


COMMONWEALTH OF PENNSYLVANIA  
Department of Environmental Protection  
Southwest Regional Office

MEMO

TO Air Quality Permit File GP5-26-00587B

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THROUGH Mark R. Gorog, P.E.  Mark A. Wayner, P.E.  
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RE Review of General Permit Application  
Laurel Mountain Midstream Operating, LLC  
Springhill Compressor Station  
Springhill Township, Fayette County  
Auth # 894174, APS # 759362, PF # 719219

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BACKGROUND

Laurel Mountain Midstream Operating, LLC ("Laurel Mountain") has submitted a General Permit application to establish self-imposed, federally enforceable emission limitations for the facility at an existing natural gas compressor station named the Springhill Compressor Station ("Springhill") located in Springhill Township, Fayette County. Springhill is currently permitted under GP5-26-00587A for two (2) engines, one (1) dehydrator/reboiler, and four (4) storage tanks. As per the applicant no physical changes are being made at the facility with this permit application. The facility provides compression and dehydration for a natural gas gathering system in the Marcellus shale. Separation of natural gas liquids does not occur at the station. Natural gas is drawn from the nearby wells, dewatered, compressed, and discharged into a natural gas transmission pipeline. This site is located southeast of SR 119, on Hope Hollow Road in Lake Lynn, and Springhill Township. Laurel Mountain has prepared and submitted the application to operate the following sources under GP-5 authorization at this site:

- One (1) previously installed Caterpillar G3516LE, 4SLB, natural gas fired compression engine, rated at 1,340 Bhp @ 1400 rpm. The engine was manufactured on April 7, 2006, and has no add on control.
- One (1) previously installed Caterpillar G3516LE, 4SLB, natural gas fired compression engine, rated at 1,340 Bhp @ 1400 rpm; controlled by an Emit Technologies oxidation catalyst, Model No. 201V0-3-6112-RT-2515-Z. The engine was manufactured on January 31, 2006.
- One (1) previously installed TEG Dehydrator, rated at 25 MMscfd including a Reboiler, rated at 0.25 MMBtu/hr. There is no add on control on the dehydrator.
- Four (4) previously installed condensate/produced storage tanks. Two (2) tanks with a capacity of 150 bbl, one (1) tank of 100 bbl, and one (1) tank of 24 bbl capacity.

- Previously installed ancillary equipment (Electric Engine, rated at 1,500 bhp) with de minimis emissions.

The application was received by the Department on September 8, 2011. Additional technical information were requested on October 4, 2011, Money Back Guarantee Clock (MBG) was stopped. All requested information was received by the Department on October 14, 2011 and MBG clock was restarted.

## REGULATORY ANALYSIS

**New Source Performance Standards (NSPS) from 40 CFR Part 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition (SI) Internal Combustion Engines (ICE)** will not apply to both the previously installed natural gas-fired engines at this facility. Per 40 CFR 60.4230(a)(3)(ii), this subpart applies to “owners or operators of stationary SI ICE that are manufactured on or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 bhp and less than 1,350 bhp”. The two previously installed Caterpillar are lean burn engines, rated at 1,340 bhp, and manufactured before January 1, 2008, and thus will not be subject to 40 CFR Part 60 Subpart JJJJ.

**NSPS from 40 CFR Part 60 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984** does not apply to this facility. Per 40 CFR 60.110b, “...the affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 75 cubic meters ( $m^3$ ) that is used to store volatile organic liquids...” Each storage tank existing at this facility has a capacity of less than  $75 m^3$  and will not be subject to this subpart.

**NSPS from 40 CFR Part 60 Subpart KKK – Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants** does not apply to this facility. Per 40 CFR 60.630(a)(1), “The provisions of this subpart apply to affected facilities in onshore natural gas processing plants.” This facility does not meet the definition of a natural gas processing plant because it does not engage in the extraction of natural gas liquids from field gas. Natural gas produced at this facility will be discharged directly to a natural gas transmission pipeline.

**National Emission Standards for Hazardous Air Pollutants (NESHAPS) from 40 CFR Part 63 Subpart HH – Oil and Natural Gas Production Facilities** will apply to this facility. Per 40 CFR 63.760(a), “This subpart applies to the owners and operators of the emission points, specified in paragraph (b) of this section that are located at oil and natural gas production facilities that meet the specified criteria in paragraphs (a)(1) and either (a)(2) or (a)(3) of this section.” Springhill will include a triethylene glycol dehydration unit as specified in paragraph (b) and also meets the criteria of paragraph (a). 40 CFR 63.764©(1)(ii) however exempts glycol dehydration units with actual average emissions of benzene less than 0.90 Mg (~ 1 ton) per year. No potential benzene emissions are expected from the dehydrator based upon the gas stream input to the GRI-GLYCalc report submitted with the application. Laurel Mountain must maintain records of the glycol dehydration unit exemption in accordance with 40 CFR 63.774(d)(1). These records include the option of either determining actual average benzene emissions using GRI-GLYCalc or through direct measurement.

**New Source Performance Standards (NSPS) from 40 CFR Part 98.1-98.9 Mandatory Greenhouse Gases (GHG) Reporting**, this rule potentially applies because the facility has the potential to emit 25,000 MT (27,558 tons) or more per year of CO<sub>2</sub>e emissions. Actual GHG emissions will be reported if the CO<sub>2</sub>e emissions exceed the 25,000 MT per year threshold per Section 98.2(a).



**NESHAPS Subpart ZZZZ** does apply to both the Caterpillar 3516LE engines, one with no add on control, and the other with an oxidation catalyst. The Caterpillar 3516LE engine with no add on control was installed in 2009 whereas the other Caterpillar 3516LE engine with an oxidation catalyst was installed in 2010. The date of installation is considered to be the date of commencement of construction per 40 CFR Part 63.2. Since both the Caterpillar engines were installed after June 12, 2006, they are considered to be “New stationary RICE”.

According to 40 CFR 63.6590(a)(2)(iii), these engines will be classified as new stationary RICE. However, Subpart ZZZZ continues per 40 CFR 63.6590(c) to subject an affected source to the requirements of 40 CFR Part 60 Subpart JJJJ and remove all further requirements under NESHAPS Subpart ZZZZ if the affected source meets any of the criteria of (c)(1) through (7) of this section. Both Caterpillar G3516LE engines meet the criteria (1) as new stationary RICE located at an area source, and is not subject to further requirements under 40 CFR Part 63 Subpart ZZZZ.

Per GP-5 Condition 13.b.i.ii, and iii the natural gas-fired compressor engine’s NO<sub>x</sub>, CO, and VOC emissions shall be limited to 2.0 g/bhp-hr each at rated bhp and speed. The emission rates for both Caterpillar G3516LE engines are expected to be below GP-5 emission limits.

**Table 1**  
**GP-5 Emission Limit**

Air Contaminant	GP-5 Emission Limit (g/bhp-hr)
NO <sub>x</sub>	2.0
CO	2.0
VOC <sup>a</sup>	2.0

<sup>a</sup>The GP-5 VOC emission limits exclude emissions of formaldehyde.

### **New Source Review (NSR) Applicability and Aggregation**

Per 40 CFR PART 81.339, Springhill Township, Fayette County is classified as an area of attainment for all National Ambient Air Quality Standards (NAAQS) except for 8-hour ozone. All of the Commonwealth of Pennsylvania is located in the Northeast Ozone Transport Region which is equivalent to a moderate ozone nonattainment area. Recognized precursor pollutants for ozone are NO<sub>x</sub> and VOC. For purposes of a Non-Attainment (NA) NSR, a facility is major if the potential to emit exceeds 100 tons of NO<sub>x</sub>, or 50 tons of VOC per year. The major source threshold for Prevention of Significant Deterioration (PSD), for this type of facility, is potential emissions of 250 TPY of a single attainment pollutant. The Title V major source criteria for Hazardous Air Pollutants (HAPs) is an emission potential of 10 TPY of a single HAP or 25 TPY of the sum of all emitted HAPs. Facilities with PTEs that do not exceed major source thresholds for HAPs are known as area sources. This facility does not have the PTE criteria and hazardous air emissions in excess of the thresholds for Title V, NANSR, and PSD and is not considered a Major Source by these programs. Therefore, it is not subject to requirements of these programs.

Laurel Mountain has been examined for NSR aggregation purposes. The following three criteria must be met when emission sources should be aggregated to be considered a single facility for PSD, but for non-attainment NSR purposes, only 1 & 2 criteria are considered.

1. The sources should be under common control.

2. The sources should be located on contiguous or adjacent properties.
3. The sources should have the same industrial grouping

### **Common Control**

Williams Laurel Mountain, LLC is the majority owner of LMM and is the sole operator of the Springhill facility. Springhill and other (Dunbar, Howser, Prah, Pritts, Salem, and Shamrock) Compressor Stations are owned and operated by Laurel Mountain Midstream Operating, LLC. Williams do not own any production wells that feed Springhill. The production wells are owned and operated either by Atlas Energy, LP or subsidiaries of Chevron USA, Inc. This does not satisfy the common control criteria.

### **Contiguous or Adjacent**

Natural gas produced from all the upstream production wells goes through the Springhill Compressor Station, dewatered, compressed, and discharged downstream to a transmission pipeline owned by Columbia Gas Transmission. Laurel Mountain does not control or own any upstream production wells or downstream transmission lines; therefore Springhill is not to be aggregated with any other emission sources for the purposes of Title V, NANSR, or PSD applicability. The station and other sources under common control do not fit within the ordinary meaning of “building,” “structure,” “facility,” or “installation” and are therefore not considered to be adjacent.

The “common sense” notion also includes the reality that potential to emit, as estimated by the applicant, for both the upstream wells and the Springhill Facility are well below the major source threshold. As such, NSR would not be triggered in any case even if emissions were aggregated. This finding comports with the Department’s Guidance for Forming Single Stationary Source Determination for Oil & Gas Industries effective October 12, 2011.

## **EMISSIONS AND CONTROLS**

Emission calculations were carried out by the applicant for the Caterpillar engine based upon the engine manufacturer’s and catalyst manufacturer’s emissions data sheets and an operation time of 8,760 hours per year. Laurel Mountain has contracted with Emit Technologies to provide an oxidation catalyst to control CO, VOC, and HAPs from the engine. Emit Technologies provided an engine specific report detailing pre- and post-control emission rates for NO<sub>x</sub>, CO, VOC and formaldehyde. Emissions are expected to be reduced by 90% for CO and Formaldehydes, and 50% for VOC. NO<sub>x</sub> is unaffected by the Oxidation Catalyst. The catalyst conversion efficiencies (% reduction) are guaranteed for engine loads of 50 to 100% by the manufacturer. All estimations were found to be acceptable and potential emission rates are below the appropriate regulatory limit. Short term and yearly PTE for each source represent the applicant’s formally requested PTE and are to be considered federally enforceable and limiting for the facility PTE under GP-5 Condition 2, Potential to Emit Limitations. Produced natural gas expected at the inlet to Springhill is identified as “dry” meaning the amount of heavier (propane and above) hydrocarbons is minimal. This also includes HAPs such as benzene, xylene, toluene, and ethylbenzene. VOC and HAP emissions from the dehydrator and fugitive sources are expected to be minimal as a result of the gas composition. Natural gas dehydrated by Springhill will not require additional processing to remove these hydrocarbon liquids before the gas is sent to a transmission line. SSM emissions are the sum of unburned fuel resulting from “cold start” of idle gas-fired engines plus the gas that is purged



(blow down) from the compressor and associated piping and equipment. Table 2 below shows the gas analysis that constitutes 99.64% of Non-VOCs, 0.34% VOC, and 0.0001% of benzene.

**Table: 2**  
**Fractional Gas Analysis**

Component	MOL%	Non-VOC Mol %	VOC Mol %
Oxygen	0.0000	-	0.0000
Nitrogen	0.4510	0.4510	-
Carbon Dioxide	0.2350	0.2350	-
Carbon Monoxide	0.0000	-	0.0000
Hydrogen Sulfide	0.0000	-	0.0000
Methane	96.7360	96.7360	-
Ethane	2.2410	2.2410	-
Propane	0.2080	-	0.2080
I-Butane	0.0300	-	0.0300
N-Butane	0.0430	-	0.0430
I-Pentane	0.0160	-	0.0160
N-Pentane	0.0120	-	0.0120
Cyclohexane	0.0005	-	0.0005
i-Hexanes	0.0079	-	0.0079
i-Heptanes	0.0036	-	0.0036
n-Heptanes	0.0017	-	0.0017
i-Octanes	0.0091	-	0.0091
n-Octanes	0.0007	-	0.0007
i-Nonanes	0.0001	-	0.0001
n-Nonanes	0.0000	-	0.0000
i-Decanes	0.0001	-	0.0001
n-Decanes	0.0000	-	0.0000
i-Undecanes+	0.0000	-	0.0000
n-Hexanes+	0.0042	-	0.0042
Benzene	0.0001	-	0.0001
Toluene	0.0001	-	0.0001
Ethylbenzene	0.0000	-	0.0000
Xylenes	0.0001	-	0.0001
<b>Total</b>	<b>100.00</b>	<b>99.663</b>	<b>0.337</b>

As per the gas analysis, it constitutes 99.66% of Non-VOC, 0.34% of VOC, and an insignificant benzene emissions.

The applicant estimates emissions from both identical Caterpillar G3516LE engines, based on the manufacturer's data and 8,760 hours of operation per year, as shown below on Table 3 and 4.

**Table 3****Emissions from Previously Installed Caterpillar, G3516LE**

Pollutants	* Emission Rate (gm/bhp)	* Emission Rate (lb/hr)	*Potential To Emit (tpy)	Estimation Method
NO <sub>x</sub>	2.0	5.91	25.88	Vendor
VOC	0.56	1.65	7.25	Vendor
CO	1.89	5.58	24.46	Vendor
PM Filterable	0.04	0.11	0.49	AP-42
HCHO	0.25	0.74	3.23	Vendor
Total HAP	0.31	0.93	4.09	Vendor

1. \*These are federally enforceable emission limitations requested by the applicant.
2. Compressor engine emissions are based on rated capacity and operating for 8,760 hrs per year.
3. Total PM is filterable and condensable Particulate Matter, including PM10 and PM2.5

**Table 4****Emissions from Previously installed Caterpillar, G3516LE (w/Catalyst)**

Pollutants	Uncontrolled Emission Rate (gm/bhp-hr)	Control Efficiency	Potential to Emit			Estimation Method
			(*gm/bhp-hr)	(*lb/hr)	(*tpy)	
NO <sub>x</sub>	2.0	0%	2.0	5.91	25.88	Vendor
VOC	0.26	50%	0.13	0.47	2.06	Vendor
CO	1.85	90%	0.19	0.56	2.46	Vendor
PM Filterable	0.04	0%	0.04	0.11	0.49	AP-42
HCHO	0.26	90%	0.03	0.09	0.39	Vendor
Total HAP	0.47	90%	0.047	0.14	0.59	Vendor

- 1.\*These are federally enforceable emission limitations requested by the applicant.
2. Compressor engine emissions are based on rated capacity and operating for 8,760 hrs per year.
3. Particulate Matter PM2.5 and PM10 being negligible are not taken into consideration.

Emission calculations were carried out by the applicant for the glycol dehydrator using GRI-GLYCalc Version 4.0, a daily natural gas throughput of 25 MMscf/day, operation for a worst case 8,760 hours per year. No control efficiency is required as the uncontrolled VOC emission from the Dehydrator is less than 10 tpy and shown in Table 5 below. Reboiler heat input, rated at 0.25 MMBtu/hr.

**Table 5****Emissions from Previously installed Dehydrator**

Pollutants	Potential to Emit (tpy)	Emission Estimation Method
NO <sub>x</sub>	0.11	AP-42
VOC	9.30	GRI-GLY Calc
CO	0.09	AP-42
HAP	1.18	GRI-GLY Calc

PM and SO<sub>x</sub> emissions being negligible are not taken into consideration

Emission calculations were carried out by the applicant for emissions from the storage tanks, Table 6 Storage tank emissions were calculated using Tanks 4.09 version software. Emission estimation method model run and the natural gas analysis for this facility along with an estimated liquid throughput of 249,186 gallons per year.

**Table 6**  
**Emissions from existing Condensate or Storage Tanks, PTE**

Pollutants	Uncontrolled Emissions (tpy)	Controlled Emissions (tpy)	PTE (tpy)	Emissions Estimation Method
VOC	0.42	0.42	0.42	E&P Tank V2.0
HAP	0.01	0.01	0.01	E&P Tank V2.0

1. Tanks store condensate and produced water.
2. This is a worst-case assumption as the stored liquids are expected to be mostly water.

Fugitive emissions are calculated by the applicant from component leaks at their facility using API Compendium of GHG Emission Methodologies as per Table 7 below:

**Table 7**  
**Fugitive Emissions from Component Leaks**

Pollutants	Emissions (lb/hr)	Emission Rate (tpy)	PTE (tpy)
VOC	0.146	0.64	0.64
HAP	0.034	0.01	0.15

1. Component types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is a preliminary estimate based on the proposed design of the Springhill.
3. Assume maximum leak rate 20% greater than measured average leak rate.

**Table 8**  
**Startup, Shutdown and Maintenance (SSM) Emissions**

Pollutants	Emissions (lb/hr)	Emissions (tpy)	PTE (tpy)
VOC	1.14	5.00	5.00
HAPs	0.17	0.75	0.75

**Table 9**  
**Truck Loading Emissions**

Pollutants	Emission Rate (lb/hr)	Emission Rate (tpy)	PTE (tpy)
VOC	0.066	0.29	0.29
HAP	0.002	0.01	0.01

Emissions factors & formulas are from AP-42 Section 5.2 Transportation and Marketing of Petroleum Liquids. HAP emissions are based on HAP to VOC proportions determined by E&P Tank V 2.0.



20% of the liquid is assumed to be VOC.

**Table 10**  
**Facility wide Emission, PTE**

Pollutants	*Caterpillar Engine (tpy)	*Caterpillar Engine (w/control) (tpy)	Dehy (tpy)	Storage Tanks (tpy)	Component Leaks (tpy)	SSM (tpy)	Truck Loading (tpy)	*Facility Wide PTE (tpy)
NO <sub>x</sub>	25.88	25.88	0.11	-	-	-	-	51.87
VOC	7.25	2.06	9.30	0.42	0.64	5.00	0.29	24.96
CO	24.46	2.46	0.09	-	-	-	-	27.01
PM (Filterable)	0.49	0.49	-	-	-	-	-	0.98
HCHO	3.23	0.39	-	-	-	-	-	3.62
Total HAP	4.09	0.59	1.18	0.01	0.15	0.75	0.01	6.78

Particulate Matter PM<sub>2.5</sub>, PM<sub>10</sub>, and SO<sub>x</sub> being negligible are not taken into consideration.

\*These are federally enforceable emission limitations requested by the applicant.

The Clean Air Act required EPA to set National Ambient Air Quality Standards ("NAAQS") for pollutants considered harmful to public health and the environment and establishes two levels of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Springhill is classified as a minor facility and as such would not typically be required to perform modeling to demonstrate that the emissions from this facility will not cause or contribute to a violation of any NAAQS. As a minor facility, emissions are not expected to exceed the NAAQS or significant impact limits for the NAAQS.

Formaldehyde is a known carcinogen and the primary HAP expected to be emitted from air contamination sources at Springhill. As per gas analysis a minimal amounts of benzene, toluene, xylene, and ethylbenzene are expected in the inlet gas to the facility. The Department has recently received air quality screening data on behalf of Pennsylvania Waste Industries Association for a model landfill scenario in which multiple landfill gas-fired engines emit formaldehyde. The PTE for formaldehyde in this scenario is approximately 12.17 tons per year compared to the worst case 3.62 tons per year to be emitted from Springhill. The nearest resident in this scenario was modeled at 374 feet from the point source of emissions. Cumulative cancer and non-cancer risks from the model scenario were found to be below the Department's human health risks benchmarks. Springhill formaldehyde PTE is 29.75% of the model landfill scenario. The comparison is not absolute due to possible differences in local terrain and meteorological data but the modeling produces conservative results and the differences would not be expected to offset the lower PTE at Springhill.

The Department has also received air dispersion modeling and risk assessment for formaldehyde and other hazardous air pollutants potentially emitted by SCI Laurel Highlands. Formaldehyde emissions from two landfill gas-fired engines at this facility were modeled considering their maximum potential emission rate of 6.86 tons per year compared to the worst case 3.62 tons per year from Springhill. Model receptors in this case were placed at 50-meter intervals out to 2,000 meters from the sources. Formaldehyde concentrations from the landfill gas-fired engines were shown to be less than the acute (1-hour average) and chronic (5-year average) toxicity benchmarks provided by the Department. Total HAP risk levels from the two landfill gas-fired engines were also shown to be less than the long-term hazard quotient and calculated cancer risk thresholds.



## RECOMMENDATIONS AND FACILITY SUMMARY

In addition to those required by the GP-5, the following records must be maintained in accordance with federal requirements:

- All notifications submitted to comply with NSPS ZZZZ and all documentation supporting any notification.
- Maintenance conducted on each compressor engine.
- Documentation that the engine no. 3 meets NSPS ZZZZ emission standards where appropriate.
- A GRI-GLYCalc Version 3.0 or higher report demonstrating the yearly benzene emission rate from the glycol dehydrator, or an average mass rate of benzene emissions in kilograms per hour through direct measurement as specified by 40 CFR Part 63 Subpart HH. This is necessary to establish the dehydrator's exemption from other NESHAPS HH control, monitoring, and reporting requirements.

Laurel Mountain Liberty Midstream and Resources, LLC has shown that emissions will meet current GP-5 requirements in this application for a natural gas production facility to be named Springhill Compressor Station. I recommend the authorization be granted to use the GP-5 for installation and operation of all sources at the facility for a period of 5 years. I also recommend inactivating GP5-26-00587A after issuance of GP5-26-00587B and have submitted a separate review memo to document the inactivation.