



**west virginia** department of environmental protection

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**ENGINEERING EVALUATION / FACT SHEET**

**BACKGROUND INFORMATION**

Application No.: G70-A174  
Plant ID No.: 051-00221  
Applicant: SWN Production Company, LLC  
Facility Name: Betty Schafer Pad  
Location: Marshall County  
NAICS Code: 211111  
Application Type: Construction  
Received Date: August 19, 2015  
Engineer Assigned: Caraline Griffith  
Fee Amount: \$1,500  
Date Received: August 20, 2015  
Complete Date: September 3, 2015  
Due Date: October 20, 2015  
Applicant Ad Date: August 20, 2015  
Newspaper: The Intelligencer  
UTM's: Easting: 530.82362 km      Northing: 4,427.012 km      Zone: 17S  
Description: SWN Production Company, LLC is applying for a G70-A permit to authorize the construction of the Betty Schafer Pad, A Natural Gas Production Facility.

**PROCESS DESCRIPTION**

SWN Production Company is applying for a G70-A general permit registration for their proposed natural gas well pad, the Betty Schafer Pad. The 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 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

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water 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 routed to a VRU with a 95% capture efficiency. The vapor combustor has two (2) natural gas-fired pilots to ensure a constant flame for combustion.

The equipment on site will be:

- Two (2) 145-hp Caterpillar G3306 NA Engines w/ Catalytic Converters
- 77-kw Zenith ZPP-644 4.4L 6 Cylinder Engine
- 146.2-kw Bucks GM Vortec 5.7L Engine
- Two (2) 1.0 mmBTU/hr GPU Burners
- Two (2) 0.5 mmBTU/hr Heater Treaters
- Four (4) 400-bbl Condensate Tanks Routed to VRU
- Two (2) 400-bbl Produced Water Tanks Routed to VRU
- Condensate Truck Loading with Vapor Return Routed to Combustor
- Produced Water Truck Loading with Vapor Return Routed to Combustor
- One (1) 20 mmBTU/hr Vapor Combustor – Loading Stream
- Vapor Combustor Pilot
- Fugitive Emissions and Fugitive Haul Road Emissions

## SITE INSPECTION

On September 29, 2015, Mr. John Money Penny, a compliance and enforcement officer for the DAQ, inspected the site. SWN Production Company, LLC is still in the process of drilling and all such ancillary equipment associated with this process is on site. No permanent equipment has been constructed for the site yet. There was concern over a residence being within 300 feet of the construction site, but SWN provided detailed proof that it is over 500 feet away from any emitting source.

Directions to site:

From Exit 2 on I-470, travel south on CR 91/1, W. Bethlehem Blvd. for 0.45 miles.

Turn right on WV-88, Ridgecrest Rd., go 8.2 miles.

Turn left on US-250, go 1.5 miles.

Turn left on McCreary's Ridge Rd. CR 44, go 0.3 miles.

Stay left on McCreary's Ridge Rd CR 7, go 3.7 miles.

Turn left on Big Wheeling Creek Rd. CR 5, go 1.6 miles.

Turn right to stay on Big Wheeling Creek RD CR 5, go 2.0 miles.

Entrance is on the right.

## ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The emission calculations were done using a combination of AP-42 chapters 3 and 13 for the RICEs and fugitive emissions, respectively. Manufacture specifications were used when estimating the emissions for the GPUs and Heater Treaters. All greenhouse gas emissions (CO<sub>2</sub>e) were calculated using 40CFR98 Table A-1.

**Table 1: PTE Estimated Emissions Summary Table**

Unit ID	Equipment	Pollutant	lb/hr	TPY
EU-ENG1	145-hp Caterpillar G3306 NA Engine w/Catalytic Converter	NOx	0.32	1.40
		CO	0.64	2.80
		VOC	0.24	1.05
		SO <sub>2</sub>	<0.01	<0.01
		PM	0.02	0.09
		Acetaldehyde	<0.01	0.02
		Acrolein	<0.01	0.01
		Benzene	<0.01	0.01
		Ethylbenzene	<0.01	<0.01
		Formaldehyde	0.02	0.09
		Methanol	<0.01	0.02
		Toluene	<0.01	<0.01
		Xylene	<0.01	<0.01
		Total HAP	0.03	0.15
		CO <sub>2</sub>	155.04	679.06
		Methane	<0.01	0.01
		N <sub>2</sub> O	<0.01	<0.01
CO <sub>2</sub> e	155.19	679.73		
EU-ENG2	145-hp Caterpillar G3306 NA Engine w/Catalytic Converter	NOx	0.32	1.40
		CO	0.64	2.80
		VOC	0.24	1.05
		SO <sub>2</sub>	<0.01	<0.01
		PM	0.02	0.09
		Acetaldehyde	<0.01	0.02
		Acrolein	<0.01	0.01
		Benzene	<0.01	0.01
		Ethylbenzene	<0.01	<0.01
		Formaldehyde	0.02	0.09
		Methanol	<0.01	0.02
		Toluene	<0.01	<0.01
		Xylene	<0.01	<0.01
		Total HAP	0.03	0.15
		CO <sub>2</sub>	155.04	679.06
		Methane	<0.01	0.01
		N <sub>2</sub> O	<0.01	<0.01
CO <sub>2</sub> e	155.19	679.73		
EU-ENG3	77-kw Zenith ZPP-644 4, 4L 6 Cylinder Engine	NOx	0.46	2.01
		CO	0.75	3.29
		VOC	0.46	2.01
		SO <sub>2</sub>	<0.01	<0.01

		PM	0.01	0.05
		Acetaldehyde	<0.01	0.01
		Acrolein	<0.01	0.01
		Benzene	<0.01	<0.01
		Ethylbenzene	<0.01	<0.01
		Formaldehyde	0.01	0.06
		Methanol	<0.01	0.01
		Toluene	<0.01	<0.01
		Xylene	<0.01	<0.01
		Total HAP	0.02	0.09
		CO2	74.89	328.00
		Methane	<0.01	0.01
		N2O	<0.01	<0.01
		CO2e	74.96	328.34
EU-ENG4	146.2-kw Bucks GM Vortec 5.7L Engine	NOx	0.43	1.68
		CO	0.86	3.77
		VOC	0.34	1.48
		SO2	<0.01	<0.01
		PM	0.03	0.13
		Acetaldehyde	<0.01	0.02
		Acrolein	<0.01	0.02
		Benzene	<0.01	0.01
		Ethylbenzene	<0.01	<0.01
		Formaldehyde	0.04	0.16
		Methanol	0.01	0.02
		Toluene	<0.01	<0.01
		Xylene	<0.01	<0.01
		Total HAP	0.06	0.24
		CO2	206.35	903.80
		Methane	<0.01	0.02
		N2O	<0.01	<0.01
CO2e	206.56	904.74		
EU-GPU1 and EU-GPU2	Two (2) 1.0- mmBTU/hr GPU Burners	NOx	0.22	0.96
		CO	0.10	0.44
		VOC	0.01	0.06
		SO2	<0.01	0.01
		PM	0.02	0.07
		Benzene	<0.01	<0.01
		Formaldehyde	<0.01	<0.01
		n-Hexane	<0.01	0.02
		Toluene	<0.01	<0.01
		Total HAP	<0.01	0.02
		CO2	233.95	1,024.72
		Methane	<0.01	0.02
		N2O	<0.01	<0.01
CO2e	234.20	1,025.78		
EU-HT1 and EU- HT2	Two (2) 0.5- mmBTU/hr	NOx	0.12	0.52
		CO	0.10	0.44

	Heater Treaters	VOC	0.01	0.02
		SO2	<0.01	<0.01
		PM	0.01	0.04
		Benzene	<0.01	<0.01
		Formaldehyde	<0.01	<0.01
		n-Hexane	<0.01	0.01
		Toluene	<0.01	<0.01
		Total HAP	<0.01	0.01
		CO2	116.98	512.36
		Methane	<0.01	0.01
		N2O	<0.01	<0.01
		CO2e	117.10	512.89
EU-TANKS-COND	Four (4) 400-bbl Condensate Tanks Routed to Vapor Combustor	VOC	10.29	45.07
		Benzene	0.01	0.03
		Ethylbenzene	0.04	0.19
		n-Hexane	0.60	2.61
		Toluene	0.04	0.18
		Xylene	0.15	0.65
		Total HAP	0.83	3.65
EU-TANKS-PW	Two (2) 400-bbl Produced Water Tanks routed to Vapor Combustor	VOC	0.03	0.12
		Benzene	<0.01	<0.01
		Ethylbenzene	<0.01	<0.01
		n-Hexane	<0.01	0.01
		Toluene	<0.01	<0.01
		Xylene	<0.01	<0.01
		Total HAP	<0.01	0.01
EU-LOAD-COND	Condensate Truck Loading w/ Vapor Return routed to Combustor	VOC	2.92	12.81
		Benzene	<0.01	0.01
		Ethylbenzene	0.01	0.05
		n-Hexane	0.17	0.74
		Toluene	0.01	0.05
		Xylene	0.04	0.18
		Total HAP	0.24	1.04
		CO2	<0.01	<0.01
		Methane	0.01	0.03
		CO2e	0.19	0.83
EU-LOAD-PW	Produced Water Truck Loading w/ Vapor Return routed to Combustor	VOC	0.03	0.11
		Benzene	<0.01	<0.01
		Ethylbenzene	<0.01	<0.01
		n-Hexane	<0.01	0.01
		Toluene	<0.01	<0.01
		Xylene	<0.01	<0.01
		Total HAP	<0.01	0.01
		CO2	<0.01	0.01
		Methane	0.21	0.94
		CO2e	5.36	23.49
APC-COMB-	One (1) 20.0	NOx	2.76	12.09

TKLD	mm/BTU/hr Vapor Combustor – Loading Stream	CO	5.51	24.13
		VOC	0.14	0.61
		PM	0.06	0.26
		Benzene	<0.01	<0.01
		Ethylbenzene	<0.01	<0.01
		n-Hexane	0.01	0.04
		Toluene	<0.01	<0.01
		Xylene	<0.01	0.01
		Total HAP	0.01	0.06
		CO2	2,339.54	10,247.19
		Methane	0.04	0.19
		N2O	<0.01	0.02
		CO2e	2,341.96	10,257.77
EU-PILOT	Vapor Combustor Pilot	NOx	0.01	0.04
		CO	0.01	0.04
		VOC	<0.01	<0.01
		SO2	<0.01	<0.01
		PM	0.01	0.04
		Benzene	<0.01	<0.01
		Formaldehyde	<0.01	<0.01
		n-Hexane	<0.01	<0.01
		Toluene	<0.01	<0.01
		Total HAP	<0.01	<0.01
		CO2	10.59	46.36
		Methane	<0.01	<0.01
		N2O	<0.01	0.02
CO2e	10.60	46.41		

**Table 2: Fugitive Emissions**

Unit ID	Equipment	Pollutant	lb/hr	TPY
EU-FUG	Fugitive Emissions	VOC	0.72	3.15
		Benzene	<0.01	<0.01
		Ethylbenzene	<0.01	0.01
		n-Hexane	0.03	0.14
		Toluene	<0.01	0.01
		Xylene	0.01	0.03
		Total HAPs	0.04	0.19
		CO2	<0.01	0.01
		Methane	0.61	2.66
		CO2e	15.25	66.51
EU-HR	Fugitive Haul Road Emissions	PM	1.12	3.69

**Table 3: Facility Wide Total PTE Estimates**

Pollutant	lb/hr	TPY
NOx	4.64	20.31
CO	8.69	38.05
VOC	15.42	67.55
SO2	<0.01	0.02
PM	1.29	4.43
Acetaldehyde	0.01	0.06
Acrolein	0.01	0.06
Benzene	0.02	0.08
Ethylbenzene	0.06	0.26
Formaldehyde	0.09	0.40
Methanol	0.02	0.07
n-Hexane	0.82	3.57
Toluene	0.06	0.25
Xylene	0.20	0.87
Total HAPs	1.28	5.61
CO2	3,292.28	14,420.58
Methane	0.89	3.90
N2O	0.01	0.02
CO2e	3,316.56	14,526.20

**AGGREGATION DETERMINATION**

Applicants for the G70-A general permit registration will be required to provide information regarding the aggregation of stationary sources that must include the 3-prong test for stationary source determinations.

The 3-prong test is:

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

Following this test, SWN determined that there were no other facilities contiguous with or adjacent to the Betty Schafer Pad to be permitted. Neither the WV DEP nor EPA have established a distance under which source aggregations are required, but the terms “contiguous” and “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 the Betty Schafer Pad to be permitted; therefore, no additional facilities are contiguous or adjacent.

## REGULATORY APPLICABILITY

*The following state and federal regulations apply to the Betty Schafer Pad:*

### **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.

Each registrant is subject to the 10% opacity requirements set forth in 45CSR2, Section 3.1. Because each GPU burner and each heater treater are under 10 mmBTU/hr, they are exempt from sections 4, 5, 6, 8, and 9 of this rule. Since natural gas is being used, the writer predicts that the 10% opacity requirements will have no problem being met.

#### **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. All facilities are inspected by the DAQ Enforcement Section.

SWN predicts that there will be no objectionable odors or cause for objectionable odors present at the Betty Schafer Pad.

#### **45CSR6 To Prevent and Control Air Pollution from the Combustion of Refuse**

45CSR6 prohibits open burning, establishes emission limitations for particulate matter, and establishes opacity requirements. Sources subject to 45CSR6 include completion combustion devices, enclosed combustion devices, and flares.

The facility-wide requirements of the general permit include the open burning limitations §§45-6-3.1 and 3.2.

All completion combustion devices, enclosed combustion devices, and flares are subject to the particulate matter weight emission standard set forth in §45-6-4.1; the opacity requirements in §§45-6-4-3 and 4-4; the visible emission standard in §45-6-4.5; the odor standard in §45-6-4.6; and the testing standard in §§45-6-7.1 and 7.2. Sections 5.0, 6.0 and 14.0 of the G70-A general permit include requirements for 45CSR6.

Enclosed combustion control devices and flares that are used to comply with emission standards of NSPS, Subpart OOOO are subject to design, operational, performance, recordkeeping and reporting requirements of the NSPS regulation that meet or exceed the requirements of 45CSR6.

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

45CSR10 establishes emission limitations for SO<sub>2</sub> emissions which are discharged from stacks of fuel burning units. A "fuel burning unit" means and includes any furnace, boiler apparatus, device, mechanism, stack or structure used in the process of burning fuel or other combustible material for the primary purpose of producing heat or power by indirect heat transfer. Sources that meet the definition of "Fuel Burning Units" per 45CSR10-2.8 include gas producing units, in-line heaters, heater treaters, and glycol dehydration unit reboilers.

Fuel burning units less than 10 MMBtu/hr are exempt, therefore, since the heater treaters and GPU units at this facility are less than 10 MMBTU/hr, they are exempt from this rule.

**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 Production Company has demonstrated compliance with 45CSR13 by submitting a complete G70-A general permit registration application, placing a legal advertisement in the *The Intelligencer* on August 20, 2015, and paying the applicable fees.

**45CSR22 Air Quality Management Fee Program**

This facility is a minor source and not subject to 45CSR30. SWN is required to keep their Certificate to Operate current. They paid the \$500 fee associated with a G70-A general permit registration application and a \$1000 NSPS fee.

**Federal Regulations:**

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

Subpart JJJJ sets forth nitrogen oxides (NO<sub>x</sub>), 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, the 77 kw Zenith engine, and the 146.2 kw (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.

The Zenith engine is certified and must maintain compliance by keeping records of conducted maintenance. The two Caterpillar engines and the GM Vortec engine are non-certified, so they must show compliance by keeping a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, SWN must conduct an initial performance test within 1 year of engine startup to demonstrate compliance.

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

40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO<sub>2</sub>) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011.

- 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.

- b. 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.

There will be no pneumatic devices with a continuous bleed rate of greater than 6 scfh installed at this facility.

- c. 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.

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 95% capture efficiency for the storage vessels, so the VOC emissions limitations will be met.

**40CFR63 Subpart HH (National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities)**

This subpart applies to owners and operators of each triethylene glycol (TEG) dehydration unit that are located at oil and natural gas production facilities. There are no TEG Dehydrators located at this facility.

**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.

Owners and operators of new or reconstructed engines at areas sources must meet the requirements of Subpart ZZZZ by complying with either 40CFR60 Subpart IIII or Subpart JJJJ. Based on emissions calculations this facility is a minor source of HAP. The engines located at this facility were constructed after June 12, 2006 and are less than or equal to 500 hp. They are subject to NSPS Subpart JJJJ and comply with MACT Subpart ZZZZ by complying with the requirements in NSPS Subpart JJJJ.

### 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 emitted at this facility:

#### **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.

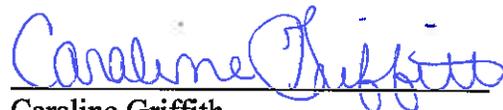
#### **Xylene:**

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.

RECOMMENDATION TO DIRECTOR

General permit G70-A174 meets all requirements of applicable state and federal regulations. Therefore, it is recommended that General Permit G70-A174 should be issued.

  
Caraline Griffith  
Permit Engineer

10/14/15  
Date