-hr			
Permit Status	Permit Pending				

Potential Emissions

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (g/hp-hr)	Nominal Rating (hp)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx		2.00	46	8760	0.20	0.89	Mfr Factors
CO		4.00	46	8760	0.41	1.78	Mfr Factors
VOC[2]		1.00	46	8760	0.10	0.44	Mfr Factors
CO_2		515.00	46	8760	52.23	228.76	Mfr Factors
SOx	0.000588		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
PM	0.0095		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
PM10	0.0095		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
Formaldehyde	0.0205		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
Benzene	0.00158		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
Toluene	0.000558		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
Ethylbenzene	0.000025		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
Xylene	0.000195		46	8760	0.00	0.00	AP-42 Ch. 3.2, table 3.2-3
CH_4	0.23		46	8760	0.00	0.00	API[1]
CO_2e					52.23035711	228.77	

1 - API Compendium of Greenhouse Gas Emissions Methodoligies for the Oil and Natural Gas Industry, Table 4-9

2 - Includes total hydrocarbons

Notes

Noble Energy, Inc; Pennsboro 2 Production Facility
Tank Detail Sheet

Source ID Number	1S-TK1-20				HYSYS lb/hr*	225.99
Equipment ID		Source Location	Zone:		HYSYS VOC wt%	73%
Tank Description	20-400 bbl Condensate Tanks		Horizontal:		HYSYS prod bbl/d	488.25
Tank Usage	Condensate Storage		Vertical:		to tanks	
Tank Make		Potential operation		8,760 hr/yr		
Tank Capacity	400 bbl					
Serial Number		Potential throughput		488 bbl/day	For all tanks combined	
Date in Service		Potential throughput		178,120 bbl/yr	374,052 gal/yr/tk	
Tank Contents	Condensate			8.1 lb VOC/bbl	From HYSYS	
Emission Controls	Vents to VRU					
Tank Orientation	Vertical, above ground	Tank Construction		Welded	(Welded, Bolted, Fiberglass)	
Shell Height / Length	20 ft	Roof color & condition		Green, good	(eg. light brown, good)	
Shell Diameter	12 ft	shell color & condition		Green, good	(eg. white, fair)	
Roof Slope	0.06	FR Primary Seal		N/A		
Roof Type (Cone, Dome, IFR, EFR, None)	Cone	FR Seconday Seal		N/A		
Permit Status		Vent pressure setting		0.03 +/- psig		
		VOC Control Efficiency		95 %	Control taken at VRU	

Potential Emissions

Pollutant	CAS	Hrs of Operation (hrs/yr)	Estimated Uncontrolled Emissions[1] (lb/hr)	(tpy)	(lb/yr)	Source of Emission Factor	Notes
VOC/flash		8760	165.22	723.65	1,447,293	HYSYS	Routed to VRU
VOC W&B		8760	0.69	60.44	6,044	TANKS 4.0.9d	Routed to VRU
Total VOC				784.08			Routed to VRU
Total BTEX	0.289 Wt%	8760	0.65	2.86		HYSYS	Routed to VRU
Total Methane	1.1747 Wt%	8760	2.65	11.63		HYSYS	Routed to VRU
Total CO2e				290.70		EPA	Routed to VRU

[1]Emissions include working and breathing

PEN-2 Analysis

500 psig GPU to 25 psig flash
0.500 MMBtu/hr line heater
1.00 MMBtu/hr LP flash
1,000,000 Btu/hr per GPU

Tank gas compressed from 0 psig to 25 psig
Combined LP sep gas and tank gas compressed from 25 psig to 500 psig
12.0 psia RVP condensate

GPU Streams	Inlet	Gas Out	Condensate Out	Water Out
			To LP Separator	
Vapor Frac	0.6763	1	0	0
Temperature (F)	70.00	70.00	70.00	70.00
Pressure (psig)	500	500	500	500
Mass Flow (lb/hr)	163092.58	111446.32	7997.77	43648.49
Liquid Flow (bbl/day)	3514.20	22353.7386	926.01	2994.80
Vapor Flow (MMSCFD)	48.46	48.46	-	-
Composition:				
Methane	0.51837	0.76308	0.14644	0
Ethane	0.10730	0.15549	0.13570	0
Propane	0.03638	0.05065	0.13501	0
i-Butane	0.00439	0.00571	0.03387	0
n-Butane	0.00922	0.01147	0.09275	0
i-Pentane	0.00228	0.00239	0.04258	0
n-Pentane	0.00319	0.00307	0.07098	0
n-Hexane	0.00360	0.00215	0.13618	0
n-Heptane	0.00109	0.00033	0.05401	0
n-Octane	0.00076	0.00010	0.04416	0
n-Nonane	0.00050	0.00003	0.03022	0
n-Decane	0.00094	0.00002	0.05869	0
C10+*	0.00014	0.00000	0.00885	0
Nitrogen	0.00240	0.00354	0.00024	0
CO2	0.00075	0.00110	0.00047	0
Oxygen	0.00003	0.00005	0.00001	0
H2O	0.30851	0.00081	0.00039	1
Benzene	0.00002	0.00001	0.00081	0
Toluene	0.00007	0.00002	0.00343	0
E-Benzene	0.00001	0.000001	0.00034	0
o-Xylene	0.00007	0.00001	0.00398	0
Cyclohexane	0.00000	0.00000	0.00000	0

PEN-2 LP Sep and Tanks	LP Separator Liquid	LP Separator Gas	Tank Gas	Combined Gas
	To Cond Tanks	To Flash Gas Comp	To VRU Comp	To Flash Gas Comp
Vapor Frac	0.076205	1	1	1
Temperature (F)	102.33	114.73	102.33	124.37
Pressure (psig)	0	25	0	25
Mass Flow (lb/hr)	5109.75	2888.02	225.99	3114.01
Liquid Flow (bbl/day)	488.25	-	-	-
Gas Flow (MMSCFD)	0.04	0.639	0.0373	0.677
Composition:				
Methane	0.00327	0.25597	0.04043	0.24409
Ethane	0.01373	0.22901	0.13761	0.22397
Propane	0.03970	0.20792	0.25529	0.21053
i-Butane	0.01991	0.04455	0.07394	0.04617
n-Butane	0.06787	0.11179	0.19817	0.11655
i-Pentane	0.05107	0.03608	0.07085	0.03800
n-Pentane	0.09579	0.05239	0.10388	0.05522
n-Hexane	0.25164	0.04785	0.09548	0.05047
n-Heptane	0.11629	0.00795	0.01539	0.00836
n-Octane	0.09868	0.00245	0.00453	0.00256
n-Nonane	0.06888	0.00065	0.00114	0.00067
n-Decane	0.13477	0.00049	0.00083	0.00051
C10+*	0.02029	0.00009	0.00015	0.00009
Nitrogen	0.00000	0.00041	0.00002	0.00039
CO2	0.00002	0.00082	0.00027	0.00079
Oxygen	0.00000	0.00001	0.00000	0.00001
H2O	0.00002	0.00067	0.00025	0.00065
Benzene	0.00151	0.00028	0.00056	0.00030
Toluene	0.00731	0.00045	0.00088	0.00048
E-Benzene	0.00077	0.00002	0.00003	0.00002
o-Xylene	0.00898	0.00016	0.00030	0.00017
Cyclohexane	0.00000	0.00000	0.00000	0.00000

Model Inlet Streams	Gas	Condensate	Water
Vapor Frac	1	0	0
Temperature (F)	80	80	80
Pressure (psig)	2000	2000	2000
Mass Flow (lb/hr)	114407.69	4960.13	43724.76
Liquid Flow (bbl/day)	-	514.20	2000.00
Vapor Flow (MMSCFD)	49.03	-	-
Composition:			
Methane	0.75658	0.08722	0
Ethane	0.15617	0.05880	0
Propane	0.05254	0.05889	0
i-Butane	0.00623	0.01825	0
n-Butane	0.01293	0.05172	0
i-Pentane	0.00300	0.03238	0
n-Pentane	0.00425	0.04000	0
n-Hexane	0.00366	0.15223	0
n-Heptane	0.00000	0.15153	0
n-Octane	0.00000	0.10649	0
n-Nonane	0.00000	0.06898	0
n-Decane	0.00000	0.13099	0
C10+*	0.00000	0.01980	0
Nitrogen	0.00350	0.00016	0
CO2	0.00110	0.00028	0
Oxygen	0.00005	0.00000	0
H2O	0.00000	0.00000	1
Benzene	0.00000	0.00291	0
Toluene	0.00000	0.00922	0
E-Benzene	0.00000	0.000814	0
o-Xylene	0.00000	0.00936	0
Cyclohexane	0.00000	0.00000	0

Condensate from Tanks	
Vapor Frac	0
Temperature (F)	102.33
Pressure (psig)	0
Mass Flow (lb/hr)	4883.76
Liquid Flow (bbl/day)	488.25
Reid VP (psia)	12.00
Composition:	
Methane	0.00021
Ethane	0.00351
Propane	0.02191
i-Butane	0.01545
n-Butane	0.05712
i-Pentane	0.04944
n-Pentane	0.09458
n-Hexane	0.26452
n-Heptane	0.12461
n-Octane	0.10645
n-Nonane	0.07417
n-Decane	0.14582
C10+*	0.02195
Nitrogen	0.00000
CO2	0.00000
Oxygen	0.00000
H2O	0.00000
Benzene	0.00158
Toluene	0.00785
E-Benzene	0.00083
o-Xylene	0.00970
Cyclohexane	0.00000

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

Identification

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Tank Dimensions

Shell Height (ft)	20.00
Diameter (ft)	12.00
Liquid Height (ft)	10.50
Avg. Liquid Height (ft)	10.00
Volume (gallons)	15,497.56
Turnovers	22.04
Net Throughput(gal/yr)	374,280.00
Is Tank Heated (y/n)	N

Paint Characteristics

Shell Color/Shade	Gray/Light
Shell Condition	Good
Roof Color/Shade	Gray/Light
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	3.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

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

PENS 2 Condensate Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

PENS 2 Condensate Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

[illegible]	
Standing Losses (lb):	[illegible]
[illegible]	[illegible]
Vapor Density (lb/cu ft):	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	[illegible]
Tank Diameter (ft):	[illegible]
[illegible]	[illegible]
Tank Shell Height (ft):	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Roof Outage (Cone Roof)	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Vapor Density	
Vapor Density (lb/cu ft):	[illegible]
[illegible]	[illegible]
[illegible]	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	
[illegible]	[illegible]
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	
[illegible]	[illegible]
[illegible]	
[illegible]	[illegible]
[illegible]	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	[illegible]
[illegible]	
[illegible]	[illegible]
[illegible]	[illegible]
Working Losses (lb):	[illegible]
[illegible]	[illegible]
[illegible]	
[illegible]	[illegible]
[illegible]	[illegible]
Annual Turnovers:	[illegible]
Turnover Factor:	[illegible]
Maximum Liquid Volume (gal):	[illegible]
Maximum Liquid Height (ft):	[illegible]
Tank Diameter (ft):	[illegible]
Working Loss Product Factor:	[illegible]
Total Losses (lb):	[illegible]

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

Emissions Report for: Annual

PENS 2 Condensate Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

Noble Energy, Inc; Pennsboro 2 Production Facility
Tank Detail Sheet

Source ID Number	2S-TK21-40				
Equipment ID		Source Location	Zone:		
Tank Description	20-400 bbl Produced Water Tanks		Horizontal:		
Tank Usage	Produced Water Storage		Vertical:		
Tank Make		Potential operation	8,760	hr/yr	
Tank Capacity	400 bbl	Potential water production	2,995	bbl/day	
Serial Number		Potential water production	1,093,100	bbl/yr	
Date in Service		Potential oil production*	37,875.93	gal Oil/yr/tank	
Tank Contents	Produced Water	Emission Factor	0.01846	lb/bbl VOC from FESCO Flash Study	
Emission Controls	Vents to VRU	Potential oil throughput	0.000560	lb/bbl BTEX from FESCO Flash Study	
Tank Orientation	Vertical, above ground	Tank Construction	Welded		(Welded, Bolted, Fiberglass)
Shell Height / Length	20 ft	Roof color & condition	Green, good		(eg. light brown, good)
Shell Diameter	12 ft	shell color & condition	Green, good		(eg. white, fair)
Roof Slope	0.06	FR Primary Seal	N/A		
Roof Type (Cone, Dome, IFR, EFR, None)	Cone	FR Seconday Seal	N/A		
Permit Status		Vent pressure setting	0.03	+/- psig	
		VOC Control Efficiency	95	%	Control taken at VRU

Potential Emissions

Pollutant	CAS	Hrs of Operation (hrs/yr)	Estimated Uncontrolled Emissions[1] (lb/hr)	(tpy)	(lb/yr)	Source of Emission Factor	Notes
VOC-Flash		8760	2.30	10.09	20,179	FESCO Flash Summary	Routed to VRU
VOC-W&B			0.31	1.34	2,689	TANKS 4.0.9d	Routed to VRU
Total VOC			**2.61**	**11.43**			Routed to VRU
Total BTEX			**0.070**	**0.306**			Routed to VRU

[1]Emissions include working and breathing

*Assumes 1.65% oil in PW

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

Identification

User Identification:	PEN 2 Produced Water Tanks
City:	Charleston
State:	West Virginia
Company:	Noble Energy Inc
Type of Tank:	Vertical Fixed Roof Tank
Description:	PEN 2 Produced Water Tanks RVP 12

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft):	19.50
Avg. Liquid Height (ft):	19.00
Volume (gallons):	16,497.58
Turnovers:	2.30
Net Throughput(gal/yr):	37,875.83
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition:	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft):	0.00
Slope (ft/ft) (Cone Roof):	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig):	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

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

PEN 2 Produced Water Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

PEN 2 Produced Water Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

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

Emissions Report for: Annual

PEN 2 Produced Water Tanks - Vertical Fixed Roof Tank
Charleston, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 12)	377.77	2,311.17	2,688.94

Noble Energy, Inc; Pennsboro 2 Production Facility
Condensate Truck Loadout

Source ID Number	6S-TL1	**Location**
		Zone
Source Description	Condensate Truck Loadout	Easting
Source Usage	Condensate Truck Loadout	Northing
		Latitude
Potential operation	8,760	Longitiude
Capture Efficiency[3]	70%	

HAP Speciation	
BTEX	2.00 mol% of VOC from HYSYS, "Condensate from Tanks" stream
BTEX	2.00 wt% of VOC
n-Hexane	26.55 mol% of VOC from HYSYS, "Condensate from Tanks" stream
n-Hexane	23.16 wt% of VOC
Total HAPs	25.16 wt% of VOC

Potential Emissions

Pollutant	EPA S Factor	True VP of Liquid (psia)	Mol. Wt. of Vapors[4] (lb/lb-mol)	T of Liquid[5] (R)	Oil Volume (bbl/yr)	Estimated Emissions (lb/1000 gal)	(PPH)	(tpy)	Source of Emission Factor	Notes
VOC	0.6	12	57	562	178,120	9.09	5.44	23.81	AP-42[1]	To VDU
HAPs							1.37	5.99	HYSYS	To VDU
VOC	0.6	12	57	562	178,120	9.09	2.33	10.20	AP-42[1]	Uncaptured
HAPs							0.59	2.57	HYSYS	Uncaptured

[1]EPA AP-42, Volume I, Fifth Edition - January 1995, Table 5.2-1, Saturation (S) Factors for Calculating Petroleum Liquid Loading Losses
[2]API Compendium of Greenhouse Gas Emissions Methodoligies for the Oil and Natural Gas Industry, Table 5-12
[3]EPA AP-42, Volume I, Fifth Edition - January 1995, Section 5.2.2.1.1. Assumes a minimum collection efficiency of 70%.
[4]Molecular Weight of Vapors comes from TANKS4.0.9 run, Liquid Contents of Storage Tank table
[5]Temperature comes from HYSYS run, "Condensate from Tanks" stream

Noble Energy, Inc; Pennsboro 2 Production Facility
Produced Water Truck Loadout

Source ID Number	7S-TL2	**Location**
		Zone
Source Description	Produced water truck loadout	Easting
Source Usage	Produced water truck loadout	Northing
		Latitude
Potential operation	8,760	Longitiude
Capture Efficiency	70%	

HAP Speciation		
BTEX	3.03 wt% of VOC	Based on FESCO PW study; ratio of lb BTEX/bbl to lb VOC/bbl of PW
Total HAPs	3.03 wt% of VOC	

Potential Emissions

Pollutant	EPA S Factor	True VP of Liquid (psia)	Mol. Wt. of Vapors[4] (lb/lb-mol)	T of Liquid[5] (R)	Oil Volume (bbl/yr)[2]	Estimated Emissions (lb/1000 gal)	PPH	(tpy)	Source of Emission Factor	Notes
VOC	0.6	12.00	57	530	18,036	9.65	0.58	2.56	AP-42[1]	To VDU
HAPs							0.02	0.078	AP-42[1]	To VDU
VOC	0.6	12.00	57	530	18,036	9.65	0.25	1.10	AP-42[1]	Uncaptured
HAPs							0.01	0.033	AP-42[1]	Uncaptured

[1] EPA AP-42, Volume I, Fifth Edition - January 1995, Table 5.2-1, Saturation (S) Factors for Calculating Petroleum Liquid Loading Losses

[2] The oil volume for this calculation assumes that 1.65% of the produced water volume is oil.

[3] EPA AP-42, Volume I, Fifth Edition - January 1995, Section 5.2.2.1.1. Assumes a minimum collection efficiency of 70%.

[4] Molecular Weight of Vapors comes from TANKS4.0.9 run, Liquid Contents of Storage Tank table

[5] Temperature comes from HYSYS run, "Water Out" stream

Noble Energy, Inc; Pennsboro 2 Production Facility
Equipt Component Fugitives Estimate
FUG

	Counts	Emission Factor[2]	% Control Efficiency	% VOC	VOC Emissions		Benzene	Toluene	E-benzene	Xylene	n-Hexane	%CH4	CH4 Emissions		CO_2e
		lb/hr/component			lb/hr	tpy	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr		lb/hr	tpy	tpy
Valve															
Gas/Vapor	423	0.00992	0	18	0.76	3.31	14.70	22.06	8.45	11.03	110.28	61.10	2.56	11.23	280.74
Light Liquid[1]	234	0.00551	0	100	1.29	5.65	103.68	390.79	26.32	311.73	759.00	0.00	0.00	0.00	0.00
Water/Oil	45	0.01846	0	100	0.83	3.64	66.80	251.78	16.96	200.84	489.01	1.00	0.01	0.04	0.91
Pumps Seals															0.00
Light Liquid	42	0.02866	0	100	1.20	5.27	96.80	364.84	24.57	291.03	708.60	0.00	0.00	0.00	0.00
Water/Oil		0.0000529	0	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Flanges															0.00
Gas/Vapor	164	0.00086	0	17.12	0.02	0.11	0.49	0.74	0.28	0.37	3.71	61.10	0.09	0.38	9.44
Light Liquid	205	0.000243	0	100	0.05	0.22	4.01	15.10	1.02	12.04	29.32	0.00	0.00	0.00	0.00
Water/Oil	21	0.00000617		100	0.00	0.00	0.01	0.04	0.00	0.03	0.08	1.00	0.00	0.00	0.00
Open-Ended Lines															0.00
Gas/Vapor	3	0.00441	0	17.12	0.00	0.01	0.05	0.07	0.03	0.03	0.35	61.10	0.01	0.04	0.89
Light Liquid		0.00309	0	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water/Oil		0.0006	0	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
Other															0.00
Gas/Vapor	59	0.0194	0	17.12	0.20	0.86	4.01	6.02	2.31	3.01	30.08	61.10	0.70	3.06	76.58
Light Liquid1	89	0.0165	0	100	1.47	6.43	118.09	445.10	29.97	355.05	864.46	0.00	0.00	0.00	0.00
Water/Oil	24	0.0309	0	100	0.74	3.25	59.64	224.78	15.14	179.30	436.56	4.00	0.03	0.13	3.25
Connectors															0.00
Gas/Vapor	865	0.000441	0	17.12	0.07	0.29	1.34	2.00	0.77	1.00	10.02	61.10	0.23	1.02	25.52
Light Liquid	1075	0.000463	0	100	0.50	2.18	40.03	150.86	10.16	120.34	293.00	0.00	0.00	0.00	0.00
Water/Oil	70	0.000243	0	100	0.02	0.07	1.37	5.16	0.35	4.11	10.01	1.00	0.00	0.00	0.02
Total Emissions					7.14	31.28	509.65	1874.17	135.97	1485.81	3734.46		3.63	15.89	397.36

Note

1. Heavy liquids are defined as having vapor pressure 0.044 psia or less at 68°F. Light Liquids are defined as having vapor pressure higher than 0.044 psia at 68° F.
2. Factors from EPA Document EPA-453.R-95-017, November 1995.

Noble Energy, Inc; Pennsboro 2 Production Facility
Vapor Recovery Unit Detail Sheet

Source ID Number						
Equipment ID	14S-VRU		**Emissions Controlled by VRU**		**VRU Control:**	**95%**
			Condensate Flash	784.08 tpy	2.86 tpy HAPs	
			Produced Water Flash	11.43 tpy	0.31 tpy HAPs	
SCC						
Equipment Usage	Vapor Recovery Unit					
Equipment Make	Gas Jack		Total VOC Emissions	795.52 tpy	3.17 tpy HAPs	
Equipment Model	GJ230					
Serial Number	Unknown		Control Efficiency	95%	95%	
Installation Date	5/31/2015		Controlled VOC Emissions	39.78 tpy	0.16 tpy HAPs	
Emission Controls	None		**Combustion**			
Pilot			Molecular Weight of Vapors	lb/lb-mol		
Brake Horsepower	46	hp	Fuel Heating Value	1200 Btu/scf		
			Potential Heat Output	0.000 MMBtu/hr		
			VOC Vapors sent to flare	1591035.9 lbs/yr		
Potential Operation	365	days/yr	Potential Operation	365 days/yr		
			Engine Heat Rate	11 Btu/hp-hr		

Total Potential Vapor Combustor Emissions

Pollutant	tpy	lb/hr
VOC	39.78	9.08
HAPs	0.16	0.04

[1] EPA AP-42, Volume I, Fifth Edition - September 1991, Table 13.5-1, Emission Factors for Flare Operations.

[2] EPA AP-42, Volume I, Fifth Edition - September 1991, Table 1.4, Emission Factors for Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Enclosed Flare Detail Sheet

Source ID Number						
Equipment ID	8S-COMB1		**Truck Loading VOC Emissions & Flash VRU downtime**			
SCC						
			Condensate Loading	23.81	tpy	5.99 tpy HAPs
Equipment Usage	Vapor Combustor		Produced Water Loading	2.56	tpy	0.08 tpy HAPs
Equipment Make	Leed		Total VOC Emissions	26.37	tpy	6.07 tpy HAPs
Equipment Model	LDF1350 Dual Stage Combustor					
Serial Number	Unknown		Control Efficiency	98%		98%
Installation Date	05/31/15		Controlled VOC Emissions	0.53	tpy	0.12 tpy HAPs
Emission Controls	None		**Combustion**			
Pilot			Molecular Weight of Vapors		lb/lb-mol	
Fuel Heating Value	1220	Btu/scf	Fuel Heating Value	1500	Btu/scf	
Design Heat Rate	0.02	MMBtu/hr	Potential Heat Output	10.500	MMBtu/hr	
Site Heat Rate	0.02	MMBtu/hr	VOC Vapors sent to flare	52736.9	lbs/yr	
Potential Operation	365	days/yr	Potential Operation	365	days/yr	
Potential Fuel Usage	0.30	Mscf/day	Ave. Gas Flared	168.000	Mscf/day	

9S-PILOT1
Combustor Pilot Emissions

Pollutant	Emission Factor lb/MMSCF	Annual gas Usage MMSCF/yr	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions Pilot tpy	Source of Emission Factor
NOx	100.000	0.11	8760	0.00	0.01	AP-42[2]
CO	84.000	0.11	8760	0.00	0.01	AP-42[2]
PM10	7.600	0.11	8760	0.00	0.00	AP-42[2]
VOC	5.500	0.11	8760	0.00	0.00	AP-42[2]
N_2O	1.000	0.11	8760	0.00	0.00	API
CO_2	120000.000	0.11	8760	3.00	13.14	AP-42[2]

Potential Combustion Emissions

Pollutant	Emission Factor lb/MMBtu	Annual gas Usage MMBtu/yr	Estimated Emissions tpy	Emission Factor Source
NOx	0.068	91980.00	3.13	AP-42[1]
CO	0.370	91980.00	17.02	AP-42[1]
N_2O	0.001	91980.00	0.05	API
CO2	117.650	91980.00	5410.72	AP-42[1]

Total Potential Vapor Combustor Emissions

Pollutant	tpy	lb/hr
NOx	3.13	0.71
CO	17.02	3.89
PM10		0.00
VOC	0.53	0.12
HAPs	0.12	0.03
N_2O	0.05	0.01
CH_4	0.00	0.00
CO_2	5410.72	1235.33
CO_2e	5424.75	1238.53

[1] EPA AP-42, Volume I, Fifth Edition - September 1991, Table 13.5-1, Emission Factors for Flare Operations.

[2] EPA AP-42, Volume I, Fifth Edition - September 1991, Table 1.4, Emission Factors for Natural Gas Combustion

Noble Energy, Inc; Pennsboro 2 Production Facility
Thermo Electric Generator

Source ID Number		
Equipment ID	10S-TE Gen	
SCC		
Equipment Usage	Thermo Electric Generator	
Equipment Make	Global Thermoelectric	
Equipment Model	Model 5220	
Serial Number		
Installation Date	5/31/2015	
Emission Controls	None	
Fuel Heating Value		Btu/scf
Design Heat Rate*	0.03	MMBtu/hr
Site Heat Rate*		MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	7.40	gal/day

* These are heat release rates and not the duty for the heater

Potential Emissions

Pollutant	Emission Factor ($lb/10^3$ gal)	Nominal Rating (MMBtu/hr)	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	13.00	0.028	8760	0.00	0.02	AP-42[1]
CO	7.50	0.028	8760	0.00	0.01	AP-42[1]
TOC	1.00	0.028	8760	0.00	0.00	AP-42[1]
SO2	0.10	0.028	8760	0.00	0.00	AP-42[1]
PM10	0.70	0.028	8760	0.00	0.00	AP-42[1]
Formaldehyde		0.028	8760		0.00	
Total HAPs		0.028	8760		0.00	
CO_2	12500.00	0.028	8760	3.85	16.88	AP-42[1]
CH_4	0.20	0.028	8760	0.00	0.00	AP-42[1]
CO_2e					16.89	

[1] EPA AP-42, Volume I, Fifth Edition - July 2008, Table 1.5-1, Emission Factors for LPG Combustion

Emission Summary Sheet
Emergency Flare Detail Sheet

Source ID Number						
Equipment ID	12S-FLARE		**Truck Loading and Tank Emissions**			
SCC			**VRU Downtime:**	10%		
Equipment Usage	Emergency Flare		LP Separator Condensate Stabilizer	925.23	tpy	2.54 tpy HAPs
Equipment Make	Leed					
Equipment Model	LDF1350 Dual Stage Combustor					
Serial Number	Unknown					
Installation Date	5/31/2015		Total VOC Emissions	925.23	tpy	2.54 tpy HAPs
Emission Controls	None		Control Efficiency	98%		98%
			Controlled VOC Emissions	18.50	tpy	0.05 tpy HAPs
			Combustion			
Pilot			Molecular Weight of Vapors		lb/lb-mol	
Fuel Heating Value	1220	Btu/scf	Fuel Heating Value	1200	Btu/scf	
Design Heat Rate	0.02	MMBtu/hr	Potential Heat Output	19.7	MMBtu/hr	
Site Heat Rate	0.02	MMBtu/hr	VOC Vapors sent to flare	1,850,466	lbs/yr	
Potential Operation	365	days/yr	Potential Operation	36.5	days/yr	
Potential Fuel Usage	0.30	Mscf/day	Flow Rate	394	Mscf/day	

13S-PILOT
Combustor Pilot Emissions

Pollutant	Emission Factor lb/MMSCF	Annual gas Usage MMSCF/yr	Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions Pilot tpy	Source of Emission Factor
NOx	100.000	0.11	8760	0.12	0.54	AP-42[2]
CO	84.000	0.11	8760	0.10	0.45	AP-42[2]
PM10	7.600	0.11	8760	0.01	0.04	AP-42[2]
VOC	5.500	0.11	8760	0.01	0.03	AP-42[2]
N_2O	1.000	0.11	8760	0.00	0.01	API
CO_2	120000.000	0.11	8760	147.00	643.86	AP-42[2]

Potential Combustion Emissions

Pollutant	Emission Factor lb/MMBtu	Annual gas Usage MMBtu/yr	Estimated Emissions tpy	Emission Factor Source
NOx	0.068	172572.00	5.87	AP-42[1]
CO	0.370	172572.00	31.93	AP-42[1]
N_2O	0.001	172572.00	0.09	API
CO2	117.650	172572.00	10151.55	AP-42[1]

Total Potential Vapor Combustor Emissions

Pollutant	tpy	lb/hr
NOx	5.87	13.40
CO	31.93	72.89
PM10		0.00
VOC	18.50	42.25
HAPs	0.05	0.01
N_2O	0.09	0.02
CH_4	0.00	0.00
CO_2	10151.55	23177.05
CO_2e	10177.86	23237.13

[1] EPA AP-42, Volume I, Fifth Edition - September 1991, Table 13.5-1, Emission Factors for Flare Operations.

[2] EPA AP-42, Volume I, Fifth Edition - September 1991, Table 1.4, Emission Factors for Natural Gas Combustion

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT J

Class I Legal Advertisement

AIR QUALITY PERMIT NOTICE
Notice of Application for Permit Application

Notice is given that Noble Energy, Inc. has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-A General Permit Registration for its new Pennsboro 2 natural gas and oil production facility located in Ritchie County, WV at latitude 39.33664 and longitude -81.01235. Take I-79 to exit 119, follow Rt. 50 for 39.8 miles. Make a right onto WV-74 (N/Pullman Dr.) and follow for 0.4 miles. Make a left onto E Myles Ave./Old US 50 E and follow for 0.6 miles. Turn right onto Grey St. and then sharp left onto E Penn Ave. Take the second right onto 1st St and continue onto WV-74 N/Mountain Dr for 3 miles. Turn Left onto Bonds Creek Rd. and follow for 3.5 miles then make a right onto Branch Bonds Creek Rd then continue onto Stone Rd.

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

Regulated Pollutant	Potential Annual Emissions in tons per year (tpy)
Carbon Monoxide	68.74
Nitrogen Oxides	18.81
Particulate Matter (PM)	0.43
PM-10	0.43
Sulfur Dioxide	0.05
Total Volatile Organic Compounds	105.81
Total Hazardous Air Pollutants	7.02
Total Carbon Dioxide Equivalent	25,847

Startup of the operation is planned to begin on or about July 1, 2015. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this application for G70A General Permit Registration should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.

Dated this, Wednesday, April 08, 2015

By: Noble Energy, Inc.
RJ Moses
Operations Manager
Marcellus Business Unit
1000 Noble Energy Drive
Canonsburg, PA 15317

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT L

General Permit Registration Application Fee

As stated in the cover letter, please contact Clayton Murral (clayton.murral@nblenergy.com, 724-820-3077) for payment.

Submittal Date: 04/08/2015

Noble Energy, Inc
Pennsboro 2 Production Facility
Permit G70-A Application

ATTACHMENT O

Emissions Summary Sheets

G-70 A EMISSION SUMMARY SHEET
Noble Energy, Inc; Pennsboro 2 Production Facility

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type[1]	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (must match Emission Units Table & Plot Plan)		Vent Time for Emission Unit (chemical processes only)		All Regulated Pollutants - Chemical Name/CAS[2] (Speciate VOCs & HAPS) See Detail Sheets	Maximum Potential Uncontrolled Emissions[3]		Maximum Potential Controlled Emissions[4]		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used[5]	Emission Concentration[7] (ppmv or mg/m[4])
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
14E-VRU	Vent	1S-TK1-20, 2S-TK21-40	20- Condensate Tanks and 20-Produced Water Tanks	N/A	N/A	N/A	N/A	VOCs	181.63	795.52	9.08	39.78	Gas/Vapor	HYSYS, TANKS, Flash Study, AP-42	
14E-VRU	Vent	1S-TK1-20, 2S-TK21-40	20- Condensate Tanks and 20-Produced Water Tanks	N/A	N/A	N/A	N/A	HAPs	0.72	3.17	0.04	0.16	Gas/Vapor	HYSYS, TANKS, Flash Study, AP-42	
8E-COMB1	Vent	6S-TL1, 7S-TL2, 9S-PILOT1, 9S-PILOT1	Condensate Loading, Produced Water Loading, Pilot	8C-COMB1	Vapor Combustor	N/A	N/A	VOCs	6.02	26.37	0.12	0.53	Gas/Vapor	HYSYS, AP-42	
8E-COMB1	Vent	6S-TL1, 7S-TL2, 9S-PILOT1, 9S-PILOT1	Condensate Loading, Produced Water Loading, Pilot	8C-COMB1	Vapor Combustor	N/A	N/A	HAPs	1.39	6.07	0.03	0.12	Gas/Vapor	HYSYS, AP-42	
8E-COMB1	Vent	8S-COMB1, 9S-PILOT1	Vapor Combustor, Pilot	N/A	N/A	N/A	N/A	NOx	0.72	3.14	0.72	3.14	Gas/Vapor	AP-42	
8E-COMB1	Vent	8S-COMB1, 9S-PILOT1	Vapor Combustor, Pilot	N/A	N/A	N/A	N/A	CO	3.89	17.03	3.89	17.03	Gas/Vapor	AP-42	
9E-PILOT1	Vent	9S-PILOT1	Pilot	N/A	N/A	N/A	N/A	SO2	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
9E-PILOT1	Vent	9S-PILOT1	Pilot	N/A	N/A	N/A	N/A	PM-10	0.00	0.00	0.00	0.00	Particulates	AP-42	
8E-COMB1	Vent	8S-COMB1, 9S-PILOT1	Vapor Combustor, Pilot	N/A	N/A	N/A	N/A	CO2e	1238.33	5,423.86	1238.33	5423.86	Gas/Vapor	AP-42	

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type[1]	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (must match Emission Units Table & Pilot Plan)		Vent Time for Emission Unit (chemical processes only)		All Regulated Pollutants - Chemical Name/CAS[2] (Speciate VOCs & HAPS) See Detail Sheets	Maximum Potential Uncontrolled Emissions [3]		Maximum Potential Controlled Emissions [4]		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used [5]	Emission Concentration[7] (ppmv or mg/m[4])
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
4E-GPU1-4E-GPU12 Emissions per Unit	12-Heater stacks Emissions per Unit	4S-GPU1 - 4S-GPU12 Emissions per Unit	Heaters	N/A	N/A	N/A	N/A	NOx	0.08	0.36	0.08	0.36	Gas/Vapor	AP-42	
								CO	0.07	0.3	0.07	0.30	Gas/Vapor	AP-42	
								VOC	0.00	0.02	0.00	0.02	Gas/Vapor	AP-42	
								SO2	0.00	0	0.00	0.00	Gas/Vapor	AP-42	
								PM-10	0.01	0.03	0.01	0.03	Particulates	AP-42	
								Formaldehyde 50-00-0	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								CO2e	98.36	430.82	98.36	430.82	Gas/Vapor	AP-42	
11F-LH	2-Heater stacks Emissions per Unit	11S-LH	Heaters	N/A	N/A	N/A	N/A	NOx	0.08	0.36	0.08	0.36	Gas/Vapor	AP-42	
								CO	0.07	0.30	0.07	0.30	Gas/Vapor	AP-42	
								VOC	0.00	0.02	0.00	0.02	Gas/Vapor	AP-42	
								SO2	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								PM-10	0.01	0.03	0.01	0.03	Particulates	AP-42	
								Formaldehyde 50-00-0	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								CO2e	98.36	430.82	98.36	430.82	Gas/Vapor	AP-42	
3E-ENG1	Engine Stack	3S-ENG1	Engine	3C-Oxy-cat	SCR	N/A	N/A	NOx	0.76	3.33	0.76	3.33	Gas/Vapor	Mfr. Data	
								CO	3.04	13.33	3.04	13.33	Gas/Vapor	Mfr. Data	
								VOC	0.84	3.66	0.84	3.66	Gas/Vapor	Mfr. Data	
								SO2	0.00	0.01	0.00	0.01	Gas/Vapor	AP-42	
								PM-10	0.00	0.00	0.00	0.00	Particulates	AP-42	
								Formaldehyde 50-00-0	0.26	1.16	0.26	1.16	Gas/Vapor	AP-42	
								CO2e	725.61	3178.16	725.61	3178.16	Gas/Vapor	Mfr. Data	
3E-ENG2	Engine Stack	3S-ENG2	Engine	3C-NSCR	NSCR	N/A	N/A	NOx	1.67	7.30	0.20	0.89	Gas/Vapor	Mfr. Data	
								CO	1.99	8.30	0.41	1.78	Gas/Vapor	Mfr. Data	
								VOC	0.10	0.44	0.10	0.44	Gas/Vapor	Mfr. Data	
								SO2	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								PM-10	0.00	0.00	0.00	0.00	Particulates	AP-42	
								Formaldehyde 50-00-0	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								CO2e	52.23	228.76	52.23	228.76	Gas/Vapor	Mfr. Data	

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type[1]	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (must match Emission Units Table & Pilot Plan)		Vent Time for Emission Unit (chemical processes only)		All Regulated Pollutants - Chemical Name/CAS[2] (Speciate VOCs & HAPS) See Detail Sheets	Maximum Potential Uncontrolled Emissions[3]		Maximum Potential Controlled Emissions[4]		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used[5]	Emission Concentration[7] (ppmv or mg/m[6])
		ID No.	Source	ID No.	Device Type	Short Term[3]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
5E-LP	Stack	5S-LP	Heater	N/A	N/A	N/A	N/A	NOx	0.08	0.36	0.08	0.36	Gas/Vapor	AP-42	
								CO	0.07	0.30	0.07	0.30	Gas/Vapor	AP-42	
								VOC	0.00	0.02	0.00	0.02	Gas/Vapor	AP-42	
								SO2	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								PM-10	0.01	0.03	0.01	0.03	Particulates	AP-42	
								CO2e	98.36	430.82	98.36	430.82	Gas/Vapor	AP-42	
10E-TE Gen	Vent	10S-TE Gen	Elec Gen	N/A	N/A	N/A	N/A	NOx	0.00	0.02	0.00	0.02	Gas/Vapor	AP-42	
								CO	0.00	0.01	0.00	0.01	Gas/Vapor	AP-42	
								VOC	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								SO2	0.00	0.00	0.00	0.00	Gas/Vapor	AP-42	
								PM-10	0.00	0.00	0.00	0.00	Particulates	AP-42	
								CO2e	3.85	16.88	3.85	16.88	Gas/Vapor	AP-42	
12E-FLARE	Vent	12S-FLARE	Emergency Flare	N/A	N/A	N/A	N/A	NOx	13.40	5.87	13.40	5.87	Gas/Vapor	AP-42	
								CO	72.89	31.93	72.89	31.93	Gas/Vapor	AP-42	
								VOCs	42.25	18.50	42.25	18.50	Gas/Vapor	AP-42	
								HAPs	0.01	0.05	0.01	0.05	Gas/Vapor	AP-43	
								CO2e	23,237	10,178	23237.13	10177.86	Gas/Vapor	AP-42	
13E-PILOT	Vent	13S-PILOT Emissions per Unit	Pilot	N/A	N/A	N/A	N/A	NOx	0.12	0.54	0.12	0.54	Gas/Vapor	AP-42	
								CO	0.10	0.45	0.10	0.45	Gas/Vapor	AP-42	
								VOC	0.01	0.04	0.01	0.04	Gas/Vapor	AP-42	
								SO2	0.01	0.03	0.01	0.03	Gas/Vapor	AP-42	
								PM-10	0.00	0.01	0.00	0.01	Particulates	AP-42	
								Formaldehyde 50-00-0	0	1	0.00	1.00	Gas/Vapor	AP-42	
								CO2e	**147.00**	**643.86**	**147.00**	**643.86**	**Gas/Vapor**	**AP-42**	

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.

[1]Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

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

[3]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/20minute batch).

[4]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).

[5]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)