



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: G70-A182
Plant ID No.: 051-00155
Applicant: SWN Production Company, LLC
Facility Name: Bonnette Pad
Location: Proctor, Marshall County, WV
NAICS Code: 211111
Application Type: Modification
Received Date: October 22, 2015
Engineer Assigned: Caraline Griffith
Fee Amount: \$1,500
Date Received: October 26, 2015
Complete Date: November 23, 2015
Due Date: January 7, 2016
Applicant Ad Date: October 21, 2015
Newspaper: *Moundsville Daily Echo*
UTM's: Easting: 524.38 km Northing: 4,396.88 km Zone: 17T
Description: Removal of all previously permitted equipment. Installation of: Two compressor engines, eight gas production units, two heaters, one low pressure tower, three condensate tanks, three produced water tanks, one VRU with engine, and a vapor combustor will be added to the site. Fugitive emissions, condensate loading, produced water loading, and haul road emissions will also occur.

PROCESS DESCRIPTION:

The subject facility is an oil and natural gas exploration and production facility, responsible for the production of condensate and natural gas. Storage of condensate and produced water will also occur on-site. A description of the facility's process is as follows: Condensate, gas and water come from the wellhead(s) to the production unit(s), where the first stage of separation occurs. Fluids (condensate and produced water) will be sent to the heater

treater(s). Produced water from the heater treater(s) flows into the produced water storage tank(s). Condensate flows into the condensate storage tank(s). Flash gases from the heater treater(s) are routed via hard-piping (with 100% capture efficiency) to the inlet of the flash gas compressor(s) to be compressed.

The natural gas stream will exit the facility for transmission via pipeline. Condensate and produced water are transported offsite via truck. Loading emissions will be controlled with vapor return, which has at least 70% capture efficiency, and will be routed to the vapor combustor for at least 98% destruction efficiency, for an overall control efficiency of 69%. Working, breathing and flashing vapors from the condensate and produced water storage tanks will be controlled by the VRU but are represented in the calculations as being controlled by the combustor for operational flexibility and as a conservative calculation of emissions. The vapor combustor has one (1) natural gas-fired pilot to ensure a constant flame for combustion.

The equipment to be added includes the following:

- Two (2) Caterpillar G3306 NA Compressor Engines
- Eight (8) 1.0 mmBTU/hr Gas Production Units
- Two (2) 0.5 mmBTU/hr Heater Treaters
- One (1) Low Pressure Tower (LPT)
- Three (3) 400 bbl Condensate Tanks
- Three (3) 400 bbl Produced Water Tanks
- One (1) 15 mmBtu/hr Vapor Combustor with Pilot
- One (1) Flogistix VRU with Associated Engine
- Condensate Loading
- Produced Water Loading
- Fugitive Emissions
- Fugitive Haul Road Emissions

SITE INSPECTION

On January 22, 2015 Angela Carey, an inspector for the DAQ compliance and enforcement section, inspected the site. The site was given a rating of 30, meaning they were in compliance and no violations were found.

Directions:

Merge onto Interstate 79N toward US-19. Take Exit 137 toward West Virginia 310N/Co Road 3/1/E Grafton Road. Turn left at West Virginia 310 N/Co Road/3/1/E Grafton Road and continue to follow West Virginia 310 N/E Grafton Road for 0.4 miles. Turn left at E. Park Avenue and after 1 mile take slight left at Merchant Street. Take third right onto Jefferson Street and after 0.4 miles turn right at US-19 S/US-250 N. Continue on US 250 N for 37.4 miles. Turn left at Amos Hollow Road/Co Route 89 and go 3.3 miles. Turn left to stay on Amos Hollow Road/Co Route 89. Continue on Co Road 89 for 9.1 miles. Turn right to stay on Co Road 89 for 62 feet, then turn right to stay on Co Road 89 and go 3.1 miles. Make sharp right to stay on Co Road 4/St. Joseph Baker Hill and continue 2.2 miles. Turn left to stay on Co Road 4/St. Joseph Baker Hill

and go 2 miles. Take slight right to stay on Co Road 4/St. Joseph Baker Hill for 0.2 miles. Continue onto Co Route 21/Emr Route 2. Well pad access will be on the left after 144 feet.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions for the two Caterpillar and the Bucks GM Vortec engines were done using manufacture’s data and AP-42. The VOC emissions for the three Caterpillar engines from the manufacture data include Formaldehyde.

The VOC emissions from the three (3) 400 bbl Condensate Tanks and the three (3) 400 bbl Produced Water Tanks are negligible because the emissions are routed directly to the Vapor Combustor (APC-COMB-TKLD).

The estimates for the GPUs, Heaters, Vapor Combustor, and truck loadings were made using AP-42.

Table 1: Maximum PTE Estimates

Emission ID	Emission Unit	Pollutant	lb/hr	TPY
EU-ENG1	Caterpillar G3306 NA	NOx	0.32	1.40
		CO	0.64	2.80
		VOC	0.24	1.05
		SO2	<0.01	<0.01
		PM10	0.01	0.04
		Formaldehyde	0.02	0.09
EU-ENG2	Caterpillar G3306 NA	NOx	0.32	1.40
		CO	0.64	2.80
		VOC	0.24	1.05
		SO2	<0.01	<0.01
		PM10	0.01	0.04
		Formaldehyde	0.02	0.09
EU-ENG3	Bucks GM Vortec 5.7L	NOx	0.43	1.88
		CO	0.86	3.77
		VOC	0.30	1.31
		SO2	<0.01	<0.01
		PM10	0.02	0.07
		Formaldehyde	0.04	0.16
EU-GPU1 to EU-GPU8	Five (5) 1.0 mmBTU/hr GPU Burners Each	NOx	0.11	0.48
		CO	0.09	0.39
		VOC	0.01	0.03
		SO2	<0.01	<0.01
		PM10	0.01	0.03
		Total HAPS	<0.01	0.01
EU-HT1 and EU-HT2	Two (2) 0.5 mmBTU/hr Heater Treaters	NOx	0.06	0.26
		CO	0.05	0.22
		VOC	<0.01	0.01
		SO2	<0.01	<0.01

		PM10	<0.01	0.02
		Total HAPs	<0.01	<0.01
EU-LOAD-COND	Condensate Truck Loading with Vapor Return Routed to Combustor	VOC	3.97	17.37
		Total HAPs	0.32	1.41
EU-LOAD-PW	Produced Water Truck Loading with Vapor Return Routed to Combustor	VOC	0.04	0.16
		Total HAPs	<0.01	0.01
APC-COMB-TKLD	15.0 mmBTU/hr Vapor Combustor – Tank/Loading System	NOx	2.07	9.07
		CO	4.13	18.09
		VOC	5.15	22.56
		PM10	0.04	0.18
		Benzene	<0.01	0.02
		Ethylbenzene	0.02	0.10
		n-Hexane	0.30	1.31
		Toluene	0.02	0.09
		Xylenes	0.07	0.32
		Total HAPs	0.42	1.84
EU-PILOT	Vapor Combustor Pilot	NOx	0.01	0.04
		CO	<0.01	0.02
		VOC	<0.01	<0.01
		SO2	<0.01	<0.01
		PM10	<0.01	<0.01
		Total HAPs	<0.01	<0.01

Table 2: Maximum Fugitive PTE Estimates

Emission ID	Emission Unit	Pollutant	lb/hr	TPY
EU-FUG	Fugitive Emissions	VOC	1.07	4.70
		Benzene	<0.01	<0.01
		Ethylbenzene	<0.01	0.01
		n-Hexane	0.05	0.20
		Toluene	<0.01	0.01
		Xylenes	0.01	0.04
		Total HAPs	0.06	0.26
EU-HR	Fugitive Haul Road Emissions	PM10	1.47	4.83

Table 3: Total Facility PTE

Pollutant	TPY
NOx	18.16
CO	31.04
VOC	47.13
SO2	0.04
PM	5.66

Acetaldehyde	0.05
Acrolein	0.05
Bezene	0.06
Ethylbenzene	0.18
Formaldehyde	0.34
Methanol	0.06
n-Hexane	2.60
Toluene	0.18
Xylenes	0.62
Total HAPs	4.14
CO ₂ e	13,380.38

AGGREGATION DETERMINATION

The aggregation of facilities is appropriate only if separate emissions sources meet the following three-prong test:

1. The sources belong to a single major industrial grouping (same two-digit major SIC code);
2. The sources are under common control of the same person (or persons under common control); and
3. The sources are located on one or more “contiguous or adjacent” properties.

Under the third prong, SWN determined that there were no other facilities contiguous with or adjacent to Bonnette to be permitted. Neither the WV DEP nor EPA have established a distance under which source aggregations are required, but the terms “contiguous” or “adjacent” require analyzing distances between operations. To be considered contiguous, two operations must share a common fence line. As for adjacent, operations located more than a quarter mile apart are clearly not adjacent, but operations within a quarter mile require an analysis to determine if they meet the common sense notion of a plant. No other SWN locations are located within a quarter mile of Bonnette to be permitted; therefore, no additional facilities are contiguous or adjacent.

REGULATORY APPLICABILITY

The following state and federal regulations apply to sources requesting registration under the G70-A General Permit:

State Regulations:

45CSR2 To Prevent and Control Particulate Air Pollution From Combustion of Fuel in Indirect Heat Exchangers

45CSR2 establishes emission limitations for smoke and particulate matter that are discharged from fuel burning units. Sources subject to 45CSR2 include gas producing units, in-line heaters, heater treaters, and glycol dehydration reboilers.

The applicant is not subject to the weight emission standard for particulate matter set forth in 45CSR2-4.1 because the two (2) Heater Treaters [EU-HTR1 and EU-HTR2] and the eight (8) gas production units [EU-GPU1 to EU-GPU8] are less than 10 MMBtu/hr; however, they are subject to the 10% opacity based on a six minute block average. Compliance will be demonstrated by complying with permit requirements. The applicant is using natural gas as fuel; therefore, meeting the 10% opacity requirements should not be a problem.

45CSR4 To Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors

45CSR4 states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable. The applicant does not see any objectionable odors being present at this sit now or in the future.

45CSR10 To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

The two (2) Heater Treaters [EU-HTR1 and EU-HTR2] and the eight (8) gas production units [EU-GPU1 to EU-GPU8] have a maximum design heat input of less than 10 MMBtu/hr and are therefore exempt from sections 3, 6, and 8.

45CSR13 Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

SWN has demonstrated compliance with 45CSR13 by submitting a complete construction permit registration application, placing a legal advertisement in the *Moundsville Daily Echo* on October 21, 2015, and paying the applicable fees.

45CSR22 Air Quality Management Fee Program

The applicant has paid the \$500 application fee and the \$1,000 NSPS fee as required by section 3.4.b of this rule because they are subject to NSPS requirements as described in this regulatory review section.

Additionally, the source is required to maintain their certificate to operate

Federal Regulations:

40CFR60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

Subpart JJJJ sets forth nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compound (VOC) emission limits, fuel requirements, installation requirements, and monitoring requirements based on the year of installation of the subject internal combustion engine.

The two 145 hp Caterpillar G3306 NA engines and the VRU 196 hp Bucks GM Vortec engine all commenced construction after June 12, 2006 and were manufactured after July 1, 2008, therefore they are subject to this rule.

40CFR60, Subpart OOOO (Standards of Performance for Crude oil and Natural Gas Production, Transmission and Distribution)

EPA published its new source performance standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. EPA published final amendments to the subpart on September 23, 2013.

40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO₂) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. The affected sources which commence construction, modification or reconstruction after August 23, 2011 are subject to the applicable provisions of this subpart as described below:

- a. Each gas well affected facility, which is a single natural gas well.

Gas well affected facilities are included in the G70-A general permit in Section 5.0. This facility is a gas well affected facility because the wells located at the site were principally drilled to produce natural gas.

- b. Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals that is located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. A centrifugal compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

There are no centrifugal compressors located at this facility.

- c. Each reciprocating compressor affected facility, which is a single reciprocating compressor located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.
- d. For the natural gas production segment (between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not including natural gas

processing plants), each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh.

Pneumatic controllers affected facilities are included in the G70-A General Permit, Section 8.0. There are no pneumatic controllers at this facility with a continuous bleed rate of more than 6 scfh.

- e. Each storage vessel affected facility, which is a single storage vessel located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment, and has the potential for VOC emissions equal to or greater than 6 tpy as determined according to this section by October 15, 2013 for Group 1 storage vessels and by April 15, 2014, or 30 days after startup (whichever is later) for Group 2 storage vessels. A storage vessel affected facility that subsequently has its potential for VOC emissions decrease to less than 6 tpy shall remain an affected facility under this subpart.

Requirements for storage vessel affected facilities are included in the G70-A General Permit, Section 12.0. Determination of storage vessel affected facility status is included in Section 6.0 of the G70-A General Permit.

The storage vessels located at this facility do have VOC emissions greater than 6 TPY. The storage vessels at this facility are classified as Group 2, meaning the storage vessels were constructed after April 12, 2013. SWN must reduce VOC emissions of storage vessels by 95% within 60 days after startup. SWN must also follow all compliance, control requirements, notification, recording keeping, and reporting requirements as laid defined in §60.5395. However, SWN has already stated they will be using a VRU with a 98% capture efficiency for the storage vessels, so the VOC emissions limitations will be met.

- f. Processing units, sweetening units and compressor stations are outside the scope of the G70-A general permit and are excluded from applicability for the general permit. The G70-A general permit is focused on activities at the production pad facility and is not intended to be a comprehensive NSPS, Subpart OOOO general permit.

Other general permits exist for natural gas compressor stations. The existing general permits for natural gas compressor stations are the Class II General Permit G30-D, the Class I General Permit G33-A (stationary spark ignition internal combustion engines \geq 25 HP and \leq 500 HP), and the Class II General Permit G35-A (natural gas compressor stations with glycol dehydration units, flares, or other specified control devices).

This facility does not have any sweetening units.

40CFR63 Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines)

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. This subpart also establishes requirements

to demonstrate initial and continuous compliance with the emission limitations and operating limitations. Only the area source requirements for non-emergency spark ignition engines are included in the G70-A general permit, Section 15.0. Requirements for engines that combust landfill or combustor gas are not included in the G70-A general permit. This section reflects EPA's final amendments to 40 CFR part 63, Subpart ZZZZ that were issued on January 15, 2013 and published in the Federal Register on January 30, 2013.

Owners and operators of new or reconstructed engines at area sources must meet the requirements of Subpart ZZZZ by complying with either 40CFR60 Subpart IIII or Subpart JJJJ. Because the engines located at this site are subject to Subpart JJJJ, they meet the requirements of Subpart ZZZZ.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Small amounts of non-criteria regulated hazardous air pollutants such as benzene, toluene, and formaldehyde may be emitted when natural gas is combusted in reciprocating engines, combusted in the fuel burning units, or combusted in one of the combustion type air pollution control devices.

All natural gas production facilities that are issued a G70-A general permit registration by the Director will be limited to those that are classified as minor sources of hazardous air pollutants. Minor sources of hazardous air pollutants are defined as those that have a potential to emit of less than 10 tons per year of any hazardous air pollutant or less than 25 tons per year of any combination of hazardous air pollutants.

Listed below is information regarding each of the possible hazardous air pollutants.

BTEX:

BTEX is the term used for benzene, toluene, ethylbenzene, and xylene. Each of these possible hazardous air pollutants are identified in this section.

Benzene:

Benzene is found in the air from emissions from burning coal and oil, gasoline service stations, and motor vehicle exhaust. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidence of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. EPA has classified benzene as a Group A, human carcinogen.

Ethyl Benzene:

Ethyl benzene is mainly used in the manufacturing of styrene. Acute (short-term) exposure to ethyl benzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects, such as dizziness. Chronic (long-

term) exposure to ethyl benzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethyl benzene. Limited information is available on the carcinogenic effects of ethyl benzene in humans. In a study by the National Toxicology Program (NTP), exposure to ethyl benzene by inhalation resulted in an increased incidence of kidney and testicular tumors in rats, and lung and liver tumors in mice. EPA has classified ethyl benzene as a Group D, not classifiable as to human carcinogenicity.

Formaldehyde:

Formaldehyde is used mainly to produce resins used in particle board products and as an intermediate in the synthesis of other chemicals. Exposure to formaldehyde may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Acute (short-term) and chronic (long-term) inhalation exposure to formaldehyde in humans can result in respiratory symptoms, and eye, nose, and throat irritation. Limited human studies have reported an association between formaldehyde exposure and lung and nasopharyngeal cancer. Animal inhalation studies have reported an increased incidence of nasal squamous cell cancer. EPA considers formaldehyde a probable human carcinogen (Group B1).

n-Hexane:

n-Hexane is a solvent that has many uses in the chemical and food industries, either in pure form or as a component of commercial hexane. The latter is a mixture that contains approximately 52% n-hexane; the balance is made up of structural analogs and related chemicals such as methylpentane and methylcyclopentane. Highly purified n-hexane is used as a reagent for chemical or chromatographic separations. Other grades of n-hexane are used as solvents for extracting edible fats and oils in the food industry and as a cleaning agent in the textile, furniture, and printing manufacturing industries. Hexane is the solvent base for many commercial products, such as glues, cements, paint thinners, and degreasers. n-Hexane is a minor constituent of crude oil and natural gas and occurs in different petroleum distillates. No data are available regarding the potential toxicity of n-hexane in humans orally exposed to n-hexane. However, as might be expected for a chemical with such wide application, the potential exists for persons to be environmentally and/or occupationally exposed to n-hexane via other routes of exposure.

Toluene:

The acute toxicity of toluene is low. Toluene may cause eye, skin, and respiratory tract irritation. Short-term exposure to high concentrations of toluene (e.g., 600 ppm) may produce fatigue, dizziness, headaches, loss of coordination, nausea, and stupor; 10,000 ppm may cause death from respiratory failure. Ingestion of toluene may cause nausea and vomiting and central nervous system depression. Contact of liquid toluene with the eyes causes temporary irritation. Toluene is a skin irritant and may cause redness and pain when trapped beneath clothing or shoes; prolonged or repeated contact with toluene may result in dry and cracked skin. Because of its odor and irritant effects, toluene is regarded as having good warning properties. The chronic effects of exposure to toluene are much less severe than those of benzene. No carcinogenic effects were reported in animal studies. Equivocal results were obtained in studies to determine developmental effects in animals. Toluene was not observed to be mutagenic in standard studies.

2,2,4-Trimethylpentane

2,2,4-Trimethylpentane is released to the environment through the manufacture, use, and disposal of products associated with the petroleum and gasoline industry. During an accident,

2,2,4-trimethylpentane penetrated the skin of a human which caused necrosis of the skin and tissue in the hand and required surgery. No other information is available on the acute (short-term) effects in humans. Irritation of the lungs, edema, and hemorrhage have been reported in rodents acutely exposed by inhalation and injection. No information is available on the chronic (long-term), reproductive, developmental, or carcinogenic effects of 2,2,4-trimethylpentane in humans. Kidney and liver effects have been observed in rats chronically exposed via gavage (experimentally placing the chemical in the stomach) and inhalation. EPA has not classified 2,2,4-trimethylpentane with respect to potential carcinogenicity.

Xylene:

Commercial or mixed xylene usually contains about 40-65% *m*-xylene and up to 20% each of *o*-xylene and *p*-xylene and ethyl benzene. Xylenes are released into the atmosphere as fugitive emissions from industrial sources, from auto exhaust, and through volatilization from their use as solvents. Acute (short-term) inhalation exposure to mixed xylenes in humans results in irritation of the eyes, nose, and throat, gastrointestinal effects, eye irritation, and neurological effects. Chronic (long-term) inhalation exposure of humans to mixed xylenes results primarily in central nervous system (CNS) effects, such as headache, dizziness, fatigue, tremors, and incoordination; respiratory, cardiovascular, and kidney effects have also been reported. EPA has classified mixed xylenes as a Group D, not classifiable as to human carcinogenicity. Mixed xylenes are used in the production of ethylbenzene, as solvents in products such as paints and coatings, and are blended into gasoline.

AIR QUALITY IMPACT ANALYSIS

Because this source is not subject to 45CSR14, no air modeling was deemed necessary.

RECOMMENDATION TO DIRECTOR

General permit registration G70-A183 meets all requirements of applicable state and federal regulations. Therefore, it is recommended that General Permit Registration G70-A182 should be issued to SWN Production Company, LLC.



Caraline Griffith
Permit Engineer

11/23/15

Date