PROJECT REPORT

Adelphia Pipeline Company > Marcus Hook Compressor Station

Plan Approval Application

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1. EXECUTIVE SUMMARY

Adelphia Pipeline Company, LLC (Adelphia) is planning to construct a new natural gas compressor station in Lower Chichester Township, Delaware County, PA (the Marcus Hook CS). Adelphia is submitting this Plan Approval application seeking authorization for the installation of the equipment associated with the construction of the compressor station.

The Marcus Hook Compressor Station (Marcus Hook CS) would be a minor source of air emissions with respect to New Source Review and Title V permitting. Emissions from the equipment associated with the proposed compressor station is reflected in site-wide total emissions shown in this Plan Approval application.

The following sections of this application report address the following topics:

- Section 2: Project Description
- Section 3: Applicable Regulations Review (includes Aggregation Analysis)
- Section 4: Best Available Technology (BAT) Review
- Section 5: Potential Emissions Calculations
- Appendix A : Area Maps and Process Flow Diagram
- Appendix B : Detailed Emission Calculations and BAT Analysis
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The proposed Marcus Hook CS would be a natural gas transmission facility covered under Standard Industrial Classification (SIC) Code 4922 and regulated by the Federal Energy Regulatory Commission (FERC). The Marcus Hook CS would compress natural gas from the Marcus Hook interstate pipeline system to be transported downstream along the transmission system. The Marcus Hook CS would have the potential to operate 24 hours per day, 7 days per week and 365 days per year.

At this time, the proposed equipment to be installed at the Marcus Hook CS is as follows:

- Threes (3) Caterpillar (CAT) G3606 natural gas compressor engines (rated at 1,875 horsepower [hp] each) equipped with oxidation catalysts;
- One (1) Cummins GTA28 emergency generator engine (rated at 701 hp) equipped with non-selective catalytic reduction (NSCR);
- One (1) 1,000 gallon produced fluid tank;
- One (1) 500 gallon engine oil tank;
- One (1) 500 gallon triethylene glycol (TEG) tank; and
- Associated piping and components and gas releases.

The proposed sources are described in detail below and depicted on a process flow diagram included in Appendix A.

2.1 COMPRESSOR ENGINES

Adelphia is proposing to install three (3) natural gas-fired reciprocating engines (each rated at 1,875 hp) for the compression and transmission of natural gas. The engines would be 4-stroke, lean burn, spark ignition engines each rated at 1,875 hp and equipped with oxidation catalyst for control of carbon monoxide (CO), volatile organic compound (VOC), and formaldehyde emissions. The compressor engines are expected to operate on a full-time basis and as such are being permitted for 8,760 hours per year. Manufacturer's specifications for the engines and oxidation catalysts are included in Appendix C. This information is based on current design and will, at least, be equivalent to final design.

The function of these reciprocating compressors is to raise the pressure of the gas to overcome the higher operating pressure in the transmission pipeline downstream of the proposed station.

2.2 EMERGENCY GENERATOR

Adelphia is proposing to install one (1) natural gas fired generator that would provide back-up power at the facility. The generator would be powered by a 4-stroke, rich burn, spark ignition engine, rated at 701 hp. This information is based on current design and will, at least, be equivalent to final design. The generator is expected to operate on an emergency basis and as such is being permitted for 500 hours per year.

2.3 STORAGE TANKS

Adelphia is proposing to install one (1) 1,000 gallon produced fluids storage tank, one (1) 500 gallon engine oil tank and one (1) 500 gallon TEG tank. The true vapor pressure of the contents of these tanks would be less than 1.5 psia.

Authorization to begin construction and initially operate a new or modified source must be obtained by complying with key regulatory elements:

- Plan Approval Requirements located in 25 PA Code §127.11 – 127.51;
- Prevention of Significant Deterioration (PSD) and/or Nonattainment New Source Review programs (NNSR) [both parts of the federal New Source Review (NSR) as incorporated by reference under 25 PA Code §127.81 – 127.83 for PSD and implemented in the Pennsylvania SIP under 25 PA Code §127.201 – 127.218 for NNSR];
- Applicable federal and state emission standards and control programs contained in the Pennsylvania State Implementation Plan (SIP); and
- Title V of the 1990 Clean Air Act Amendments (as incorporated and implemented in the Pennsylvania SIP under 25 PA Code §127.501 – 127.543).

This section of the report addresses the applicability of the proposed project to these permitting programs and requirements.

3.1 SOURCE AGGREGATION ANALYSIS

To determine applicability of various permitting programs to the proposed Marcus Hook CS, a single source determination must be performed for the site. According to the Department's Guidance for Performing Single Stationary Source Determinations for Oil and Gas Industries (Docket 270-0810-006), the following three factors must all be met in order for emission sources to be aggregated and considered a single facility: (1) the sources all belong to the same industrial grouping; (2) the activities are located on one or more contiguous or adjacent properties; and (3) the activities are under common control.

The proposed Marcus Hook CS would be sited within an existing industrial complex. However, Adelphia does not own, or control, any additional sources that are directly adjacent to the Marcus Hook CS. The nearest source controlled by Adelphia is a meter station located almost exactly a quarter mile away and which is situated in Delaware. As a result of the above-described analysis, Adelphia has determined that the proposed Marcus Hook CS is a single source and should not be aggregated with any other source.

3.3 MAJOR NEW SOURCE REVIEW (25 PA CODE §127)

The Federal New Source Review (NSR) program applies to major stationary sources. The NSR permitting regulations are comprised of two programs: 1) Prevention of Significant Deterioration (PSD) for projects located in areas where specified pollutant levels have met National Ambient Air Quality Standards (NAAQS); and 2) Nonattainment New Source Review (NNSR) for projects located in areas where pollutant levels have not attained the corresponding NAAQS. The NSR program regulates the installation of new major sources or major modifications to existing major sources. The Marcus Hook CS is located in Delaware County which is classified as attainment with all NAAQS except for ozone and $PM_{2.5}$. Due to its location within the Ozone Transport Region (OTR), in accordance with 25 Pa. Code 127.201(f), a facility located in Delaware County that emits or has the potential to emit at least 25 tpy VOC or NO_X would be considered a major facility and would be subject to the requirement applicable to a major facility located in a severe nonattainment area for ozone. These requirements would include Lowest Achievable Emission Rate (LAER), an alternative site analysis and obtaining emissions offsets. However, if NNSR permitting is not triggered, then the project is deemed to not significantly impact the ability of the area to attain the NAAQS. Furthermore, Delaware County is classified as 'moderate' nonattainment

area for $PM_{2.5}$. As such, the major source threshold for this pollutant, and its precursors (NO_x and SO_2), is 100 tpy for $PM_{2.5}$.

The estimated emissions as a result of the proposed project, as shown in Table 3-1**,** are below major source thresholds for NSR under 25 Pa Code Section 127, Subchapter E and PSD permitting under 25 Pa Code Section 127, Subchapter D. As such, NSR is not applicable to this plan approval application.

Table 3-1: NSR Major Source Thresholds[4]

Pollutant	Potential Site-Wide PTE (TPY)[1]	Major Source Threshold (TPY)	NSR Program	Subject to Major NSR?
PM_{10}	1.91	250	PSD	No
$PM_{2.5}$	1.91	100	NNSR	No
SO_2	0.11	250/100	PSD/NNSR	No
CO	10.78	250	PSD	No
NO_X	17.07	100/25	PSD/NNSR[2]	No
VOC	16.69	25	NNSR	No
CO_2e	33,151	NA[3]	PSD	No

[1] PTE includes site-wide emissions from all sources, including storage tanks, fugitive leaks, and blowdowns.
[2] NO_2 is also a regulated PSD pollutant with a major source threshold of 250 tpy and a precursor of $PM_{2.5}$ with a major source threshold of 100 tpy.
[3] Only applicable if another pollutant exceeds major source threshold for PSD.
[4] Emissions are based on current design for which the formal bidding process is underway. Final design specifications are to be, at least, equivalent.

3.4 POTENTIALLY APPLICABLE FEDERAL EMISSIONS STANDARDS

Two types of federal emission standards could apply to certain operations being permitted as part of this project. These emission standards are: New Source Performance Standards (NSPS) codified in 40 CFR 60 and National Emission Standards for Hazardous Air Pollutants (NESHAP) standards codified in 40 CFR 63.

3.2.1. National Emission Standards for Hazardous Air Pollutants (NESHAP or MACT)

Regulatory requirements for facilities subject to NESHAP standards, otherwise known Maximum Available Control Technology (MACT) Standards for source categories, are contained in 40 CFR Part 63. 40 CFR Part 61 NESHAP standards are defined for specific pollutants while Part 63 NESHAPs are defined for source categories where allowable emission limits are established on the basis of a MACT determination for a particular major source. A major source of HAP is defined as having potential emissions in excess of 25 tpy for total Hazardous Air Pollutants (HAPs) and/or potential emissions in excess of 10 tpy for any individual HAP.

Potential HAP emissions from the proposed Marcus Hook CS would be below the major source thresholds, as shown in Appendix B, and therefore the facility would be an area source of HAP. The potential applicability of specific MACT standards to the Marcus Hook CS is discussed below.

3.2.1.1. NESHAP Subpart HH – Natural Gas Production Facilities

Subpart HH – NESHAP for natural gas production facilities applies to glycol dehydration units at natural gas production facilities that are major or area sources of HAP emissions prior to custody transfer to the transmission pipeline. The proposed project would be located after custody transfer. Therefore, the proposed Marcus Hook CS would not be a natural gas production facility as defined by the rule, and this subpart would not be applicable.

3.2.1.2. NESHAP Subpart HHH – Natural Gas Transmission and Storage Facilities

Subpart HHH, NESHAP from Natural Gas Transmission and Storage Facilities applies to glycol dehydration units at natural gas transmission and storage facilities that are major sources of HAP emissions located downstream of the point of custody transfer (after processing and/or treatment in the production sector), but upstream of the distribution sector. The Marcus Hook CS would be an area source of HAP emissions; therefore, the Marcus Hook CS would not be subject to Subpart HHH.

3.2.1.3. NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines

Stationary reciprocating internal combustion engines (RICE) at both area and major sources of HAP emissions are potentially subject to Subpart ZZZZ – *NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE)*. Stationary RICE at facilities that are major sources of HAP are considered new if they are ordered after June 12, 2006. Per 40 CFR §63.6590(c), new area source (such as the Marcus Hook CS) stationary RICE are required to meet the requirements of this MACT standard by meeting the applicable requirements of the applicable New Source Performance Standard in 40 CFR 60 (Subpart IIII for compression ignition engines and Subpart JJJJ for spark ignition engines). No further requirements apply to such engines under NESHAP Subpart ZZZZ.

The three (3) proposed CAT 3606 compressor engines and the Cummins GTA28 generator engine at the proposed Marcus Hook CS would comply with Subpart ZZZZ by complying with 40 CFR 60, Subpart JJJJ as described in the following section.

3.2.2. New Source Performance Standards (NSPS)

Pennsylvania has received delegation from EPA to regulate facilities subject to NSPS. Regulatory requirements for facilities subject to NSPS are contained in Pennsylvania SIP in 25 Pa Code §122 and 40 CFR Part 60. The potential applicability of NSPS standards to the proposed operations at the Marcus Hook CS are:

- 40 CFR Part 60 Subpart K/Ka/Kb – Storage Vessels for Petroleum Liquids/Volatile Organic Liquids
- 40 CFR Part 60 Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engine
- 40 CFR Part 60 Subpart OOOO – Crude Oil and Natural Gas Production, Transmission, and Distribution
- 40 CFR Part 60 Subpart OOOOa – Crude Oil and Natural Gas Facilities

3.2.2.1. NSPS Subparts K, Ka, and Kb – Storage Vessels for Petroleum Liquids/Volatile Organic Liquids

These subparts apply to storage tanks of certain sizes constructed, reconstructed, or modified during various time periods. Subpart K applies to storage tanks constructed, reconstructed, or modified prior to 1978, and Subpart Ka to those constructed, reconstructed, or modified prior to 1984. All storage tanks located at the Marcus Hook CS would be constructed after these dates; therefore, the requirements of Subparts K and Ka do not apply. Subpart Kb applies to volatile organic liquid (VOL) storage tanks constructed, reconstructed, or modified after July 23, 1984 with a capacity equal to or greater than 75 m^3 (~19,813 gallons). All storage tanks

at the Marcus Hook CS were constructed after this date, but do not have a capacity greater than 75 m^3. Therefore, Subpart Kb would not apply to the storage tanks at the Marcus Hook CS.

3.2.2.2. NSPS Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, applies to manufacturers, owners and operators of stationary spark (SI) engines. The requirements for SI engines with a maximum power rating greater than or equal to 500 hp (except lean burn engines 500 hp ≤ hp < 1,350) apply to owner/operators of such engines ordered on or after July 1, 2007.

The proposed Cummins GTA28 emergency generator engine is a 4-stroke, rich burn spark ignition RICE rated at 701 hp. The engine would be equipped with a non-selective catalytic reduction (NSCR or "three-way") catalyst for control of NO_X, CO, VOC, and HAPs. The engine would be operated only for electric generation during emergency situations and would be subject to the following emissions standards per Table 1 to NSPS Subpart JJJJ applicable to emergency use engines.

Table 3-2: NSPS Subpart JJJJ Emission Standards for Emergency Natural Gas Engines ≥ 130 HP Manufactured On or After 7/1/2010

Pollutant	Emission Standards (g/hp-hr)	Cummins GTA28 Specifications - with NSCR (g/hp-hr) **
NO_X	2.0	2.0
CO	4.0	4.0
VOC*	1.0	1.0

*VOC as defined in NSPS JJJJ does not include formaldehyde.

**Emissions are based on current design for which the formal bidding process is underway. Final design specifications are to be, at least, equivalent.

The proposed three (3) CAT G3606 compressor engines would be new 4-stroke, lean burn spark ignition RICE rated at 1,875 hp each. The compressor engines would be equipped with oxidation catalysts and would be subject to the following emissions standards per Table 1 to NSPS Subpart JJJJ applicable to non-emergency use engines. All catalysts will be guaranteed by the manufacturer to have emissions less than those cited in Table 3-3 below.

Table 3-3: NSPS Subpart JJJJ Emission Standards for Non-Emergency Natural Gas Engines ≥ 500 HP Manufactured On or After 7/1/2010

Pollutant	Emission Standards (g/hp-hr)	CAT G3606 Specifications - with Oxidation Catalyst (g/hp-hr)**
NO_X	1.0	0.3
CO	2.0	0.17
VOC*	0.7	0.16

*VOC as defined in NSPS JJJJ does not include formaldehyde.

**Emissions are based on current design for which the formal bidding process is underway. Final design specifications are to be, at least, equivalent.

It should be noted that 40 CFR §60.4243(b)(1) allows for compliance with this subpart to be demonstrated by purchasing an engine certified by the manufacturer according to specified procedures and then operating the engine in accordance with the manufacturer's emission-related written instructions. However, while the proposed engines at Marcus Hook CS would be equipped with control technology to achieve the emissions limits shown in Table 3-3, certification is not available from the engine manufacturer.

Therefore, Adelphia would demonstrate compliance with this subpart for all non-certified engines at the Marcus Hook CS in accordance with 40 CFR 60.4243(b)(2)(ii), which requires Adelphia to keep a maintenance plan and records of conducted maintenance and to maintain and operate the engines, to the extent practicable, in a manner consistent with good air pollution control practices for minimizing emissions. Additionally, Adelphia would be required to conduct an initial performance test and subsequent compliance testing every 8,760 hours of operation or three (3) years, whichever comes first, to demonstrate continued compliance. Testing would be conducted in accordance with 40 CFR §60.4244.

Records of all notifications submitted to comply with this subpart, maintenance conducted on the engines, and performance testing would be maintained in accordance with 40 CFR §60.4245(a). Initial notification of construction commencement would be submitted as required in 40 CFR §60.7(a)(1) and §60.4245(c), and performance testing results would be reported as required in 40 CFR §60.4245(d).

3.2.2.3. NSPS Subpart OOOO – Natural Gas Production, Transmission, and Storage

Subpart OOOO, Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, applies to affected facilities that commenced construction, reconstruction, or modification after August 23, 2011 and before September 18, 2015. The proposed project does not include any source categories within the applicability dates for this subpart. Therefore, this subpart would not apply.

3.2.2.4. NSPS Subpart OOOOa – Crude Oil and Natural Gas Facilities

Subpart OOOOa, Standards of Standards of Performance for Crude Oil and Natural Gas Facilities, applies to affected facilities that commenced construction, reconstruction, or modification after September 18, 2015. The regulation was published final in the Federal Register on June 3, 2016. The rule includes provisions for the following facilities:

- Hydraulically fractured wells;
- Centrifugal compressors with wet seals located between the wellhead and the point of custody transfer to the natural gas distribution segment;
- Reciprocating compressors located between the wellhead and the point of custody transfer to the natural gas distribution segment;
- Continuous bleed natural gas-driven pneumatic controllers with a bleed rate of > 6 scfh located in the production, gathering, processing, or transmission and storage segments (excluding natural gas processing plants);
- Continuous bleed natural gas-driven pneumatic controllers located at natural gas processing plants;
- Pneumatic pumps located in the production and processing segments;
- Storage vessels located in the production, gathering, processing, or transmission and storage segments;
- The collection of fugitive emissions components at a well site;
- The collection of fugitive emissions components at a compressor station; and
- Sweetening units located onshore that process natural gas produced from either onshore or offshore wells.

The Marcus Hook CS would not be a gas wellhead, nor is it a natural gas processing plant. Therefore, the only potentially applicable requirements for the equipment at the station are those for new storage vessels,

reciprocating compressors, fugitive emission sources, and pneumatic controllers, where construction commenced after September 18, 2015.

The produced water storage vessel for the Marcus Hook CS commenced construction after the applicability date, and would be potentially subject to requirements of Subpart OOOOa. Subpart OOOOa applies to storage vessels with VOC emissions equal to or greater than 6 tpy. As shown in Appendix B, the storage vessel at the facility would have VOC emissions less than 6 tpy and, therefore, would not be subject to Subpart OOOOa.

The reciprocating compressors at the facility are subject to the requirements of NSPS OOOOa, 40 CFR §60.5385a, which requires owners and operators of affected reciprocating compressors to change the rod packing prior to each operating 26,000 hours or prior to 36 months of since start up or the last packing replacement. Adelphia would comply with the requirements of this rule for the compressors at the facility.

The pneumatic controllers at the facility would potentially be subject to NSPS OOOOa. All pneumatic controllers proposed to be located at the Marcus Hook CS would either be intermittent or air/electric. Therefore, these units would not be subject to the requirements of Subpart OOOOa.

The collection of fugitive emission sources at the Marcus Hook CS would be an affected facility under this subpart. Per 60.5397a, Adelphia would be required to monitor all fugitive emission components (ex. connectors, flanges, etc.) with an optical gas imaging (OGI) device, and repair all sources of fugitive emissions in accordance with the rule. Adelphia would also develop a corporate-wide monitoring plan and a site specific monitoring plan (or one plan that incorporates all required elements), and conduct surveys on a quarterly basis. Adelphia would also be subject to the applicable recordkeeping and reporting requirements of the rule.

3.5 POTENTIALLY APPLICABLE STATE STANDARDS

The Pennsylvania Code contains regulations that fall under two (2) main categories: the regulations that are generally applicable (e.g., permitting requirements), and those that have specific applicability (e.g., sulfur compound emissions from combustion units). The generally applicable requirements are straightforward (e.g., filing of emission statements) and, as such, are not discussed in further detail. The specific requirements associated with the proposed Marcus Hook CS are discussed in the following section.

3.3.1. 25 Pa Code §123.1 and 123.2

25 Pa Code §123.1 and 123.2, *Prohibition of Certain Fugitive Emissions* and *Fugitive Particulate Matter*, both state exceptions to fugitive emissions sources and methods for controlling fugitive emissions. This regulation applies to the facility in general.

3.3.2. 25 Pa Code §123.11 and 123.13

25 Pa Code §123.11, *Particulate Emissions: Combustion Units,* defines particulate matter emissions for combustion units. Combustion units are defined in §121.1 as stationary equipment used to burn fuel primarily for the purpose of producing power or heat by indirect heat transfer such as boilers. This definition does not apply to the proposed generator and compressor engines at the Marcus Hook CS. As such, the particulate matter emissions limitations for processes in 25 Pa Code §123.13 *Particulate Emissions*: *Processes* would apply to these units instead.

25 Pa Code §123.13 defines particulate matter emissions limitations for processes. For processes excluded from Table 1 of §123.13(b), particulate emissions are limited to 0.04 gr/dscf and 0.02 gr/dscf, for exhaust flowrates less than 150,000 dscfm and greater than 300,000 dscfm, respectively. Particulates from equipment with

exhaust flowrates between 150,000 dscfm and 300,000 dscfm are limited to the allowable emission rate calculated using the formula in §123.13(c)(1)(ii). As all proposed combustion sources at the facility would be fueled exclusively with pipeline quality natural gas, potential particulate emissions from all sources would be expected to comply with these requirements.

3.3.3. 25 Pa Code §123.21

25 Pa Code §123.21, *Sulfur Compound Emissions: General,* states that the concentration of sulfur oxides in the effluent gas may not exceed 500 ppmvd. The proposed equipment at Marcus Hook CS would combust pipeline quality natural gas and the sulfur oxide emissions would be expected to be well below this concentration level in the combustion exhaust.

3.3.4. 25 Pa Code §123.31

25 Pa Code §123.31, *Odor Emissions,* prohibits the emission of malodorous air contaminants from any source that are detectable outside the facility fence line. This regulation applies to the facility in general. The gas in the pipeline will be odorized. However, Adelphia would take measures to minimize odor from the Marcus Hook CS operations by combusting pipeline quality natural gas fuel only, using air pneumatics, employing gas detection monitors inside the compressor station building that is continuously monitored by a supervisory control and data acquisition (SCADA) system, and by use of pressure/vacuum reliefs on the produced fluid storage tank to minimize atmospheric venting under normal operations.

3.3.5. 25 Pa Code §123.41 and 123.43

25 Pa Code §123.41, *Visible Emissions: Limitations,* states that a facility may not emit visible emissions equal to or greater than 20% for a period or periods aggregating more than 3 minutes in any 1 hour, or equal to or greater than 60% at any time. This standard would apply to the proposed combustion units at the Marcus Hook CS. The use of pipeline quality natural gas as fuel would ensure compliance with this requirement.

3.3.6. 25 Pa Code §127.11

25 Pa Code §127.11, *Plan Approval Requirements*, outlines requirements for Plan Approvals required to authorize construction or modification of air contamination sources. Construction, installation, modification, or reactivation of air contaminant sources or air pollution control devices is prohibited unless otherwise approved by the Department. The construction of new equipment at the proposed Marcus Hook CS would be subject to Plan Approval permitting requirements under this requirement.

3.3.7. 25 Pa Code §129.57

25 Pa Code §129.57, *Storage Tanks Less Than or Equal to 40,000 Gallons Capacity Containing VOCs*, contains requirements for storage vessels less than 40,000 gallons in capacity that contain VOCs. Under this section, above-ground storage tanks with a capacity greater than or equal to 2,000 gallons which contain VOCs with a vapor pressure greater than 1.5 psia must be equipped with pressure relief valves which are maintained in good operating condition and which are set to release at no less than 0.7 psig of pressure or 0.3 psig of vacuum (or the highest possible pressure and vacuum in accordance with state or local fire codes or the National Fire Prevention Association (NFPA) guidelines). The proposed produced fluid storage tank, oil storage tank, and TEG tank for the Marcus Hook CS would be less than 2,000 gallons in capacity, and also would not contain VOCs with a vapor pressure greater than 1.5 psia (see EPA TANKS output for vapor pressure data in Appendix B). As such, the proposed tanks would not be subject to the requirements in 25 Pa. Code §129.57.

3.3.8. 25 Pa Code §129.96

25 Pa Code §129.96, *Additional RACT Requirements for Major Sources of NOx and VOCs*, establishes control standards for major stationary sources of NO_X and VOC under the Reasonably Available Control Technology (RACT) program. The standards are also only applicable for sources in existence on or before July 20, 2012. Major stationary sources of NO_X and VOC are defined in 25 PA Code §121.1. For RACT purposes, the applicable major source thresholds are 100 tons per year of NO_X and 50 tons per year of VOC.

This regulation would not apply because the Marcus Hook CS would not have potential emissions of NO_X in excess of 100 tpy or VOC in excess of 50 tpy and because the compressor station would be built after July 20, 2012. However, note that the limitation on hours of operation would be consistent with presumptive RACT for an emergency engine as set for in 25 Pa Code §129.93.

3.3.9. 25 Pa Code §129.203 and 204

25 Pa Code §129.203, *Stationary Internal Combustion Engines*, establishes NO_X RACT emission limits for stationary internal combustion engines rated for more than 1,000 hp which are located in Bucks, Chester, Delaware, Montgomery, or Philadelphia County. The proposed Marcus Hook CS would be located in Delaware County. As such, the proposed compressor engines would be subject to these requirements. The allowable emissions for spark-ignited engines are 3.0 grams of NO_X per brake horsepower- hr. Also, the owner or operator of the stationary internal combustion engine shall calculate the difference between the allowable and actual emissions from the unit during the period from May 1 through September 30. Adelphia would comply with the requirements of this rule by installing natural gas fired spark ignition compressor engines that do not exceed the allowable emissions rate. Adelphia would also keep records of actual emissions from each engine for the specified reporting period. Actual emissions of NO_X from the proposed engines would be determined using the 1-year average emission rate calculated from the most recent permit emission limit compliance demonstration test data for NO_X.

3.3.10. 25 Pa Code §131

25 Pa Code §131, *Ambient Air Quality Standards*, references National Ambient Air Quality Standards (NAAQS) for criteria pollutants and establishes State Ambient Air Quality Standards (SAAQS) for settled particulate, beryllium, fluorides, and hydrogen sulfide. As discussed in Section 3.3, the proposed project would not trigger NSR and the associated emissions of criteria pollutants would not reasonably be anticipated to exceed the corresponding NAAQS. The proposed project would not emit any quantifiable amount of beryllium, fluorides, or hydrogen sulfide, and as such the corresponding SAAQS would not apply.

3.3.11. 25 Pa Code §135

25 Pa Code §135, *Reporting of Sources*, includes requirements for submittal of emissions data to the Department for the purposes of evaluating the effectiveness of regulations, identifying available or potential emission offsets, and maintaining an accurate inventory of air contaminant emissions for air quality assessment and planning activities. As the proposed Marcus Hook CS would be considered part of an oil and natural gas system, emissions from the sources at the site would be subject to reporting and recordkeeping requirements under this section. As such, Adelphia would submit annual emissions inventory data by March 1 of year per the Department's requirements.

3.3.12. 25 Pa Code §137

25 Pa Code §137, *Air Pollution Episodes*, contains requirements intended to prevent the excessive buildup of air pollutants during air pollution episodes, thereby preventing the occurrence of an emergency due to the effects of

the pollutants on the health of persons. This chapter specifically addresses air pollution episodes and the Department's response to such episodes. §137.4 specifies certain industrial sources that must have standby plans, which includes coal- and oil-fired electric and steam generating facilities and other specific manufacturing industries (e.g., metals, refining, paper, etc.). The proposed Marcus Hook CS would be a natural gas transmission facility, which is not an industry specified by these regulations.

3.3.13. 25 Pa Code §139

25 Pa Code §139, *Sampling and Testing*, establishes requirements for source operators to provide adequate sampling ports, safe sampling platforms and adequate utilities, and establishes testing procedures to be followed, for performance testing when required by the Department. The proposed Marcus Hook CS would be designed and constructed to accommodate performance testing as required by applicable federal regulations (e.g., NSPS Subpart JJJJ) and any permit conditions set forth by the Department in the ensuing Plan Approval.

3.2 TITLE V AND STATE PERMITTING REQUIREMENTS

The Title V Operating Permit program applies to stationary sources with the potential to emit over 100 tons per year (tpy), or a lower major source threshold defined by nonattainment status, of any individual criteria air pollutant, 10 tpy of any individual Hazardous Air Pollutant (HAP), or 25 tpy of combined HAPs. Since this site would be in Delaware County, PA which is in the severe ozone transport region, a major source threshold of 25 tpy is applicable for VOC and NO_X. As shown in Appendix B, maximum potential emissions for NO_X, VOC, and total HAP from the Marcus Hook CS would not exceed the major source thresholds for Title V. Therefore, the Marcus Hook CS would be a minor source with respect to the Title V Program after the construction of the proposed project. Adelphia would apply for a State Only Operating Permit once the Plan Approval is issued and the facility is constructed.

With respect to greenhouse gases (GHGs), EPA had previously incorporated provisions into the existing Title V rules via the Greenhouse Gas Tailoring Rule. These included the specification of a major source threshold and subject to regulation/significant emission rate of 100,000 tpy and 75,000 tpy of carbon dioxide equivalent (CO_2e), respectively[1], for current projects. On June 23, 2014, the U.S Supreme Court decision in the case of *Utility Air Regulatory Group v. EPA* effectively changed the permitting procedures for greenhouse gases (GHGs) under the PSD and Title V programs[2]. In essence, GHGs remain "subject to regulation" but only for sources which otherwise trigger Title V requirements. As such, the Marcus Hook CS would not be subject to the regulation of GHG emissions, as it would not trigger Title V requirements.

[1] CO_2e is carbon dioxide equivalents calculated as the sum of the six well-mixed GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) with applicable global warming potentials per 40 CFR 98 applied.
[2] http://www.supremecourt.gov/opinions/13pdf/12-1146_4g18.pdf

Under PADEP air permitting regulations in 25 Pa Code §127.1, new sources of air emissions must implement Best Available Technology (BAT). The Marcus Hook CS would be installing new equipment, sources applicable to this requirement that must be deemed by PADEP to satisfy this requirement before a Plan Approval can be issued. The section addresses the proposed BAT for the various emission sources proposed as part of this project.

4.1 BAT FOR COMPRESSOR ENGINES

The proposed natural gas-fired compressor engines would be 1,875 bhp four stroke-lean burn Caterpillar G3606 engines. The engines would be equipped with air/fuel ratio control to reduce NO_X emissions. Caterpillar's specifications for this engine indicate an emission rate of 0.3 g/bhp-hr, which is much lower than the current applicable limit of 1.0 g/bhp-hr required by NSPS Subpart JJJJ for engines of this size, type, and use. Furthermore, this emission rate would be compliant with PADEP's BAT limit for compressor engines in the production/gathering segment of the industry authorized under GP-5 as finalized in February 2013. As such, Adelphia believes that the potential NO_X emissions rate of 0.3 g/bhp-hr complies with the BAT requirement in 25 Pa Code § 127.1 and as such, Adelphia would propose a limit of 0.3 g/bhp-hr.

A potential option to further reduce NO_X emissions is through the use of Selective Catalytic Reduction (SCR) control technology. The SCR process chemically reduces the NO_X molecule into molecular nitrogen and water vapor. A nitrogen-based reagent such as ammonia or urea is injected into the engine exhaust upstream of a catalyst bed. The exhaust gas mixes with the reagent and enters a reactor module containing catalyst. The hot flue gas and reagent diffuse through the catalyst. The reagent reacts selectively with the NO_X within a specific temperature range and in the presence of the catalyst and oxygen. The rate of reaction would depend on the type of catalyst, reagent, and the temperature. The reaction requires an optimum temperature range of 480 to 800 ^{o}F and fairly constant exhaust temperatures for best performance. [3]

SCR is not a widely used technology for natural gas-fired combustion engines like those proposed for this project. Although potentially technically feasible, SCR is very costly. Capital costs are significantly higher than other types of NO_X controls due to the volume of catalyst that is required. The Operating & Maintenance (O & M) costs of using SCR are driven by the reagent usage, catalyst replacement, and increased electrical power usage. The following shows budgetary cost estimates for installation of SCR for each of the compressor engines proposed for this project:

Capital Cost	~ $990,000
O & M Cost	~ $200,000
Annual Cost	~ $300,000

The compressor engines being proposed for the Marcus Hook CS are estimated with potential emissions at approximately 5.43 tpy each. At an estimated NO_X control efficiency of 90%, the cost effectiveness of SCR on the engines at the proposed Marcus Hook CS would be estimated to be greater than $60,000 per ton (see Appendix B for detailed cost-effectiveness calculations). Therefore, SCR is determined to be **economically infeasible** for this application. As such, Adelphia believes that the proposed NO_X emission rate of 0.3 g/bhp-hr complies with the BAT requirement in 25 Pa Code § 127.1.

[3] http://www.epa.gov/ttn/catc/dir1/fscr.pdf

Adelphia is proposing the use of an oxidation catalyst as BAT for controlling emissions of Carbon Monoxide (CO) and Volatile Organic Compounds (VOC) from the compressor engines. The rate of formation of CO during natural gas combustion depends primarily on the efficiency of combustion. The formation of CO occurs in small, localized areas inside the combustion chamber (engine cylinder) where oxygen levels cannot support the complete oxidation of carbon to CO_2. CO emissions resulting from natural gas combustion can be decreased via catalytic oxidation.

This reaction is promoted by several noble metal-enriched catalysts at high temperatures. The oxidation catalyst will be guaranteed a CO removal efficiency of 93% at this temperature, resulting in an emission rate of 0.17 g/bhp-hr. This emission rate is well below the current limit of 2.0 g/bhp-hr required by NSPS Subpart JJJJ for non-emergency lean burn natural gas engines ≥ 1,350 HP manufactured after July 1, 2010, and is less than the PADEP's BAT level for compressor engines under GP-5 (0.25 g/bhp-hr). As such, Adelphia believes that the potential CO emissions rate complies with the BAT requirement in 25 Pa Code § 127.1.

Catalytic oxidation also promotes the conversion of non-methane/non-ethane hydrocarbon (NMNEHC) and formaldehyde to carbon dioxide and water, over the face of the catalyst, thereby reducing emissions of these pollutants. The efficiency of the oxidation catalyst proposed for the Marcus Hook CS compressor engines is estimated to be at least 50% for NMNEHC emissions resulting in an emission rate of 0.16 g/bhp-hr, and at least 75% for formaldehyde emissions resulting in an emission rate of 0.04 g/bhp-hr. The engines' NMNEHC emission rate is well below the current limit of 0.7 g/bhp-hr required by NSPS Subpart JJJJ for non-emergency lean burn natural gas engines ≥ 1,350 HP manufactured after July 1, 2010, and the proposed NMNEHC and formaldehyde emission limits are compliant with PADEP's BAT limits in the recently finalized GP-5. Similar to CO and NO_X, Adelphia believes that the potential NMNEHC and formaldehyde emission rates comply with the BAT requirement in 25 Pa Code § 127.1.

Potential BAT options for both PM/PM_{10} and SO_2 emissions, based on a search in the EPA's Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database, indicate that the only technologies used to reduce these pollutants from natural gas burning engines are good combustion practices and low-sulfur fuels. The sulfur content of the pipeline quality natural gas, which would be used in the engines, is very low. Adelphia would also operate the engines in accordance with the manufacturer's recommended practice to minimize emissions of particulate matter and SO_2. Both technologies are considered base-case and are equally effective. Adelphia proposes that the combination of good combustion practices and the firing of pipeline quality natural gas be considered BAT for the proposed compressor engines.

The proposed BAT levels for the new engines at the Marcus Hook CS are summarized below. These levels are at least as stringent as the presumptive BAT levels that PADEP established in the GP-5 permit conditions. See Appendix B for a top-down BACT analysis.

Table 4-1. Summary of Proposed BAT for Compressor Engines

Pollutant	Proposed BAT for Compressor Engines		
	Controls	Removal Efficiency	Emission Rate
NO_X	Lean-Burn, Air-to-Fuel Ratio Control	Inherent Design	0.3 g/bhp-hr
CO	Catalytic Oxidation	93 %	0.17 g/bhp-hr
NMNEHC	Catalytic Oxidation	~50 %	0.16 g/bhp-hr
HCHO	Catalytic Oxidation	75 %	0.04 g/bhp-hr

4.2 BAT FOR EMERGENCY GENERATOR ENGINE

The Cummins GTA28 emergency generator engine would be expected to operate less than 500 hours per year. Based on potential emissions from the unit, the emergency generator engine is exempt from Plan Approval permitting. The engine would be equipped with a non-selective catalytic reduction (NSCR or "three-way") catalyst for controlling emissions of NOX, CO, and VOC. The engine will comply with Federal requirements of NSPS JJJJ.

4.3 BAT FOR TANKS

NSPS OOOOa regulates VOC emissions from storage tanks at oil and gas facilities. Emissions control is required for storage tanks with VOC emissions greater than 6.0 tpy, as EPA has deemed controls for such tanks to be cost effective. The proposed produced fluid tank for the Marcus Hook CS would be estimated to have potential VOC emissions from combined working, breathing, and flashing losses at 0.50 tpy. As such, the installation of add-on controls is believed to be economically infeasible for this tank. Potential emissions from all other storage tanks are even lower than the produced fluid tank.

4.4 BAT FOR GHG EMISSIONS SOURCES

While the proposed construction of the Marcus Hook CS would not trigger PSD permitting for any regulated pollutant based on maximum potential emission rates, Adelphia is including this discussion of BAT for GHG pollutants as requested by PADEP for similar projects. EPA has published white papers for different industries to discuss available GHG control technologies. However, at this time, there is no white paper specifically for the natural gas sector. In the permitting guidance, EPA agrees that energy efficiency improvements would satisfy the BACT requirements for GHGs in most cases. As such, GHG BAT would be expected to be limited to the use of energy efficient design and the minimization of GHG releases through good work practices for the natural gas industry.

Adelphia is proposing that 40 CFR 60 Subpart OOOOa requirements be utilized to satisfy Best Available Technology (BAT) requirements for fugitive emissions (as opposed to pulling in state-specific Leak Detection and Repair [LDAR] requirements such as GP-5), as the requirements would be stringent and prevent confusing regulatory overlap (at no additional environmental benefit). As noted in Section 3.3.2.4, the requirements of this

regulation would apply to the Marcus Hook CS. The regulation does not distinguish between gathering and transmission facilities in terms of LDAR requirements; the Marcus Hook CS would be subject to OGI monitoring requirements as a transmission facility. Fugitive GHG (and to a lesser extent, VOC) leaks would be minimized by adhering to good operating and maintenance practices. Despite the lack of federal or PADEP guidance on conducting control technology reviews for GHGs, Adelphia believes the proposed project is designed to reduce GHG emissions where technically and economically feasible and, therefore, to a level that would be consistent with BACT or BAT.

In addition, Adelphia has reviewed EPA's voluntary Natural Gas Star program for potential emission reduction measures.[4] Total site-wide VOC and GHG emissions from fugitive and blowdown sources are estimated to be low. Therefore, any additional emission reduction would not be cost effective due to the minimal emission reductions achieved. Table 4-5 summarizes the evaluation of the Natural Gas Star program practices for the proposed compressor station.

[4] http://www.epa.gov/gasstar/

Table 4-5. Summary of Natural Gas Star Program

Energy Star Project[5]	Feasibility Assessment
Replace Gas Starters with Air or Nitrogen	Feasible – Engine gas starters may be replaced with air. However, this requires installation of a large compressed air system that is not practical.
Reduce Natural Gas Venting with Fewer Compressor Engine Startups and Improved Engine Ignition	Feasible – Engines are intended to operate at all times other than preventative maintenance shutdowns. Adelphia's preventative maintenance program would reduce engine starts related to unanticipated engine shutdown/repairs.
Reducing Methane Emissions from Compressor Rod Packing Systems	Not feasible – This reduction strategy is applicable to older compressors with potentially worn packing. Compressors are equipped with newly installed packing by design. Adelphia would follow the manufacturer's recommended procedures and Subpart OOOOa for proper maintenance and inspection of compressor rod packing systems.
Test and Repair Pressure Safety Valves	Feasible - Completed by Adelphia on periodic basis.
Eliminate Unnecessary Equipment and/or Systems	Adelphia would only be installing what is required for this application.
Install Automated Air/Fuel Ratio Controls	Feasible – Engines would be equipped with state-of-the art AFR (air-to-fuel-ratio) controllers.
Install Electric Motor Starters	Not feasible – these engines are intended to operate at all times therefore the number of starts is minimized and the potential methane reductions would be minimal.
Reducing Emissions When Taking Compressors Off-Line	Feasible - Blowdown gas may be injected into the fuel gas recovery system. However, the proposed facility is a transmission facility that is expected to operate at or near 100% capacity year round. Shutdown events are expected to be very infrequent, and the current design of the station does not allow for recycling of engine blowdowns.
Replace Compressor Cylinder Unloaders	Not Applicable.
Install Electric Compressors	Not Feasible - Electric compressors are cost prohibitive even if electric supply is available. As stated in the NG Star fact sheet "The capital costs and the electricity costs, however, are higher for an electric motor compared to those for a gas driven engine. The savings from maintenance costs relative to the cost of energy would not be justified unless the engine is at the end of its economic life."
Wet Seal Degassing Recovery System for Centrifugal Compressors	Not applicable to CAT engines - units are reciprocating compressors.

[5] http://epa.gov/gasstar/tools/recommended.html#compressors

5. SAMPLE EMISSION SOURCE CALCULATIONS

The characteristics of air emissions from the Marcus Hook CS, along with the methodology used for calculating emissions from the proposed sources, are described in narrative form below. Detailed supporting calculations are also provided in Appendix B.

Emissions from the Marcus Hook CS would result from natural gas combustion in the compressor and generator engines, and from flashing, working, and breathing losses from the produced fluid storage tank and other tanks. Finally, there would be fugitive emissions from process-related equipment. The methods by which emissions from each of these sources has been calculated are summarized below.

- **Compressor Engines:** Potential emissions of nitrogen oxides (NO_x), carbon monoxide (CO), non-methane/non-ethane hydrocarbon (NMNEHC), formaldehyde, and GHGs are calculated using factors provided by the engine manufacturer and the oxidation catalyst manufacturer where available. Potential emissions of other criteria pollutants and all other HAPs are calculated using U.S. EPA's AP-42 factors for natural gas-fired engines.[6] When needed to estimate emissions, calculations assume a site-specific heat content of natural gas.

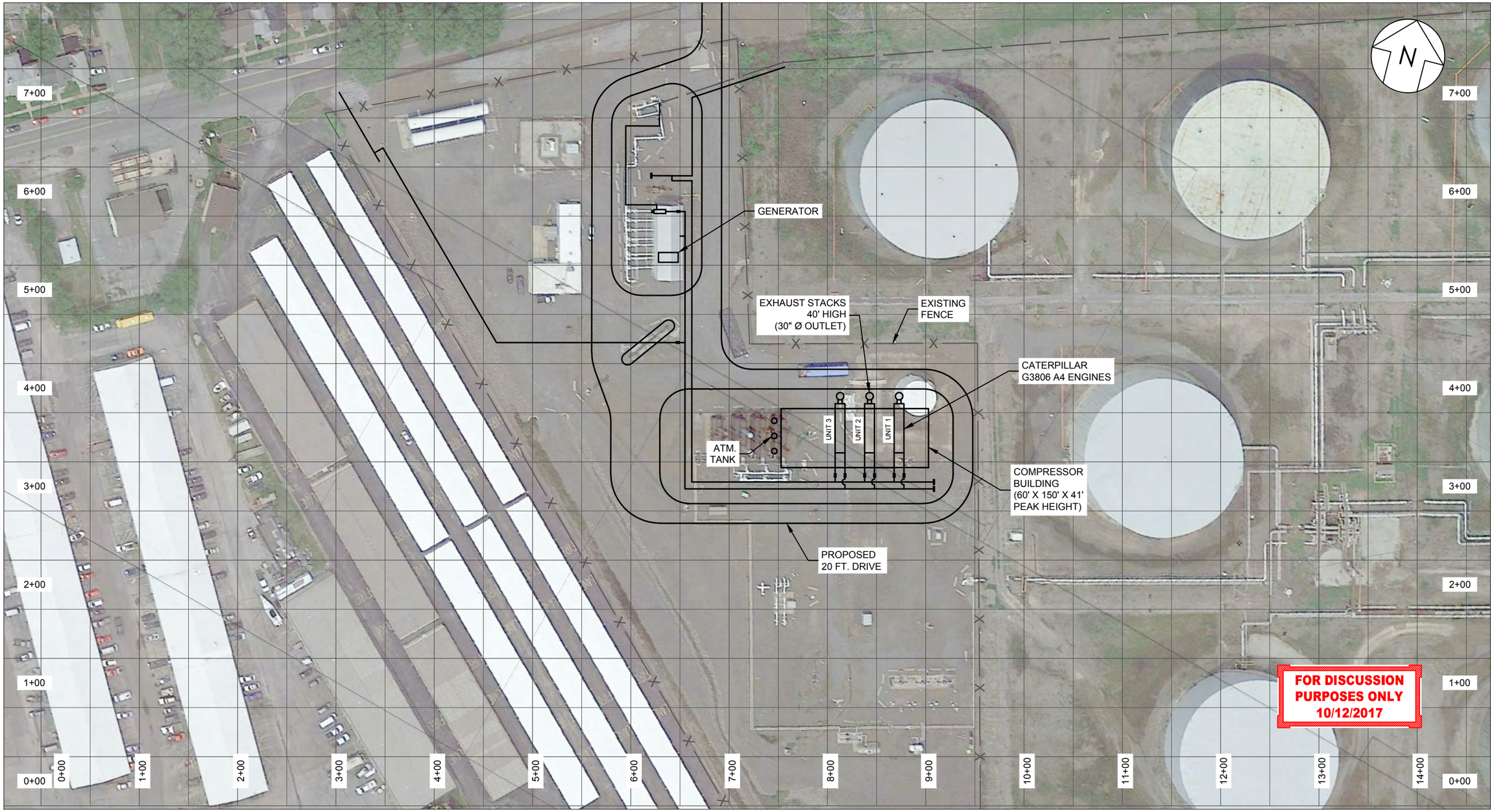
- **Emergency Generator Engine:** Potential emissions of nitrogen oxides (NO_x), carbon monoxide (CO), non-methane/non-ethane hydrocarbon (NMNEHC), and GHGs are calculated using factors provided by the engine manufacturer. Potential emissions of other criteria pollutants and all other HAPs are calculated using U.S. EPA's AP-42 factors for natural gas-fired engines. Potential GHG emissions from the engine have been calculated using the relevant emission factors for natural gas combustion from 40 CFR 98, Subpart C. When needed to estimate emissions, calculations assume a site-specific heat content of natural gas

- **Process Fugitives:** Potential emissions of VOC and HAPs from process fugitives are calculated using estimated component counts of valves, connectors, flanges, open-ended lines, pump seals, etc. along with U.S. EPA's equipment leak emission factors.[7] In addition, potential VOC and HAP emissions from vented blowdown emissions have been estimated using the expected number of blowdown events and the volume of gas to be vented. Similarly, potential GHG emissions from process fugitives and blowdown events have been calculated using the relevant equations from 40 CFR 98, Subpart W.

- **Storage Tanks:** Potential emissions of VOC and HAP from the storage tanks have been estimated, although they are expected to be insignificant. Emissions from the TEG and oil tanks have been estimated using EPA's TANKS 4.0.9d software to evaluate working and breathing losses from the tanks. Emissions from the produced fluids tank have been estimated using E & P TANK software which includes flashing, working, and breathing losses.

[6] U.S. EPA, AP 42, Fifth Edition, Volume I, Chapter 3.2, *Natural Gas-Fired Reciprocating Engine*, July 2000.
[7] *Table 2-4 :Oil & Gas Production Operations Average Emission Factors, Protocol for Equipment Leak Emission Estimates*, EPA 453/R-95-017, November 1995. Emission factors based on average measured TOC from component types indicated in gas service at O&G Production Operations.

APPENDIX A: AREA MAP AND PROCESS FLOW DIAGRAM



REV	DESCRIPTION	CHK	DATE	APP	DATE

REVISION

DRAWN BY	PLH	09/12/17
DESIGNED BY		
CHECKED BY		
APPROVED BY		
HGA JOB NO.	8.A17022	
PLOT SCALE	1:1	
MODEL ID		

HGA

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FIRM #: PA

NEW JERSEY RESOURCES
SITE PLAN
MARCUS HOOK PUMP STATION
DELAWARE COUNTY, PENNSYLVANIA

SCALE	DRAWING NUMBER	REV
1" = 100'	8.A17022.01-SITE-MARCUS HOOK	

HUMPHREY, PERRY 10/12/2017 4:39 PM

LEGEND

- PROPOSED MARCUS HOOK COMPRESSOR STATION
- PROPOSED 16" TILGHMAN LATERAL
- PROPOSED 16" PARKWAY LATERAL
- EXISTING PIPELINE

0 2,000 4,000 Feet

NOTES

DRG 7.5 MIN. QUAD MAP:
-o39075g4 (MARCUS HOOK, PA)

HUNT, GUILLOT & ASSOCIATES, LLC
ONE METROPLEX DRIVE, SUITE 100
BIRMINGHAM, AL 35209
PHONE:205-970-4977
FIRM # PA 4004148

REV	DESCRIPTION	CHK	DATE	APP	DATE
0	ISSUED FOR FERC	MEH	12/29/2017	RCH	12/29/2017

DRAWN BY	PLH	12/19/17
DESIGNED BY	PLH	06/29/17
CHECKED BY	MEH	12/21/17
APPROVED BY	RCH	12/21/17
HGA JOB NO.	8.A17022.01.0	
PLOT SCALE	1:1	
MODEL ID	8.A17022	

ADELPHIA GATEWAY, LLC
PROJECT LOCATION MAP
PROPOSED MARCUS HOOK COMPRESSOR STATION
DELAWARE COUNTY, PENNSYLVANIA

SCALE	DRAWING NUMBER	REV
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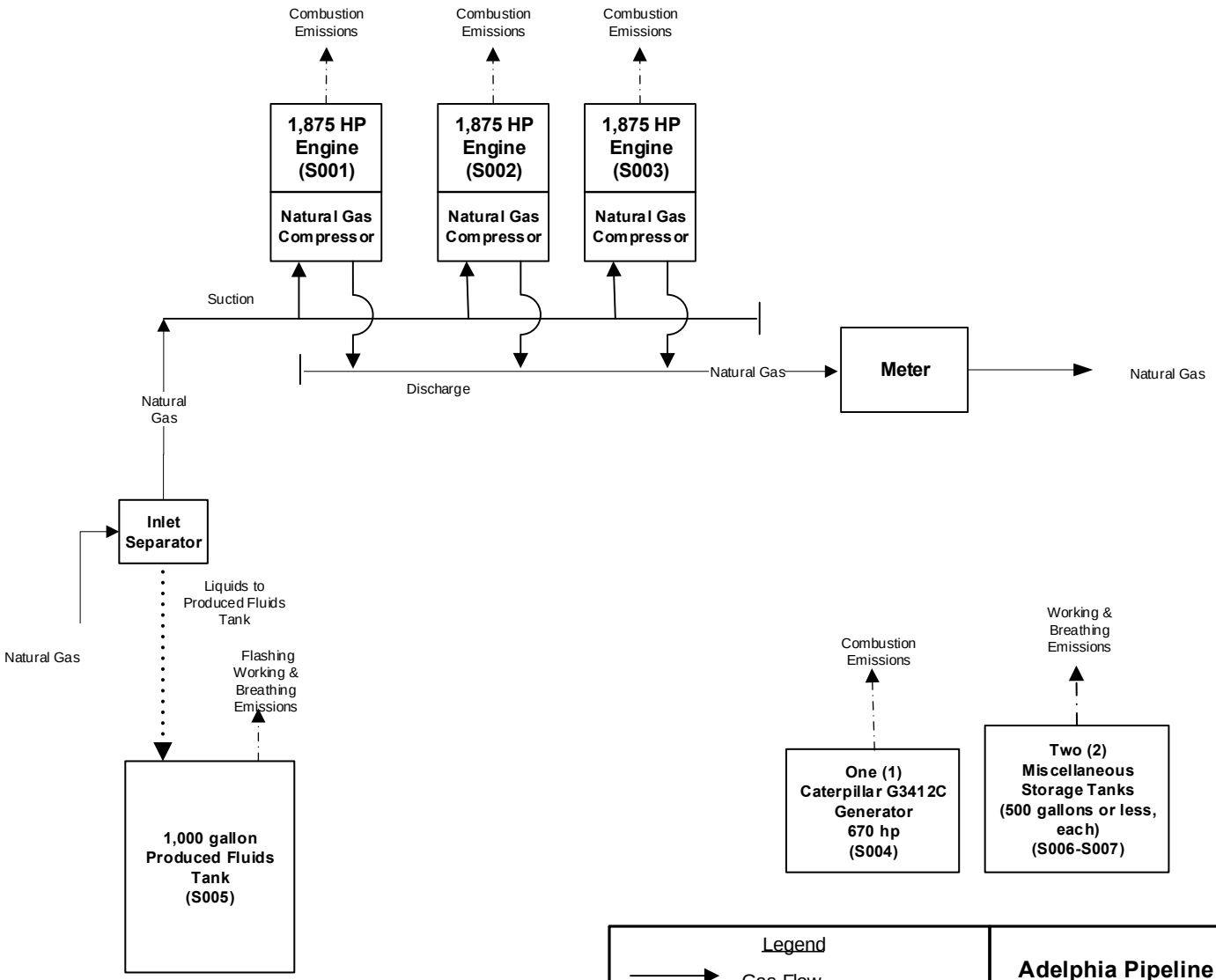
1/8/2018 3:24:42 PM mfowler

RR01 - FIGURE 1-2a



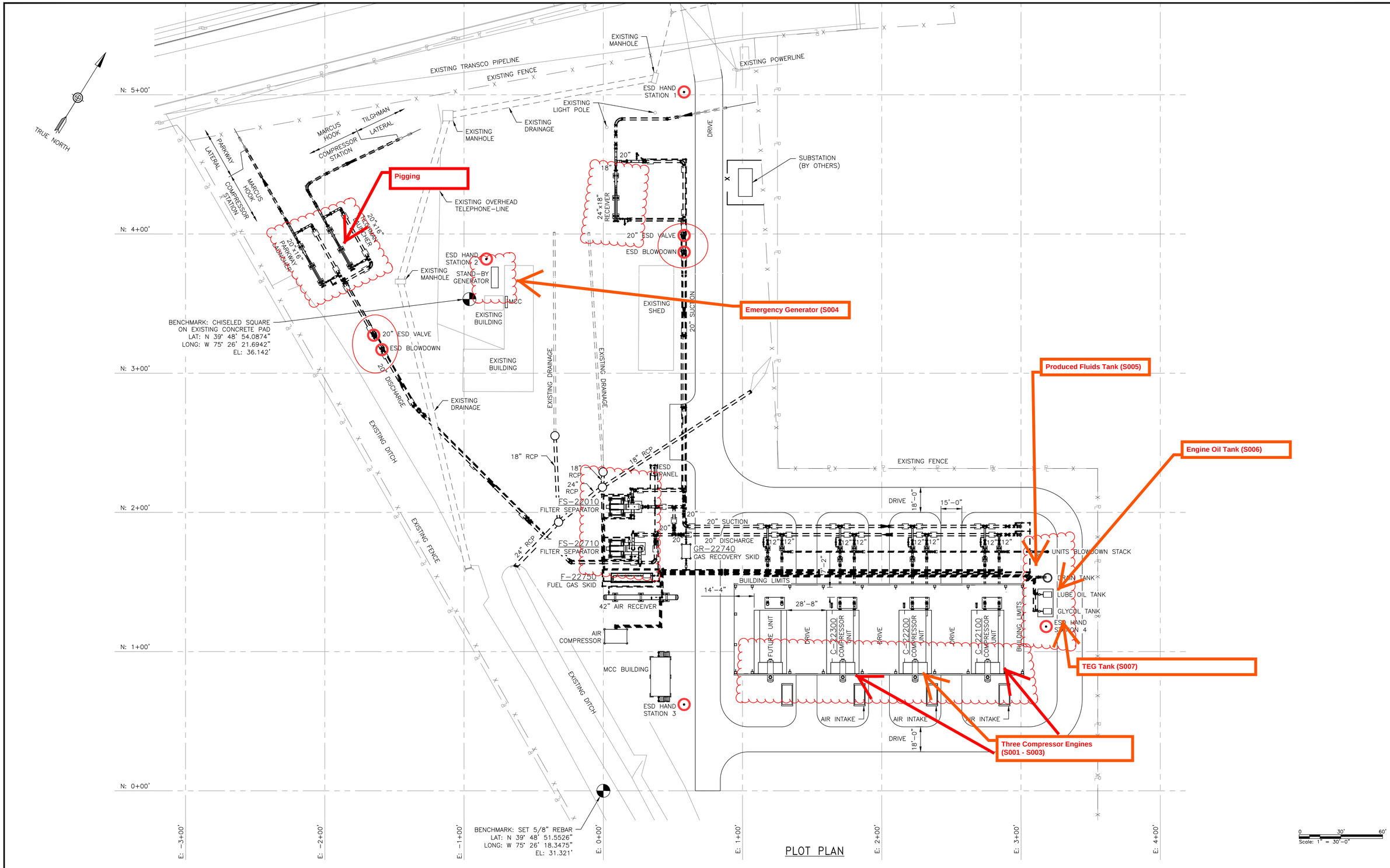
Adelphia Pipeline Company, LLC

Process Flow Diagram*

Marcus Hook Compressor Station

Trinity Consultants

April 2018



PLOT PLAN

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ADELPHIA GATEWAY

FOR REVIEW AND COMMENT

DATE: 08/20/2018

– NOT FOR CONSTRUCTION –

REV	DESCRIPTION	CHK	DATE	APP	DATE
B	ISSUED FOR 70% REVIEW	MVL	08/20/18	RCH	08/20/18
A	ISSUED FOR 30% REVIEW	MVL	03/09/18	RCH	03/09/18

REVISION

DRAWN BY	BPT	02/21/18
DESIGNED BY	HGA	02/21/18
CHECKED BY	DNS	02/26/18
APPROVED BY	RCH	03/05/18
HGA JOB NO.	8.A17022.02	
PLOT SCALE		
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ADELPHIA GATEWAY
MARCUS HOOK COMPRESSOR STATION
PLOT PLAN
DELAWARE COUNTY, PENNSYLVANIA

SCALE	DRAWING NUMBER	REV
1"=30'	MRHKCS-M-101	B

8/22/2018 12:31 PM

APPENDIX B: EMISSION CALCULATIONS & BAT CALCULATIONS

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-1. Internal Combustion (IC) Engine Emissions Calculations

Engine Information:

Source ID:	S001-S003
Manufacturer:	Caterpillar
Model No.:	G3606
Stroke Cycle:	4-stroke
Type of Burn:	Lean
Rated Horsepower (bhp) each:	1,875
Control Device:	Oxidation Catalyst
Stack Designation:	P001-P003
Number of Units:	3

Engine Fuel Information:

	Per Unit
Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,030
Specific Fuel Consumption (Btu/bhp-hr):	7,666
Maximum Fuel Consumption at 100% Load (scf/hr):	13,955
Engine Exhaust flow rate (cfm)	11,972
Heat Input (MMBtu/hr):	14.37
Potential Fuel Consumption (MMBtu/yr):	125,914
Max. Fuel Consumption (MMscf/yr):	122.2
Max. Annual Hours of Operation (hr/yr):	8,760

Engine Emissions Data:

Pollutant	**Emission Factor**	**Units**	**Potential Emissions Per Unit**		**Estimation Basis / Emission Factor Source**
			lbs/hr	**tpy**	
NO_X	0.30	g/bhp-hr	1.24	5.43	Manufacturer's Specifications
NMNEHC (Excludes HCHO)	0.16	g/bhp-hr	0.66	2.90	Vendor Guarantee
VOC (NMNEHC + Formaldehyde)	---	---	0.83	3.62	Vendor Guarantee (NMNEHC + HCHO)
CO	0.17	g/bhp-hr	0.70	3.08	Vendor Guarantee
SO_X	0.001	lb/MMBtu	0.01	0.04	AP-42, Table 3.2-2 (Aug-2000)
PM_{10}	0.01	lb/MMBtu	0.14	0.63	AP-42, Table 3.2-2 (Aug-2000)
$PM_{2.5}$	0.01	lb/MMBtu	0.14	0.63	AP-42, Table 3.2-2 (Aug-2000)
Formaldehyde (HCHO)	0.04	g/bhp-hr	0.17	0.72	Vendor Guarantee
GHG (CO_2e)	See Table Below		2,359	10,333.13	Man. Specs. And 40 CFR 98, Table C-2
Other (Total HAP)	See Table Below		0.44	1.95	AP-42, Table 3.2-2 (Aug-2000)

Notes:
1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type
4. Vendor/manufacturer data are based on preliminary design. Bidding is still in process and as such emissions are current estimate and will be at least equivalent to final specifications

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-1. Internal Combustion (IC) Engine Emissions Calculations

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Potential Emissions Per Unit		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	454	g/bhp-hr	1876.65	8219.74	Manufacturer's Specifications
CH_4	4.66	g/bhp-hr	19.26	84.37	Manufacturer's Specifications (THC-NMHC)
N_2O	0.0001	kg/MMBtu	0.00	0.01	40 CFR 98, Table C-2
GHG (CO_2e)			**2,359**	**10,333**	
Organic HAPs:					
1,1,2,2-Tetrachloroethane	4.00E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
1,1,2-Trichloroethane	3.18E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
1,3-Butadiene	2.67E-04	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-2 (Aug-2000)
1,3-Dichloropropene	2.64E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
2-Methylnaphthalene	3.32E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
2,2,4-Trimethlpentane	2.50E-04	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-2 (Aug-2000)
Acenaphthene	1.25E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Acenaphthylene	5.53E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Acetaldehyde	8.36E-03	lb/MMBtu	0.12	0.53	AP-42, Table 3.2-2 (Aug-2000)
Acrolein	5.14E-03	lb/MMBtu	0.07	0.32	AP-42, Table 3.2-2 (Aug-2000)
Benzene	4.40E-04	lb/MMBtu	0.01	0.03	AP-42, Table 3.2-2 (Aug-2000)
Benzo(b)fluoranthene	1.66E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Benzo(e)pyrene	4.15E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Benzo(g,h,i)perylene	4.14E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Biphenyl	2.12E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-2 (Aug-2000)
Carbon Tetrachloride	3.67E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Chlorobenzene	3.04E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Chloroform	2.85E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Chrysene	6.93E-07	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Ethylbenzene	3.97E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Ethylene Dibromide	4.43E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Fluoranthene	1.11E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Fluorene	5.67E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Methanol	2.50E-03	lb/MMBtu	0.04	0.16	AP-42, Table 3.2-2 (Aug-2000)
Methylene Chloride	2.00E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
n-Hexane	1.11E-03	lb/MMBtu	0.02	0.07	AP-42, Table 3.2-2 (Aug-2000)
Naphthalene	7.44E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
PAH	2.69E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Phenanthrene	1.04E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Phenol	2.40E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Pyrene	1.36E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Styrene	2.36E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Tetrachloroethane	2.48E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Toluene	4.08E-04	lb/MMBtu	0.01	0.03	AP-42, Table 3.2-2 (Aug-2000)
Vinyl Chloride	1.49E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-2 (Aug-2000)
Xylene	1.84E-04	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-2 (Aug-2000)
Total HAP			**0.44**	**1.95**	

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-2. Generator Engine Emissions Calculations

Engine Information:

Source ID:	S004
Manufacturer:	Cummins
Model No.:	GTA28
Stroke Cycle:	4-stroke
Type of Burn:	Rich
Rated Horsepower (bhp):	701

Engine Fuel Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,030
Specific Fuel Consumption (Btu/bhp-hr):	8,373
Max. Fuel Consumption at 100% (scf/hr):	5,699
Heat Input (MMBtu/hr):	5.87
Potential Fuel Consumption (MMBtu/yr):	2,935
Max. Fuel Consumption at 100% (MMscf/hr):	0.0057
Max. Fuel Consumption (MMscf/yr):	2.8
Max. Annual Hours of Operation (hr/yr):	500

Engine Emissions Data:

Pollutant	Post-Control Emissions		Maximum Potential Emissions		Estimation Basis / Emission Factor Source
	Emission Factor	Units	lbs/hr	tpy	
NO_X	2.00	g/bhp-hr	3.09	0.77	Manufacturer's Specifications
NMNEHC as propane (excludes HCHO)	1.00	g/bhp-hr	1.55	0.39	Manufacturer's Specifications
VOC (NMNEHC + Formaldehyde)	---	---	1.67	0.42	Manufacturer Specification (NMNEHC) + HCHO(AP-42)
CO	4.00	g/bhp-hr	6.18	1.55	Manufacturer's Specifications
SO_X	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
PM_{10}	0.02	lb/MMBtu	0.11	0.03	AP-42, Table 3.2-3 (Aug-2000)
$PM_{2.5}$	0.02	lb/MMBtu	0.11	0.03	AP-42, Table 3.2-3 (Aug-2000)
Formaldehyde (HCHO)	0.02	lb/MMBtu	0.12	0.03	AP-42, Table 3.2-3 (Aug-2000)
GHG (CO_2e)	See Table Below		781	195	40 CFR 98 and Manufacturer
Other (Total HAP, incl. HCHO)	See Table Below		0.19	0.05	AP-42, Table 3.2-3 (Aug-2000)

Notes:
1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.
4. Vendor/manufacturer data are based on preliminary design. Bidding is still in process and as such emissions are current estimate and will be at least equivalent to final specifications.

Greenhouse Gas (GHG) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
GHGs:					
CO_2	53.06	kg/MMBtu	687	172	40 CFR 98, Table C-1
CH_4	2.440	g/bhp-hr	3.77	0.94	Manufacturer's Specifications
N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
GHG (CO_2e)			**781**	**195**	

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-2. Generator Engine Emissions Calculations

Hazardous Air Pollutant (HAP) Emissions Calculations:

Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
			lbs/hr	tpy	
Organic HAPs:					
1,1,2,2-Tetrachloroethane	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,1,2-Trichloroethane	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,3-Butadiene	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
1,3-Dichloropropene	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Acetaldehyde	0.003	lb/MMBtu	0.02	0.00	AP-42, Table 3.2-3 (Aug-2000)
Acrolein	0.003	lb/MMBtu	0.02	0.00	AP-42, Table 3.2-3 (Aug-2000)
Benzene	0.002	lb/MMBtu	0.01	0.00	AP-42, Table 3.2-3 (Aug-2000)
Carbon Tetrachloride	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Chlorobenzene	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Chloroform	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Ethylbenzene	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Ethylene Dibromide	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Methanol	0.003	lb/MMBtu	0.02	0.00	AP-42, Table 3.2-3 (Aug-2000)
Methylene Chloride	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Naphthalene	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
PAH	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Styrene	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Toluene	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Vinyl Chloride	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Xylene	0.000	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Total HAP (Excluding HCHO)			**0.07**	**0.02**	

Example Calculations:
Emission Rate (lbs/hr) = EF (g/bhp-hr) * Engine Power (hp) ÷ 453.592 (grams/lb)
Emission Rate (lbs/hr) = EF (lb/MMBtu) * Engine Heat Input (MMBtu/hr)
Emission Rate (lbs/hr) = EF (kg/MMBtu) * Engine Heat Input (MMBtu/hr) * 2.205 (lb/kg)
Emission Rate (tpy) = Emissions (lb/hr) * (hrs/yr) ÷ 2,000 (lbs/ton)

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-3. Storage Tank Emissions Calculations - Produced Fluids Tank

Storage Tank Information:

Source ID:	S005
Tank Capacity (gallons):	1,000
Tank Contents:	Produced Fluids
Annual Throughput (gallons/year):	24,000
Daily Throughput (bbl/day)	2
Percent Condensate	5%
Condensate Throughput (bbl/day)	0.1
Control Type:	None
Control Efficiency:	N/A
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	0.05	0.23	E&P TANK 2.0
HAPs	0.01	0.02	E&P TANK 2.0
GHG (CO2e)	0.03	0.15	E&P TANK 2.0

E & P Tanks Emissions Data:

Pollutant	Total Emissions (Working + Breathing + Flashing)		
	lbs/hr	lbs/yr	tpy
VOC	0.05	455.52	0.23
HAPs	0.01	43.80	0.02
GHG (CO_2e)	0.03	219.00	0.15

Notes:
1. E & P TANK software estimates working, breathing, and flashing losses and reports as one total. Emissions are based on a conservative estimate of 95 % water and 5% condensate
2. This tank does contain hydrocarbons that could be flashed off at tank operating conditions.

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-4. Miscellaneous Storage Tank Emissions Calculations

Storage Tank Information:

Source ID:	S006	S007
Tank Capacity (gallons):	500	500
Tank Contents:	Engine Oil	TEG
Annual Throughput (gallons/year):	6,000	6,000
Control Type:	None	None
Control Efficiency:	N/A	N/A
Max. Annual Hours of Operation (hr/yr):	8,760	8,760

Emissions Data:

Pollutant	Total Emissions (Working + Breathing)		Total Emissions (Working + Breathing)	
	lbs/hr	tpy	lbs/hr	tpy
VOC	3.42E-05	1.50E-04	2.28E-06	1.00E-05
HAPs	3.42E-05	1.50E-04	2.28E-06	1.00E-05

Notes:
1. EPA TANKS software run for engine oil is using properties of distillate fuel oil #2.
2. EPA TANKS software run for TEG is using properties of propylene glycol.

Tank Emissions Data:

Pollutant	Total Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	3.65E-05	1.60E-04	EPA TANKS 4.0.9d
HAPs	3.65E-05	1.60E-04	EPA TANKS 4.0.9d
Methane	0.00	0.00	EPA TANKS 4.0.9d

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-5. Fugitive Emissions Calculations

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor		Average Gas Leak Rate	Max Gas Leak Rate	Potential VOC Emissions	Potential HAP Emissions
		(lb/hr/component)	Factor Source	(lb/hr)	(tpy)	(tpy)	(tpy)
Connectors	1,596	0.0004	EPA Protocol, Table 2-4	0.70	3.39	0.27	0.00
Flanges	798	0.001	EPA Protocol, Table 2-4	0.69	3.31	0.26	0.00
Open-Ended Lines	45	0.004	EPA Protocol, Table 2-4	0.20	0.96	0.08	0.00
Pump Seals	6	0.005	EPA Protocol, Table 2-4	0.03	0.15	0.01	0.00
Valves	279	0.010	EPA Protocol, Table 2-4	2.77	13.34	1.05	0.00
Other	24	0.019	EPA Protocol, Table 2-4	0.47	2.24	0.18	0.00
Total				**4.85**	**23.38**	**1.84**	**0.00**

Notes:
1. "Other" equipment 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 station
3. Conservatively assumed that maximum leak rate is 10% greater than measured average leak rate for the purposes of establishing PTE
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis

Rod Packing Emissions

Number of Compressors	Number of Rods Per Compressor	Leak Rate (scf/hr/rod)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
3	4	15	1,576,800	1.84	0.00	0.00	32.60	814.96
Total				**1.84**	**0.00**	**0.00**	**32.60**	**814.96**

1. Caterpillar does not publish specific crankcase and rodpacking emission leak rates. The leak rates are based on engineering estimates on the operation of the engines

Engine Crankcase Emissions

Number of Engines	Engine Rating (hp)	Leak Rate (scf/bhp-hr)	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HCHO Emissions (tpy)	Potential HAP Emissions (tpy)	Potential CO_2 Emissions (tpy)	Potential CH_4 Emissions (tpy)	Potential CO_2e Emissions (tpy)
3	1,875	0.5	24,637,500	0.04	0.01	0.02	32.18	0.33	40.44
Total				**0.04**	**0.01**	**0.02**	**32.18**	**0.33**	**40.44**

Flow Rate of Engine[1] 11,972 ft^3/min

1. From Vendor data sheet

Engine Crankcase Exhaust Composition

Constituent	Engine Exhaust Emissions (tpy)	Composition of Exhaust Gas (lb/MMscf)
VOC	9	2.93
HCHO	3	1.09
Total HAP	5	1.48
CO_2	8,220	2,613
CH_4	84	26.82

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-5. Fugitive Emissions Calculations

VOC and HAP Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Station ESD Vent	1,000,000	1	1,000,000	1.17	0.00
Pigging and Pipeline Blowdowns	4,000	2	8,000	0.01	0.00
Reciprocating Compressors	10,000	24	240,000	0.28	0.00
Total				**1.46**	**0.00**

Density of natural gas: 0.05 lb/ft^3 @ STP (www.engineeringtoolbox.com)

GHG Vented Blowdown Emissions

Blowdown Emissions Sources	Vented Gas Volume Per Blowdown Event (scf)	Number of Blowdown Events per year	Total Volume NG Emitted (scf/yr)	Potential CH_4 Emissions[1] (tpy)	Potential CO_2 Emissions[1] (tpy)	Potential CO_2e Emissions (tpy)
Station ESD Vent	1,000,000	1	1,000,000	20.67	0.00	517
Pigging and Pipeline Blowdowns	4,000	2	8,000	0.17	0.00	4
Reciprocating Compressors	10,000	24	240,000	4.96	0.00	124
Total				**25.8**	**0.00**	**645**

1. Calculated in accordance with Equations W-14 and W-35, and W-36 in Subpart W of 40 CFR 98

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	GHG Emission Factor		CH_4 Emissions	CO_2 Emissions	CO_2e Emissions
		(scf/hr/component)	Factor Source	(tpy)	(tpy)	(tpy)
Connectors	1,596	0.004	40 CFR 98, Table W-1A	1.16	0.000	28.90
Flanges	798	0.004	40 CFR 98, Table W-1A	0.58	0.000	14.45
Open-Ended Lines	45	0.061	40 CFR 98, Table W-1A	0.50	0.000	12.43
Pump Seals	6	13.3	40 CFR 98, Table W-1A	14.45	0.000	361.30
Valves	279	0.03	40 CFR 98, Table W-1A	1.36	0.000	34.11
Other	24	0.04	40 CFR 98, Table W-1A	0.17	0.000	4.35
Total				**18.22**	**0.00**	**455.54**

Notes:
1. The component count is a preliminary estimate based on the proposed design of the station
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis
3. Emissions are calculated in accordance with Equations W-31, W-35 and W-36 in Subpart W of 40 CFR 98
4. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CC_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions		Emissions Estimation Method
	lbs/hr	tpy	
VOC	1.18	5.18	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
HCHO	0.00	0.01	Concentration and Vented Volume
HAPs	0.00	0.02	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
CO_2	7.35	32.18	40 CFR 98, Table W-1A and Site-Specific Gas Analysis
CH_4	17.57	76.95	40 CFR 98, Table W-1A and Site-Specific Gas Analysis
GHG (CO_2e)	447	1,956	40 CFR 98, Table W-1A and Site-Specific Gas Analysis

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-6. Liquid Loading Emissions Calculations

Liquid Loading Information:

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0%	
Control Efficiency	0%	
P	0.38	true vapor pressure of liquid loaded (psia) - TANKS Data
M	19.27	molecular weight of vapors (lb/lb-mol) - TANKS Data
T	517.0	temperature of liquids loaded (deg R) - TANKS Data

Description	Loading Losses	Maximum Throughput[2]	VOC Emissions	
	(lb/10^3 gal)[1]	(gal)	(lb/hr)	(tpy)
Liquids Hauling	0.3	24,000	0.001	0.003

Notes:

1. Uncontrolled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T
2. Produced fluids throughput.

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-7. Atmospheric Emissions from Each Source at the Station

Source	Pollutants																							
	VOC		NO_X		CO		HCHO		Total HAPs		PM_{10}		$PM_{2.5}$		SO_X		CO_2		CH_4		N_2O		GHG (CO_2e)	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Caterpillar 3606 Engine 1 (S001)	0.83	3.62	1.24	5.43	0.70	3.08	0.17	0.72	0.44	1.95	0.14	0.63	0.14	0.63	0.01	0.04	1876.65	8219.74	19.26	84.37	0.00	0.01	2,359	10,333
Caterpillar 3606 Engine 2 (S002)	0.83	3.62	1.24	5.43	0.70	3.08	0.17	0.72	0.44	1.95	0.14	0.63	0.14	0.63	0.01	0.04	1876.65	8219.74	19.26	84.37	0.00	0.01	2,359	10,333
Caterpillar 3606 Engine 3 (S003)	0.83	3.62	1.24	5.43	0.70	3.08	0.17	0.72	0.44	1.95	0.14	0.63	0.14	0.63	0.01	0.04	1876.65	8219.74	19.26	84.37	0.00	0.01	2,359	10,333
Emegency Generator (S004)	1.67	0.42	3.09	0.77	6.18	1.55	0.12	0.03	0.19	0.05	0.11	0.03	0.11	0.03	0.00	0.00	686.59	171.65	3.77	0.94	0.00	0.00	781	195
Produced Fluids Tank (S005)	0.05	0.23	--	--	--	--	--	--	0.01	0.02	--	--	--	--	--	--	--	--	0.00	0.01	--	--	0.0	0.2
Misc Tanks Tank (S006-S007)	0.00	0.00	--	--	--	--	--	--	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fugitive Leaks	1.18	5.18	--	--	--	--	0.00	0.01	0.00	0.02	--	--	--	--	--	--	7.35	32.18	17.57	76.95	--	--	447	1,956
Liquid Loading	0.00	0.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Facility-Wide	**5.38**	**16.69**	**6.81**	**17.07**	**8.29**	**10.78**	**0.62**	**2.22**	**1.53**	**5.92**	**0.54**	**1.91**	**0.54**	**1.91**	**0.03**	**0.11**	**6,324**	**24,863**	**79**	**331**	**0.01**	**0.04**	**8,305**	**33,151**

Notes:
1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. VOC emissions for the engines are conservatively estimated as: VOC=NMNEHC+HCHO (Formaldehyde)

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-8. Total Emissions from All Sources at the Station

Pollutants	Estimated Site-Wide Emissions	
	lb/hr	tpy
VOC	5.38	16.69
NO_X	6.81	17.07
CO	8.29	10.78
Formaldehyde (HCHO)	0.62	2.22
Total HAPs	1.53	5.92
SO_X	0.03	0.11
PM_{10}	0.54	1.91
$PM_{2.5}$	0.54	1.91
CO_2	6323.90	24863.06
CH_4	79.13	331.01
N_2O	0.01	0.04
GHG (CO_2e)	8,305	33,151

Notes:
1. PM_{10} and $PM_{2.5}$ emissions are filterable + condensable.
2. Emissions from all sources at the facility are included above.

Company Name: Adelphia Pipeline Company, LLC
Facility Name: Marcus Hook Compressor Station
Project Description: Plan Approval Emissions Calculations

TABLE B-9. Site-Specific Gas Analysis

HHV (Btu/scf): 1,030

Constituent	Natural Gas Stream Speciation (Vol. %)	Natural Gas Stream Speciation (Wt. %)
N2	0.19637	0.322
METHANE	97.6841	91.682
CO2	0.0000	0.000
ETHANE	0.07735	0.136
PROPANE	0.17483	0.451
I-BUTANE	0.00000	0.000
N-BUTANE	0.44425	1.511
I-PENTANE	0.0000	0.000
N-PENTANE	1.3971	5.898
N-HEXANE	0.0000	0.000
HEPTANES	0.0000	0.000
Totals	99.974	100.000

*Gas Analysis showed no detectable compounds above n-hexane.

TOC (Total)	99.78	99.68
VOC (Total)	2.02	7.86
HAP (Total)	0.00	0.00

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

Identification

User Identification:	Liquid Loading Parameters
City:	
State:	Pennsylvania
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	Liquid loading parameter calculations for truck loading of produced liquids

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	20.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,800.00
Turnovers:	12.00
Net Throughput(gal/yr):	201,600.00
Is Tank Heated (y/n):	N

Paint Characteristics

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

Roof Characteristics

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

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Philadelphia, Pennsylvania (Avg Atmospheric Pressure = 14.73 psia)

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

Liquid Loading Parameters - Vertical Fixed Roof Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Produced Water	All	62.79	53.49	72.09	57.36	0.2824	0.2104	0.3754	19.2672			18.16	
Benzene						1.2612	0.9722	1.6182	78.1100	0.0001	0.0004	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Butane (-n)						0.5293	0.4449	0.6254	58.1200	0.0005	0.0009	58.12	Option 2: A=5.09536, B=935.86, C=238.73
Decane (-n)						0.0356	0.0288	0.0440	142.2900	0.0045	0.0005	142.29	Option 1: VP60 = .033211 VP70 = .041762
Ethylbenzene						0.1195	0.0862	0.1634	106.1700	0.0000	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Heptane (-n)						0.6645	0.5019	0.8712	100.2000	0.0008	0.0017	100.20	Option 3: A=37358, B=8.2585
Hexane (-n)						2.0565	1.6110	2.5985	86.1700	0.0010	0.0069	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isopentane						10.7095	8.6270	13.1168	72.1500	0.0003	0.0118	72.15	Option 1: VP60 = 10.005 VP70 = 12.53
Nonane (-n)						0.0702	0.0562	0.0878	128.2600	0.0009	0.0002	128.26	Option 1: VP60 = .065278 VP70 = .08309
Octane (-n)						0.1574	0.1239	0.1998	114.2300	0.0009	0.0005	114.23	Option 1: VP60 = .145444 VP70 = .188224
Pentane (-n)						7.2700	5.9048	8.8859	72.1500	0.0006	0.0155	72.15	Option 3: A=27691, B=7.558
Propane (-n)						112.6069	97.8828	128.9497	44.0956	0.0002	0.0602	44.10	Option 2: A=7.340862493, B=1104.2267744, C=291.70993941
Toluene						0.3599	0.2687	0.4761	92.1300	0.0001	0.0001	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Water						0.2727	0.2021	0.3641	18.0150	0.9901	0.9013	18.02	Option 1: VP60 = .247 VP70 = .339

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

Liquid Loading Parameters - Vertical Fixed Roof Tank

Annual Emission Calcaulations	
Standing Losses (lb):	27.3494
Vapor Space Volume (cu ft):	1,130.9734
Vapor Density (lb/cu ft):	0.0010
Vapor Space Expansion Factor:	0.0785
Vented Vapor Saturation Factor:	0.8698
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,130.9734
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.0000
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.0000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.0000
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0010
Vapor Molecular Weight (lb/lb-mole):	19.2672
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.2824
Daily Avg. Liquid Surface Temp. (deg. R):	522.4602
Daily Average Ambient Temp. (deg. F):	54.2792
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	517.0292
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,263.2634
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0785
Daily Vapor Temperature Range (deg. R):	37.2105
Daily Vapor Pressure Range (psia):	0.1650
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.2824
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.2104
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.3754
Daily Avg. Liquid Surface Temp. (deg R):	522.4602
Daily Min. Liquid Surface Temp. (deg R):	513.1576
Daily Max. Liquid Surface Temp. (deg R):	531.7629
Daily Ambient Temp. Range (deg. R):	18.2750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.8698
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.2824
Vapor Space Outage (ft):	10.0000
Working Losses (lb):	26.1156
Vapor Molecular Weight (lb/lb-mole):	19.2672
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.2824
Annual Net Throughput (gal/yr.):	201,600.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	16,800.0000
Maximum Liquid Height (ft):	20.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	53.4651

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

Emissions Report for: Annual

Liquid Loading Parameters - Vertical Fixed Roof Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Produced Water	26.12	27.35	53.47
Decane (-n)	0.01	0.01	0.03
Nonane (-n)	0.01	0.01	0.01
Ethylbenzene	0.00	0.00	0.00
Octane (-n)	0.01	0.01	0.03
Toluene	0.00	0.00	0.01
Heptane (-n)	0.05	0.05	0.09
Benzene	0.01	0.01	0.02
Hexane (-n)	0.18	0.19	0.37
Isopentane	0.31	0.32	0.63
Pentane (-n)	0.41	0.42	0.83
Water	23.54	24.65	48.19
Propane (-n)	1.57	1.65	3.22
Butane (-n)	0.02	0.02	0.05

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

Identification

User Identification:	Marcus Hook - Oil
City:	
State:	Pennsylvania
Company:	
Type of Tank:	Horizontal Tank
Description:	One (1) 500 gallon storage vessels with lube oil

Tank Dimensions

Shell Length (ft):		5.50
Diameter (ft):		4.00
Volume (gallons):		500.00
Turnovers:		12.00
Net Throughput(gal/yr):		6,000.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Philadelphia, Pennsylvania (Avg Atmospheric Pressure = 14.73 psia)

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

Marcus Hook - Oil - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	60.92	52.86	68.99	56.52	0.0075	0.0053	0.0088	130.0000			188.00	Option 1: VP60 = .0074 VP70 = .009

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

Marcus Hook - Oil - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	0.1639
Vapor Space Volume (cu ft):	44.0223
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0581
Vented Vapor Saturation Factor:	0.9992
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	44.0223
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	5.2939
Vapor Space Outage (ft):	2.0000
Tank Shell Length (ft):	5.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0075
Daily Avg. Liquid Surface Temp. (deg. R):	520.5926
Daily Average Ambient Temp. (deg. F):	54.2792
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	516.1892
Tank Paint Solar Absorptance (Shell):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,263.2634
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0581
Daily Vapor Temperature Range (deg. R):	32.2585
Daily Vapor Pressure Range (psia):	0.0035
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0075
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0053
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0088
Daily Avg. Liquid Surface Temp. (deg R):	520.5926
Daily Min. Liquid Surface Temp. (deg R):	512.5280
Daily Max. Liquid Surface Temp. (deg R):	528.6573
Daily Ambient Temp. Range (deg. R):	18.2750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9992
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0075
Vapor Space Outage (ft):	2.0000
Working Losses (lb):	0.1402
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0075
Annual Net Throughput (gal/yr.):	6,000.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.3041

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

Emissions Report for: Annual

Marcus Hook - Oil - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.14	0.16	0.30

```
*****************************************************************************************
*     Project Setup Information                                                         *
*****************************************************************************************
Project File              : P:\Client\NV5\Adelphia\04 Draft\Marcus Hook CS Plan Approval\Att B - Emission Calcs
Flowsheet Selection       : Oil Tank with Separator
Calculation Method        : RVP Distillation
Control Efficiency        : 100.0%
Known Separator Stream    : Geographical Region
Geographical Region       : All Regions in US
Entering Air Composition  : No

Filed Name                : Marcus Hook Compressor Station
Well Name                 : Produced Fluids Tank
Date                      : 2017.10.04


*****************************************************************************************
*     Data Input                                                                        *
*****************************************************************************************

Separator Pressure        : 50.00[psig]
Separator Temperature     : 125.00[F]
Ambient Pressure          : 14.70[psia]
Ambient Temperature       : 125.00[F]
C10+ SG                   : 0.8420
C10+ MW                   : 287.00

-- Low Pressure Oil ------------------------------------------------------------------
   No.    Component             mol %
   1      H2S                   1.2800
   2      O2                    0.0000
   3      CO2                   0.0300
   4      N2                    0.0000
   5      C1                    1.2700
   6      C2                    2.0800
   7      C3                    4.5700
   8      i-C4                  1.8900
   9      n-C4                  6.4800
   10     i-C5                  3.8800
   11     n-C5                  7.0400
   12     C6                    3.0500
   13     C7                    6.8200
   14     C8                    7.7800
   15     C9                    7.2300
   16     C10+                 37.9300
   17     Benzene               0.8300
   18     Toluene               1.0200
   19     E-Benzene             0.0700
   20     Xylenes               0.6500
   21     n-C6                  6.1000
   22     224Trimethylp         0.0000

-- Sales Oil -------------------------------------------------------------------------
Production Rate           : 0.1[bbl/day]
Days of Annual Operation  : 365 [days/year]
API Gravity               : 49.0
Reid Vapor Pressure       : 8.90[psia]


*****************************************************************************************
*     Calculation Results                                                               *
*****************************************************************************************

-- Emission Summary ------------------------------------------------------------------
Item               Uncontrolled   Uncontrolled
                   [ton/yr]       [lb/hr]
```

Total HAPs	0.020	0.005
Total HC	0.254	0.058
VOCs, C2+	0.247	0.056
VOCs, C3+	0.229	0.052

Uncontrolled Recovery Info.

Vapor	10.6600 x1E-3	[MSCFD]
HC Vapor	9.9100 x1E-3	[MSCFD]
GOR	106.60	[SCF/bbl]

-- Emission Composition ----------

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]
1	H2S	0.012	0.003
2	O2	0.000	0.000
3	CO2	0.000	0.000
4	N2	0.000	0.000
5	C1	0.006	0.001
6	C2	0.018	0.004
7	C3	0.049	0.011
8	i-C4	0.020	0.005
9	n-C4	0.059	0.013
10	i-C5	0.026	0.006
11	n-C5	0.039	0.009
12	C6	0.008	0.002
13	C7	0.008	0.002
14	C8	0.004	0.001
15	C9	0.002	0.000
16	C10+	0.000	0.000
17	Benzene	0.002	0.000
18	Toluene	0.001	0.000
19	E-Benzene	0.000	0.000
20	Xylenes	0.000	0.000
21	n-C6	0.013	0.003
22	224Trimethylp	0.000	0.000
	Total	0.267	0.061

-- Stream Data ----------

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	1.2800	0.2130	0.2130	6.8990	0.0000	6.8990
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0300	0.0021	0.0021	0.1768	0.0000	0.1768
4	N2	28.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	C1	16.04	1.2700	0.0369	0.0369	7.7635	0.0000	7.7635
6	C2	30.07	2.0800	0.2466	0.2466	11.7345	0.0000	11.7345
7	C3	44.10	4.5700	1.3445	1.3445	21.5554	0.0000	21.5554
8	i-C4	58.12	1.8900	0.9750	0.9750	6.7085	0.0000	6.7085
9	n-C4	58.12	6.4800	3.9279	3.9279	19.9192	0.0000	19.9192
10	i-C5	72.15	3.8800	3.2983	3.2983	6.9431	0.0000	6.9431
11	n-C5	72.15	7.0400	6.3906	6.3906	10.4595	0.0000	10.4595
12	C6	86.16	3.0500	3.2895	3.2895	1.7886	0.0000	1.7886
13	C7	100.20	6.8200	7.8112	7.8112	1.6004	0.0000	1.6004
14	C8	114.23	7.7800	9.1297	9.1297	0.6724	0.0000	0.6724
15	C9	128.28	7.2300	8.5561	8.5561	0.2466	0.0000	0.2466
16	C10+	166.00	37.9300	45.1329	45.1329	0.0000	0.0000	0.0000
17	Benzene	78.11	0.8300	0.9150	0.9150	0.3821	0.0000	0.3821
18	Toluene	92.13	1.0200	1.1834	1.1834	0.1596	0.0000	0.1596
19	E-Benzene	106.17	0.0700	0.0825	0.0825	0.0041	0.0000	0.0041
20	Xylenes	106.17	0.6500	0.7670	0.7670	0.0341	0.0000	0.0341
21	n-C6	86.18	6.1000	6.6977	6.6977	2.9524	0.0000	2.9524
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		159.21	179.60	179.60	51.88	0.00	51.88
	Stream Mole Ratio		1.0000	0.8404	0.8404	0.1596	0.0000	0.1596
	Heating Value	[BTU/SCF]				2822.40	0.00	2822.40
	Gas Gravity	[Gas/Air]				1.79	0.00	1.79
	Bubble Pt. @ 100F	[psia]	76.98	12.70	12.70			

RVP @ 100F	[psia]	27.72	8.66	8.66
Spec. Gravity @ 100F		0.690	0.698	0.698

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

Identification

User Identification:	Marcus Hook - TEG
City:	
State:	Pennsylvania
Company:	
Type of Tank:	Horizontal Tank
Description:	One (1) 500 gallon storage vessel with TEG

Tank Dimensions

Shell Length (ft):		5.50
Diameter (ft):		4.00
Volume (gallons):		500.00
Turnovers:		12.00
Net Throughput(gal/yr):		6,000.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Gray/Light
Shell Condition	Good

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Philadelphia, Pennsylvania (Avg Atmospheric Pressure = 14.73 psia)

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

Marcus Hook - TEG - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Propylene glycol	All	60.92	52.86	68.99	56.52	0.0010	0.0006	0.0015	76.1100			76.11	Option 2: A=8.2082, B=2085.9, C=203.54

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

Marcus Hook - TEG - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	0.0126
Vapor Space Volume (cu ft):	44.0223
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0580
Vented Vapor Saturation Factor:	0.9999
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	44.0223
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	5.2939
Vapor Space Outage (ft):	2.0000
Tank Shell Length (ft):	5.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	76.1100
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0010
Daily Avg. Liquid Surface Temp. (deg. R):	520.5926
Daily Average Ambient Temp. (deg. F):	54.2792
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	516.1892
Tank Paint Solar Absorptance (Shell):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,263.2634
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0580
Daily Vapor Temperature Range (deg. R):	32.2585
Daily Vapor Pressure Range (psia):	0.0009
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0010
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0006
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0015
Daily Avg. Liquid Surface Temp. (deg R):	520.5926
Daily Min. Liquid Surface Temp. (deg R):	512.5280
Daily Max. Liquid Surface Temp. (deg R):	528.6573
Daily Ambient Temp. Range (deg. R):	18.2750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9999
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0010
Vapor Space Outage (ft):	2.0000
Working Losses (lb):	0.0108
Vapor Molecular Weight (lb/lb-mole):	76.1100
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0010
Annual Net Throughput (gal/yr.):	6,000.0000
Annual Turnovers:	12.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.0234

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

Emissions Report for: Annual

Marcus Hook - TEG - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Propylene glycol	0.01	0.01	0.02

Cost Evaluation of Selective Catalytic Reduction (SCR) for NOx Control of One Compressor Engine

Pollutant: NO_X
Technology: SCR
Source: RICE - CAT3606

CAPITAL COSTS		*2010 Dollars*	*Footnote Reference*
Direct & Indirect Capital Costs			
Purchased Equipment			
Delivered vendor equipment cost	***$***	***380,000***	1
Freight (5% of control device cost)	***$***	***19,000***	2
Instrumentation (10% of control device cost)	***$***	***38,000***	2
Total Direct Capital Costs	***$***	***437,000***	
Installation			
Installation Costs	***$***	***342,000***	3
Commissioning Labor (SCR Vendor)	***$***	***55,000***	1
Engineering and Home Office Fees (10% of purchased equipment costs)	***$***	***43,700***	4
Process Contingency (5% of purchased equipment costs)	***$***	***21,850***	4
Total Indirect Capital Costs	***$***	***462,550***	
Project Contingency (15% of purchased equipment costs plus process contingency)	***$***	***68,828***	4
Preproduction Cost (2% of direct & indirect capitol cost plus project contingencies)	***$***	***19,368***	4
Inventory Capital (cost of initial reactant tank fill - 550 gallons)	***$***	***1,375***	4
TOTAL CAPITAL INVESTMENT (TCI)	**$**	**989,120**	
ANNUAL OPERATING COSTS			
Direct Annual Costs			
Annual Operating and Supervisory Labor ($)	**$**	**65,000**	
Annual Maintenance Costs (1% of TCI)	**$**	**9,891.20**	4
Annual Cost of Reactant Solution ($2.50/gal at a rate of 1 gal/hr)	**$**	**21,900**	3
Annual Electricity Costs ($)	**$**	**5,000**	
Annual Water Costs ($)	**$**	**-**	
Annual Catalyst Costs	**$**	**90,000**	
Total Direct Annual Operating Costs	**$**	**191,791**	
Indirect Annual Costs			
Fractional Interest Rate for Capital		7.00%	
Equipment Lifetime (yrs)		15	
Capital Recovery Factor		0.1098	
Total Indirect Annual Operating Costs	**$**	**108,600**	
TOTAL ANNUAL COST (TAC)	**$**	**300,391**	
Pre-controlled emission rate of (tons/yr)		5.43	6
Control Efficiency		90%	7
Pollutant Removed - (tons/yr)		**4.89**	
AVERAGE ANNUAL CONTROL COST EFFECTIVENESS ($/ton removed)	**$**	**61,467**	**NOx**

Footnotes:

1. Purchased equipment costs based on historical quotes and engineering knowledge. Includes reactant storage tank and recommended spare parts.
2. Based on data in EPA's Pollution Control Cost Manual, Section 2, Table 2.4. http://www.epa.gov/ttn/catc/dir1/cs1ch2.pdf
3. Installation costs are estimates.
4. Based on data in EPA's Pollution Control Cost Manual, Section 4, Table 2.5. http://www.epa.gov/ttn/catc/dir1/cs4-2ch2.pdf
5. Based on data from EPA Air Pollution Control Technology Fact Sheet (EPA -452/F-03-032)
6. Emissions based on a pre-controlled emission rate of 0.3 g/bhp-hr for an engine rated at 1,875 hp operated at 8760 hrs/yr.
7. Control efficiency based on experience with vendor estimates. Note that is the high range for this technology.

EXPANDED BACT FOR COMPRESSOR ENGINES

The Best Available Technology (BAT) discussion that follows applies to the proposed new compressor engines at the Quakertown Compressor Station and Marcus Hook Compressor Station. Under Pennsylvania Department of Protection (PADEP) air permitting regulations in 25 Pa Code §127.1, new sources of air emissions must implement Best Available Technology (BAT). As noted previously in the regulatory discussion, the proposed compressor engines are 4-stroke, lean burn compressor engines that will be subject to NSPS Subpart JJJJ.

In the preparation of this analysis, numerous sources were consulted to identify potential technologies and to evaluate their technical and economic feasibility. The following is a list of references used in preparing this analysis:

- EPA's Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Reduction (LAER) Clearinghouse (RBLC) database for similar source types;
- Determinations of BAT by PADEP for other similar sources, including the technical support document for PADEP's GP-5 BAT evaluation in 2018;
- NSPS and NESHAP standards for similar sources;
- Information provided by air pollution control equipment vendors;
- Previous engineering experience with similar sources and control applications; and/or
- Review of literature from industrial technical or trade organizations.

Based on the analysis described in the following sections, the proposed BAT levels for the compressor engines at the Quakertown Compressor Station and Marcus Hook Compressor Station are summarized below. Proposed BAT levels for the new compressor engines are at least as stringent as the presumptive BAT levels that PADEP established in the current (August 2018) GP-5 permit conditions.

Table 1 Natural Gas Fired (Lean-Burn) Compressor Engines - Top-Down BAT Analysis for NO_x

Process			Step 1. Identify Air Pollution Control Technologies		Step 2. Eliminate Technically Infeasible Options	Step 3. Rank Remaining Control Technologies	Step 4. Evaluate and Document Most Cost-Effective Controls	Step 5. Select BAT
ID	Process	PSD Pollutant	Control Technology	Control Technology Description	Technical Feasibility	Typical Overall Standard Emission Rate (Rank)	Cost Effectiveness, $/ton	
S001-S003	Caterpillar Compressor Engines	NO_x	Operating per Manufacturer's Recommendation for Air Fuel/Ratio	NO_x from reciprocating engines are primarily due to thermal NO_x generation. NO_x formed in the high-temperature, post-flame region of the combustion equipment is "thermal NO_x." NO_x can also be formed as a result of fuel NO_x. "Fuel NO_x" forms when fuels containing nitrogen are burned. When these fuels are burned, the nitrogen bonds break and some of the resulting free nitrogen oxidizes to form NO_x. With excess air, the degree of fuel NO_x formation is primarily a function of the nitrogen content of the fuel. Operating the compressor engine based on the manufacturer's recommended air to fuel ratio will limit the formation of NO_x for lean burn engines.	**Feasible**. The compressor engines would be equipped with air/fuel ratio control to reduce NO_X emissions. Caterpillar's specifications for this engine indicate an emission rate of 0.3 g/bhp-hr, which is much lower than the current applicable limit of 1.0 g/bhp-hr required by NSPS Subpart JJJJ for engines of this size, type, and use. Furthermore, this emission rate would be compliant with PADEP's BAT limit for compressor engines in the production/gathering segment of the industry authorized under GP-5 effective starting in August 2018. As such, Adelphia believes that the potential NO_X emissions rate of 0.3 g/bhp-hr complies with the BAT requirement in 25 Pa Code § 127.1 and as such, Adelphia would propose a limit of 0.3 g/bhp-hr.	1	**N/A (Selected as BAT)**	**Selected as BAT**
			Selective Catalyst Reduction (SCR)	The SCR process chemically reduces the NO_x molecule into molecular nitrogen and water vapor. A nitrogen-based reagent such as ammonia or urea is injected into the turbine exhaust upstream of a catalyst bed. The exhaust gas mixes with the reagent and enters a reactor module containing catalyst. The hot flue gas and reagent diffuse through the catalyst. The reagent reacts selectively with the NO_x within a specific temperature range and in the presence of the catalyst and oxygen. The rate of reaction will depend on the type of catalyst, reagent, and the temperature. The reaction requires an optimum temperature range of 480 to 800°F and fairly constant exhaust temperatures for best performance.	**Infeasible (Cost) -** SCR is not a widely used technology for natural gas-fired combustion engines like those (e.g., size) proposed for this project. Although potentially technically feasible and very effective, SCR is also very costly. Capital costs are significantly higher than other types of NO_x controls due to the volume of catalyst that is required The Operating & Maintenance (O&M) costs of using SCR are driven by the reagent usage, catalyst replacement, and increased electrical power usage. The compressor engines being proposed are estimated with potential emissions at approximately 5.43 tpy each. At an estimated NO_x control efficiency of 90%, the cost effectiveness of SCR on the engines would be estimated to be greater than $60,000 per ton. Therefore, SCR is determined to be economically infeasible for this application. As such, Adelphia believes that the proposed NO_x emission rate of 0.3 g/bhp-hr complies with the BAT requirement in 25 Pa Code § 127.1	2	$60,000 (see initial application for details), cost ineffective	N/A
S001-S003	Caterpillar Compressor Engines	NO_x	Good Combustion Practice	Good combustion practices include properly operating and maintaining the engine in accordance with manufacturer specifications. Such practices would help minimize NO_x emissions.	**Feasible -**Good combustion practices are technically feasible methods for controlling NO_x emissions from the Compressor engines. These methods have been cited in the RBLC as BACT for NO_x control for natural gas fired compressor engines. Adelphia is required by NSPS Subpart JJJJ to operate and maintain the engine per manufacture's emission related written instruction.	3	N/A	Base Case **Selected as BAT**

Table 2 Natural Gas Fired (Lean-Burn) Compressor Engines - Top-Down BAT Analysis for CO, VOC, and HCHO

Process			Step 1. Identify Air Pollution Control Technologies		Step 2. Eliminate Technically Infeasible Options	Step 3. Rank Remaining Control Technologies	Step 4. Evaluate and Document Most Cost-Effective Controls	
ID	Process	PSD Pollutant	Control Technology	Control Technology Description	Technical Feasibility	Typical Overall Standard Emission Rate (Rank)	Cost Effectiveness, $/ton	Step 5. Select BAT
S001-S003	Caterpillar Compressor Engines	CO, VOC, HCHO	Oxidation Catalyst	Oxidation catalysts are widely used on lean-burn gas engines to reduce hydrocarbon and carbon monoxide emissions. Specifically, oxidation catalysts are effective for the control of CO, VOCs, formaldehyde and other HAPs from lean-burn gas engines. Oxidation catalysts consist of a substrate made up of thousands of small channels. Each channel is coated with a highly porous layer containing precious metal catalysts, such as platinum or palladium. As exhaust gas travels down the channel, hydrocarbons and carbon monoxide react with oxygen within the porous catalyst layer to form carbon dioxide and water vapor. The resulting gases then exit the channels and flow through the rest of the exhaust system.	**Feasible**. The oxidation catalyst vendor has guaranteed a CO removal resulting in an emission rate of 0.17 g/bhp-hr. This emission rate is well below the current limit of 2.0 g/bhp-hr required by NSPS Subpart JJJJ for non-emergency lean burn natural gas engines ≥ 1,350 HP manufactured after July 1, 2010, and is also less than the recently established PADEP's BAT level for compressor engines under GP-5 (0.25 g/bhp-hr). As such, Adelphia believes that the potential CO emissions rate complies with the BAT requirement in 25 Pa Code § 127.1 The efficiency of the oxidation catalyst proposed for the compressor engines is guaranteed by the vendor to result in a NMNEHC emissions rate of 0.16 g/bhphr, and at least 75% for formaldehyde emissions resulting in an emission rate of 0.04 g/bhp-hr. The engines' NMNEHC emission rate is well below the current limit of 0.7 g/bhp-hr required by NSPS Subpart JJJJ for nonemergency lean burn natural gas engines ≥ 1,350 HP manufactured after July 1, 2010, and the proposed NMNEHC and formaldehyde emission limits are compliant with PADEP's BAT limits in the recently finalized GP- 5 (0.25 g/bhp-hr and 0.05 g/bhp-hr). Similar to CO and NO_X, Adelphia believes that the potential NMNEHC and formaldehyde emission rates comply with the BAT requirement in 25 Pa Code § 127.1	**1**	**N/A (Selected as BAT)**	**Selected as BAT**
			Good Combustion Practice	Good combustion practices include properly operating and maintaining the engine in accordance with manufacturer specifications. Such practices would help minimize CO emissions.	**Feasible -**Good combustion practices are technically feasible methods for controlling CO emissions from the emergency Compressor engine. These methods have been cited in the RBLC as BACT for CO control for natural gas fired compressor engines. Adelphia is required by NSPS Subpart JJJJ to operate and maintain the engine per manufacture's emission related written instruction**.**	2	N/A	Base Case **Selected as BAT**

Table 3 Natural Gas Fired (Lean-Burn) Compressor Engine- Top-Down BAT Analysis for PM, SO_2

Process			Step 1. Identify Air Pollution Control Technologies		Step 2. Eliminate Technically Infeasible Options	Step 3. Rank Remaining Control Technologies	Step 4. Evaluate and Document Most Cost-Effective Controls	Step 5. Select BAT
ID	Process	PSD Pollutant	Control Technology	Control Technology Description	Technical Feasibility	Typical Overall Standard Emission Rate (Rank)	Cost Effectiveness, $/ton	
S001-S003	Caterpillar Compressor Engines	PM/PM_{10}/$PM_{2.5}$, SO_2	Good Combustion Practices and low-sulfur fuels	Good combustion practices include properly operating and maintaining the engine in accordance with manufacturer specifications, as well as burning low sulfur fuels. Such practices would help minimize SO_2 and PM emissions.	**Feasible**. Potential BAT options for both PM/PM_{10}/$PM_{2.5}$ and SO_2 emissions, based on a search in the EPA's Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database, indicate that the only technologies used to reduce these pollutants from natural gas burning engines are good combustion practices and low-sulfur fuels. Pipeline quality natural gas will be used in the engines, which has a very low sulfur content. Adelphia will operate the engines in accordance with the manufacturer's recommended practice to minimize emissions of particulate matter and SO_2. Both technologies are considered base-case and are equally effective. Adelphia concludes that the combination of good combustion practices and the firing of pipeline quality natural gas be considered BAT for the proposed engine.	1	N/A (Selected as BAT)	Selected as BAT

APPENDIX C: MANUFACTURER'S SPECIFICATIONS

G3606

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
OP0756-Q-0701

CATERPILLAR

ENGINE SPEED (rpm):	1000	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	7.6	RATING LEVEL:	CONTINUOUS
AFTERCOOLER TYPE:	SCAC	FUEL SYSTEM:	GAV
AFTERCOOLER - STAGE 2 INLET (°F):	130		WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 INLET (°F):	174	**SITE CONDITIONS:**	
JACKET WATER OUTLET (°F):	190	FUEL:	Gas Analysis
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
COOLING SYSTEM:	JW+1AC, OC+2AC	FUEL METHANE NUMBER:	84.9
CONTROL SYSTEM:	ADEM4	FUEL LHV (Btu/scf):	949
EXHAUST MANIFOLD:	DRY	ALTITUDE(ft):	50
COMBUSTION:	LOW EMISSION	MAXIMUM INLET AIR TEMPERATURE(°F):	77
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.3	STANDARD RATED POWER:	1875 bhp@1000rpm
SET POINT TIMING:	18		

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	1875	1875	1406	938
INLET AIR TEMPERATURE			°F	77	77	77	77
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(3)	Btu/bhp-hr	6913	6913	7193	7770
FUEL CONSUMPTION (HHV)		(3)	Btu/bhp-hr	7666	7666	7976	8616
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(4)(5)	ft3/min	4701	4701	3572	2452
AIR FLOW	(WET)	(4)(5)	lb/hr	20846	20846	15837	10873
FUEL FLOW (60ºF, 14.7 psia)			scfm	228	228	178	128
INLET MANIFOLD PRESSURE		(6)	in Hg(abs)	102.1	102.1	78.8	56.1
EXHAUST TEMPERATURE - ENGINE OUTLET		(7)	°F	822	822	893	971
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(8)(5)	ft3/min	11972	11972	9609	6994
EXHAUST GAS MASS FLOW	(WET)	(8)(5)	lb/hr	21454	21454	16311	11215
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(9)(10)	g/bhp-hr	0.30	0.30	0.30	0.30
CO		(9)(10)	g/bhp-hr	2.49	2.49	2.50	2.49
THC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	5.22	5.22	5.38	5.72
NMHC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	0.56	0.56	0.57	0.61
NMNEHC (VOCs) (mol. wt. of 15.84)		(9)(10)(11)	g/bhp-hr	0.32	0.32	0.33	0.36
HCHO (Formaldehyde)		(9)(10)	g/bhp-hr	0.19	0.19	0.20	0.22
CO2		(9)(10)	g/bhp-hr	437	437	453	491
EXHAUST OXYGEN		(9)(12)	% DRY	11.0	11.0	10.9	10.5
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(13)	Btu/min	22827	22827	18357	15212
HEAT REJ. TO ATMOSPHERE		(13)	Btu/min	5971	5971	5730	5496
HEAT REJ. TO LUBE OIL (OC)		(13)	Btu/min	11668	11668	10790	9350
HEAT REJ. TO A/C - STAGE 1 (1AC)		(13)(14)	Btu/min	13688	13688	6929	1996
HEAT REJ. TO A/C - STAGE 2 (2AC)		(13)(14)	Btu/min	6860	6860	4293	2178

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+1AC)	(14)(15)	Btu/min	39482
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)	(14)(15)	Btu/min	21204
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

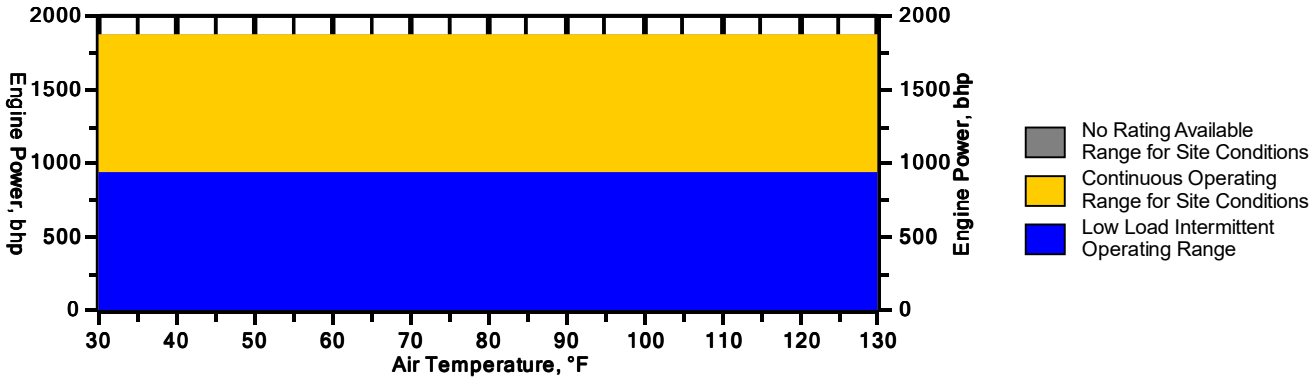
CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

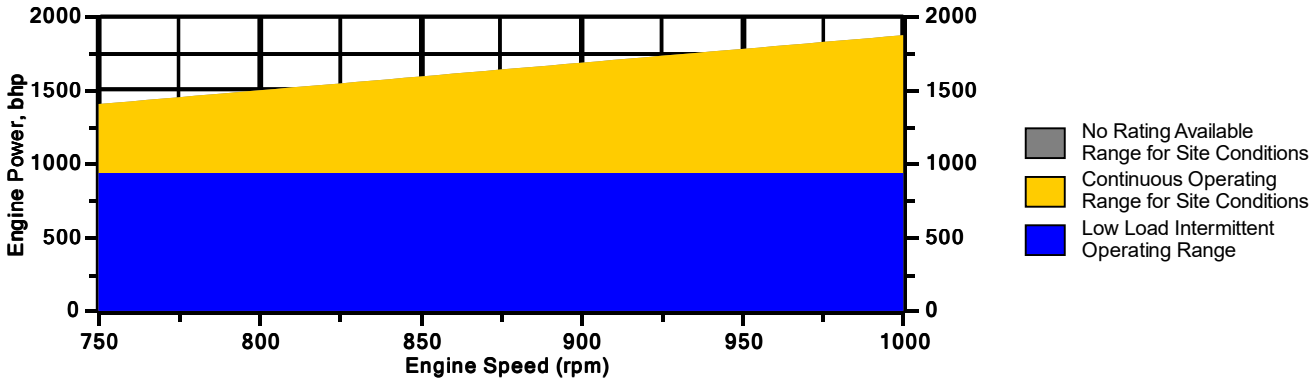
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 50 ft and 1000 rpm



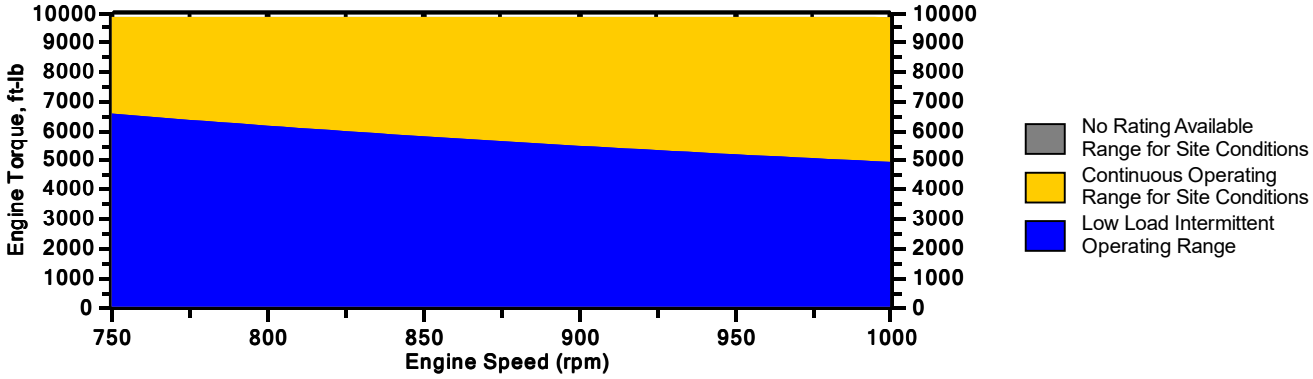
Engine Power vs. Engine Speed

Data represents speed sweep at 50 ft and 77 ºF



Engine Torque vs. Engine Speed

Data represents speed sweep at 50 ft and 77 ºF



Note: At site conditions of 50 ft and 77°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

NOTES

1. Fuel pressure range specified is to the engine gas shutoff valve (GSOV). Additional fuel train components should be considered in pressure and flow calculations.

2. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

3. Fuel consumption tolerance is ± 2.5% of full load data.

4. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

5. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

6. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

7. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

8. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

9. Emissions data is at engine exhaust flange prior to any after treatment.

10. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

11. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

12. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

13. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

14. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

15. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	94.2280	94.2290
Ethane	C2H6	4.8290	4.8291
Propane	C3H8	0.3690	0.3690
Isobutane	iso-C4H1O	0.0310	0.0310
Norbutane	nor-C4H1O	0.0450	0.0450
Isopentane	iso-C5H12	0.0100	0.0100
Norpentane	nor-C5H12	0.0070	0.0070
Hexane	C6H14	0.0119	0.0119
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	0.2620	0.2620
Carbon Dioxide	CO2	0.2060	0.2060
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		99.9989	100.0000

Fuel Makeup:	Gas Analysis
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	84.9
Lower Heating Value (Btu/scf):	949
Higher Heating Value (Btu/scf):	1053
WOBBE Index (Btu/scf):	1240
THC: Free Inert Ratio:	212.68
Total % Inerts (% N2, CO2, He):	0.47%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.998
Stoich A/F Ratio (Vol/Vol):	9.91
Stoich A/F Ratio (Mass/Mass):	16.92
Specific Gravity (Relative to Air):	0.586
Fuel Specific Heat Ratio (K):	1.308

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

EMIT Technologies, Inc.
2555 Heartland Dr.
Sheridan, WY. 82801

Proposal Prepared For:	**Prepared By:**	Jesse Stinson	**Proposal:**	QUO-23730
Alan Halbert		O: (307)675-5081	**Revision:**	2
Bidell		jstinson@emittechnologies.com	**Expires:**	October 12, 2018

APPLICATION INFORMATION

DRIVER

Make:	Caterpillar
Model:	G3606 A4
Horsepower:	1875
RPM:	1000
Compression Ratio:	7.6
Exhaust Flow Rate (CFM):	11972
Exhaust Temperature (°F):	822
Allowable Backpressure:	12" WC
Reference:	EM1402-04-001
Fuel:	Marcus Hook Fuel
Annual Operating Hours:	8760

GAS COOLER

Make:	N/A
Model:	N/A
Orientation:	Horizontal

UNCONTROLLED EMISSIONS DATA

	g/bhp-hr
NO_x:	0.30
CO:	2.49
THC:	5.22
NMHC:	0.56
NMNEHC:	0.32
HCHO:	0.19
Oxygen:	11.00%

EMISSIONS AND SILENCING INFORMATION

HOUSING INFORMATION (Standard Offering)

HOUSING

Make:	Hospital Grade Cooler Mount Catalyst/Silencer
Insertion Loss:	35-40 dBA
Model:	ELH-5000-1820F-4CE0-362-C
Element Capacity:	4
Weight:	2167 Lbs

CATALYST

Catalyst Model:	RT-3615-Z
Catalyst Type:	Oxidation, Standard Precious Metals Group
Catalyst Size:	Rectangle, 36" x 15" x 3.5"
Catalyst Qty:	3
Blank Qty:	1

POST CATALYST EMISSIONS - Marcus Hook Emissions

	g/bhp-hr
NO_x:	Unaffected by Oxidation Catalyst
CO:	<0.17
VOC:	<0.16
HCHO:	<0.04

SYSTEM BACKPRESSURE (Standard Offering)

Total System Backpressure <9.80" WC

Engine Emissions Data

Cummins Inc

Columbus, Indiana 47202-3005

http://www.cummins.com

Power Generation

GTA28

FR 995060

701 hp (523 kWm) @ 1800 rpm

2045 lb-ft (2773 N-m) @ 1800 rpm

Configuration	CPL Code	Revision
TBD	**TBD**	**20-May-15**

Compression Ratio: **8.5:1**

Fuel System: **Natural Gas**

Combustion: **Stoichiometric**

Emission Certification: **US EPA NSPS Compliant Upgradable/Capable**

Displacement: **1711 cu. in. (28 L)**

Cylinders: **12**

Bore x Stroke: **5.5 x 6.0 in (140 x 152 mm)**

Aspiration: **Turbocharged and Aftercooled**

Engine Speed	Standby Power		75% Load		50% Load	
rpm	hp	kWm	hp	kWm	hp	kWm
1,800	701	523	526	392	351	262

Exhaust Emissions Data @ 1800 rpm

	Standby Power			75% Load			50% Load		
Component	g/hp-hr	mg/nm^3*	ppm	g/hp-hr	mg/nm^3*	ppm	g/hp-hr	mg/nm^3*	ppm
Total Hydrocarbons (Wet)	2.6	N/A	1385	2.5	N/A	1269	2.4	N/A	1092
Non Methane Hydrocarbons (Wet)	0.16	N/A	110	0.18	N/A	93	0.21	N/A	74
NOx (Dry)	10.0	N/A	2308	9.0	N/A	1958	8.9	N/A	1763
CO (Dry)	10.9	N/A	4107	15.5	N/A	5556	5.6	N/A	1814
CO2 (Dry)	461	N/A	N/A	479	N/A	N/A	551	N/A	N/A
HCHO (Formaldehyde)	N/A	N/A	28	N/A	N/A	25	N/A	N/A	22
Volatile Organic Compounds (VOC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

O2 (Dry)	0.4%	0.4%	0.3%
BSFC	8373 BTU/hp-hr	8858 BTU/hp-hr	9658 BTU/hp-hr
Ignition timing (BTDC)	24°	24°	24°

* mg/nm^3 is measured @ 5% O_2

Test Methods and Conditions:

Steady-State emissions recorded per ISO 8178-1 during operation at rated engine speed (+/- 2%) and stated constant load (+/- 2%) with engine temperatures, pressures and emission rates stabilized.

Fuel Specifications:

Dry processed natural gas fuel with 905 BTU per standard cubic foot lower heating value.

Reference Conditions:

25 °C (77 °F) Air Inlet Temperature, 99.5 kPa (29.39 in-Hg) Barometric Pressure [152 m (500 ft) altitude], and relative humidity of 50%.

Data was taken for a single engine test with the Test Method, Fuel Specification and Reference Conditions stated above. Field tests using alternate Test Methods, Fuel or Reference Conditions may yield different results.

Emissions Data Tolerances:

NOx - +/- 5%, Hydrocarbons - +/- 5%, CO - +/- 5%

CO2 - +/- 5%, O2 - +/- 5%

CHIEF ENGINEER: **Kendra Eads (Application)**

Lynn Zopff (Base Engine)

April 7, 2017

Attention: Dave Ciha
Cummins NPower, LLC.
875 Lawrence Drive
DePere, WI.

Subject: Emissions Guarantee - MIRATECH Catalysts

Dave,

The following emissions guarantee from MIRATECH references these specific engine/catalyst combinations (or any MIRATECH engineer sized solutions) to perform at equal or below the 2009 EPA SI NSPS regulations for standby engines of (2 g/hp/hr NOx, 4 g/hp/hr CO, 1 g/hp/hr NMNEHC) when operating on dry processed pipeline natural gas at the END of the stated warranty period.
**Specific emissions targets can be achieved and documented for projects and applications with different requirements.

Engine Model		Catalyst Part Number	Qty per Engine
GTA 855		SP -NX-12-06F-EN1 *	1
GTA 19	SP	SP-NX-12-08F-EN1*	1
GTA 28		SP-NX-12-08F-EN1*	2
GTA 38		SP-NX-14-08F-EN1*	2
GTA 50		SP-NX-14-08F-EN1*	2

*Part Numbers or arrangement for specific projects may be different. But any MIRATECH engineer sized solution will carry the same performance guarantee unless specifically stated in the product proposal.

The MIRATECH standard warranty shall apply to all products. Products installed and operated in accordance with the application guidelines carry a 2 year warranty, with no hour limitation. See attached warranty documentation for details.

Sincerely,

Greg Laemmer cc.
Michael Wilson

420 South 145th East Avenue • Drop Box A • Tulsa, OK 74108 • USA • Ph +1 918 513-1252 • glaemmer@miratechcorp.com
www.miratechcorp.com

GENERAL TERMS AND CONDITIONS OF SALE

1. **Integration** The General Terms and Conditions of Sale contained herein shall be deemed a material part of any sale or proposed sale by MIRATECH Group, LLC ("Seller") to _____ ("Purchaser") and, unless and only to the extent specifically excluded therein, shall be a material part of any subsequent letter of authorization, contract, purchase order, sale or other agreement between Seller and Purchaser, with respect to all products, equipment, services and/or parts relating thereto (hereinafter referred to as the "Product").

2. **Compliance** To Seller's knowledge, Seller has complied with all applicable laws and regulations including, but not limited to, the Fair Labor Standards Act, the Civil Rights Act of 1964, the Equal Employment Opportunity Act of 1972, as respectively amended, Executive Orders 11246, 11375 and 11141 (Title 41, Chapter 60, Code of Federal Regulations), the Vietnam Era Veterans Readjustment Act of 1974, and all amendments thereto and regulations, rules and orders there under, as amended or superseded and all of the foregoing are made a part hereof by reference and incorporated herein as though fully set forth herein. Purchaser understands and agrees that the foregoing sentence is for Purchaser's information stating that which Seller strives to achieve and is not made as a covenant, warranty or representation and is not meant to create or permit, nor shall it be construed as creating or permitting any enforceable rights hereunder for Purchaser or any other person or entity. All standards promulgated with respect to noise or air control are specifically excluded hereunder.

3. **Title, Risk of Loss, Security Interest** Title and risk of loss or damage to the Product shall pass to Purchaser under tender of delivery Ex-Works (Incoterms 2010) manufacturing facility unless expressly stipulated otherwise, regardless of when partial or final payment is to be made by Purchaser. Notwithstanding the foregoing, a purchase money security interest in the Product or any replacement thereof shall remain in Seller, regardless of mode of attachment to realty or other property, until full payment has been made therefore and collected by Seller.

4. **Inspection, Rejection, Remedy** Purchaser shall have the right to reasonable inspection of the Product after delivery to destination, which inspection shall be completed within ten (10) days of the date of delivery to such destination. Any rejection by Purchaser as to part or all of the Product shall be in writing, specifically stating the non-conformities thereof. In such event, Seller shall have a reasonable period of time to determine the validity of and, if necessary, to correct the non-conformities forming the basis of the Purchaser's rejection or, at Seller's option and if appropriate, to replace part or all of the Product. Purchaser's failure to make rejection as herein stated, or to allow Seller to cure Purchaser's objections, shall be deemed to conclusively establish acceptance by Purchaser of the Product.

5. **Time, Force Majeure** Seller may, from time to time, quote delivery dates to Purchaser. Such dates shall be interpreted as estimated and in no event shall such dates be construed as falling within the meaning of "time is of the essence." Seller shall not be liable for loss, damage, detention, or delay due to war, riots, civil insurrection or acts of the common enemy, fire, flood, severe weather conditions at Seller's premises or outside fabrication sites, strikes or other labor difficulties, acts of civil or military authority including governmental law, orders, priorities or regulations, acts of Purchaser, embargo, car shortage, wrecks or delay in transportation, inability to obtain necessary labor, materials or manufacturing facilities from usual sources, faulty forgings or castings, or other causes beyond the reasonable control of Seller. In the event of delay in performance due to any such cause, the date of delivery or time for completion shall be adjusted to reflect the actual length of time necessary to properly reflect the delay without change to the purchase price. In the event of such delay or default in delivery, Seller shall complete work in progress and/or make delivery as soon as reasonably practicable. Upon completion and delivery of the Product to Purchaser, after such delay in delivery, the obligation of Purchaser for payment shall be completely reinstated.

6. **Taxes** Prices quoted by Seller do not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts or other like taxes which may now or hereafter be applicable to, measured by, or imposed upon this transaction, the Product, its sale, its value, its use or any services performed in connection therewith. Purchaser, by agreeing to purchase product from Seller, agrees to be responsible for payment of any and all taxes it may owe as a result of such purchase and to hold harmless and indemnify Seller from any such tax liability.

7.1 **Limited Warranty** Products have different warranty periods and are subject to the exclusions contained herein. Seller warrants that the:

Next and Vortex Substrates utilizing catalyst formulations other than "EU" and "XU" and "XJ" formulation designations shall be free of defects in material and workmanship for a period of twenty-four (24) months from the date the Product is complete and ready for shipment;

Next and Vortex Substrates utilizing "EU" or "XU" or "XJ" catalyst formulation designations shall be free of defects in material and workmanship for: **gas fueled engine applications** - for a period of twelve (12) months from the date the Product is complete and ready for shipment, or eighty eight hundred (8,800) hours of operation, whichever shall first occur; **NESHAP applications** - for a period of twenty-four (24) months from the date the Product is complete and ready for shipment, or eighteen hundred (1,800) hours of operation, whichever shall first occur;

SCR Products shall be free of defects in material and workmanship, unless other terms are specified in the proposal which provides the basis for these General Terms and Conditions, for a period of twenty-four (24) months from the date the Product is placed in operation or twenty-six (26) months from the date the Product is complete and ready for shipment, whichever shall first occur;

Passive Diesel Particulate Filter Products shall be free of defects in material and workmanship for a period of 8,000 hours of operation or twenty-four (24) months from the date the Product is ready for shipment, whichever shall first occur;

Active Diesel Particulate Filter Products included with AT-IV shall be free of defects in material and workmanship for a period of 2,600 hours of operation, twelve (12) months from the date the Product is commissioned by an authorized MIRATECH field service representative or eighteen (18) months from the date the Product is ready for shipment to Purchaser, whichever shall first occur;

Service shall be free of defects of workmanship for a period of ninety (90) days from the date the final Service is provided by Seller to Purchaser;

Silencer Only Products shall be free of defects in material and workmanship for a period of twelve (12) months from the date the Silencer Only Product is placed in operation or eighteen (18) months from the date the Silencer Only Product is complete and ready for shipment, whichever shall first occur;

Vaporphase Products shall be free of defects in material and workmanship for a period of twelve (12) months from the date the Vaporphase Product is placed in operation or eighteen (18) months from the date the Vaporphase Product is complete and ready for shipment, whichever shall first occur;

Replacement Parts for use on previously installed Products, ("Spare Parts") shall be free of defects in material and workmanship for a period of twelve (12) months from the date the Spare Part is placed in operation or eighteen (18) months from the date the Spare Part is complete and ready for shipment, whichever shall first occur;

Exhaust Accessories shall be free of defects in material and workmanship for a period of twelve (12) months from the date the Exhaust Accessory Product is placed in operation;

All other Products shall be free of defects in material and workmanship for a period of twelve (12) months from the date the Product is placed in operation or eighteen (18) months from the date the Product is complete and ready for shipment, whichever shall first occur;

provided Purchaser shall, within such period, notify Seller in writing of such defect(s) and fully cooperate with Seller in pursuing the remedying thereof. Should any failure to conform to this warranty be reported to Seller within said period, Seller shall, upon Purchaser promptly notifying Seller in writing thereof, correct such nonconformity by suitable repair to the Product or, at Seller's option, furnish replacement parts F.C.A. Seller's point of shipment, provided Purchaser has restored the Product to the "as shipped" condition prior to installation and has installed, maintained and operated the Product in accordance with standard industry practices, article 7.2 of these Terms and Conditions of Sale and has complied with the specific recommendations of Seller respecting the Product. In the event Seller deems the Service to be defective, Seller's obligation shall be to correct non-conformities in the manner and for the remaining period of time of the Service warranty period.

Accessories or other parts of the Product furnished by Seller, but manufactured by others, shall carry whatever warranty, if any, the manufacturers thereof have given to Seller and which can be passed on to Purchaser. Purchaser agrees to look solely to such other manufacturers or suppliers of such accessories or parts for any warranty, repair or product liability claims arising out of the performance, condition or use of such accessories or parts. Seller agrees to cooperate in furnishing assignments of its rights thereto to Purchaser from such manufacturers and suppliers. Seller shall not be liable for any repairs, replacements or adjustments to the Product or any costs of labor performed by Purchaser without Seller's prior written approval. Seller's warranty shall expire in the event the Product is misused, neglected or operated other than for its intended purpose. Except as specifically stated herein, Seller makes no performance warranty of any kind respecting the Product except as contained in this document. The effects of corrosion, erosion and normal wear and tear are specifically excluded from Seller's warranty.

For all emissions related products, Seller's warranty shall expire in the event: an A-36 carbon steel housing provided by Seller is insulated, or has a heat shield or similar product adjustment installed, and operated with an inlet operating temperature to the housing greater than 900 deg F; or a component supplied by others that is upstream of the Seller's provided scope, damages the Seller provided scope.

For all standalone silencers, exhaust accessories or piping, Seller's warranty shall expire in the event of either: (1) an A-36 carbon steel silencer provided by Seller is insulated (external to housing) or has a heat shield or similar product adjustment installed and operated with an inlet operating temperature to the housing greater than 1100 deg F for a period of greater than 500 hours per year; (2) an A-36 carbon steel silencer with internal insulation is operated with inlet temperature to the housing greater than 1100 deg F; or (3) an Aluminized steel silencer with internal or external insulation, a heat shield or similar product adjustments installed and operated with an inlet operating temperature to the housing greater than 1100 deg F.

Any damage or defects to the Products caused by the acts or omissions of others after receipt of the Product but prior to commissioning or during the warranty period are not warrantable events and are specifically excluded from this warranty.

Correction by Seller of non-conformities, whether patent or latent, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of Seller for such non-conformities, whether based on contract, warranty, negligence, indemnity, strict liability or otherwise with respect to or arising out of the Product. Seller shall in no event be liable for consequential damages.

7.2 **Limited Warranty, Conditions** Throughout the Warranty Period, Seller warrants that the Product will achieve the emissions levels set forth in the Proposal referenced in and attached to the Contract between Seller and Purchaser, subject to the conditions that:

a. the Product is operated and maintained at all times in accordance with MIRATECH's written instructions;
b. the Purchaser's equipment is operated and maintained at all times in accordance with all manufacturer's instructions and guidelines;
c. the Purchaser's equipment, during operation, shall never exceed the raw emission rate set forth in the Proposal;
d. the Purchaser's equipment shall be operated within the temperature limits stated in the Proposal after startup;
e. the Purchaser will operate the equipment so the engine emissions & temperature are as stated in the proposal and:
    1. the NO_x, CO, VOC/NMNEHC, O_2, and $PM_{2.5}$ will not fluctuate more than 2% from the Proposal value and,
    2. the Exhaust flow rate will not fluctuate more than 2% from the Proposal value and,
    3. the Exhaust temperature into the catalyst will not fluctuate more than 10°F from the Proposal value.

Diesel Particulate Filter Products shall be operated and maintained at all times in accordance with the Seller's written instructions including:

i. for Passive Diesel Particulate Filter Product - the most recent version of the MIRATECH "Guidelines for the Successful Operation of Diesel Particulate Filters"; or
ii. for Active Diesel Particulate Filter Components included with AT-IV the most recent version of the AT-IV Operations and Maintenance Manual.

Vaporphase Products shall be installed, operated, and maintained at all times in accordance with Seller's written instructions. Performance levels listed in the Proposal are expected values and are not warranted, unless expressly noted as "warranted performance".

Emissions levels, temperature and flow rates from Purchaser's equipment and the Product discharge point shall be tested at the Purchaser's expense, in accordance with a mutually agreed test procedure and protocol consistent with accepted industry practices.

Purchaser will operate the engine, or cause the engine to be operated by others, other than the Seller, at no cost to and for the benefit of the Seller in order for the Seller to make adjustments and modifications to the Product.

If the above conditions are met and the Product fails to achieve the output performance stated in the Proposal within the Warranty Period, Seller will replace or modify and adjust its Product as needed to meet such output performance standards. Purchaser is required to notify the Seller in writing of the specific defect and provide Seller with complete documentation of the defect and satisfaction of all conditions, a – e, of this article.

7.3 **Warranty Disclaimer** **SELLER MAKES NO OTHER WARRANTY OR REPRESENTATION OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF GOOD TITLE TO THE PRODUCT, AND ALL IMPLIED WARRANTIES, INCLUDING ANY WARRANTY OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED.**

8. **Remedies Exclusive** The remedies of Purchaser set forth herein are exclusive. The total liability of Seller with respect to the performance and other matters related to the manufacture, sale, delivery, installation, repair or technical direction thereof, whether based on contract, warranty, negligence, indemnity, strict liability or otherwise, shall in no event exceed the purchase price of the particular Unit of Product upon which such liability is based, and not the aggregate of all Products covered by any agreement or document between Seller and Purchaser. Seller shall, in no event, be liable to Purchaser, any successors in interest or any beneficiary or assignee of Purchaser, for any consequential, incidental, indirect, special or punitive damages or any defect in, or failure or malfunction of, the Product, whether based upon lost goodwill, lost profits or revenue, interest, work stoppage, impairment of other goods, loss by reason of shutdown or non-operation, increased expenses of operation of Product, loss of use of power system, costs of purchase of replacement power or claims of Purchaser or customers of Purchaser for service interruption, whether or not such loss or damage is based on contract, warranty, negligence, indemnity, strict liability or otherwise. Purchaser warrants that the Product is purchased for, and will be used for, business purposes only by qualified and properly trained personnel.

9. **Set-off** Purchaser shall not have the right to retain, back charge, or set off against any amounts which may be or become payable by it to Seller or otherwise, for amounts which Seller may allegedly or in fact owe Purchaser whether arising hereunder or otherwise.

10. **Performance, Governing Law, Jurisdiction and Venue** The Purchaser and Seller agree that the purchase and sale of products under this Agreement shall be performed in the State of Oklahoma, and the rights and obligations of Purchaser and Seller shall be construed in accordance with and governed by the laws of Oklahoma, notwithstanding any conflict of law provisions which would have the effect of making the laws of another state applicable. The Purchaser and Seller agree that the sole and exclusive jurisdiction and venue respecting any and all disputes between Purchaser and Seller with regard to the purchase and sale of Product hereunder shall be in Tulsa County, Oklahoma.

11. **No Waiver** No waiver by Seller of any breach of any obligation of Purchaser set forth in the General Terms and Conditions herein shall be construed as a waiver of any succeeding breach of the same or of any covenant or condition, and in no event shall this provision itself be waived.

12. **Invoicing and Payment** Invoicing and payment terms shall be as stated in the purchase order or other agreement between Seller and Purchaser. Terms of payment are net thirty (30) days from date of invoice, unless otherwise agreed in writing.

13.1 **Cancellation of Contract before Delivery for other than SCR or Diesel Particulate Filter Products** For standard products, a cancellation charge equal to, in the sole discretion of the Seller, not more than 50% of the original purchase price may be made for any cancellation of the Contract by Purchaser prior to Seller's delivery of the Product to Purchaser. For custom products, a cancellation charge equal to, in the sole discretion of the Seller, not more than 100% of the original purchase price may be made for any cancellation of the Contract by Purchaser prior to Seller's delivery of the Product to Purchaser. The parties agree that such cancellation charges represent Seller's liquidated damages arising out of cancellation of the Contract in lieu of actual damages, it being understood and agreed between the parties that Seller's actual damages would be impractical or extremely difficult, time consuming and expensive to ascertain. Seller's failure to impose a cancellation charge with respect to one or more cancellations by Purchaser and/or other customers shall not be deemed in any case a waiver of its right under the Contract to impose such a charge in connection with any other cancellation by Purchaser, and Purchaser may not rely on any representation of any person to the contrary.

13.2 **Cancellation of Contract Before Delivery for SCR or Diesel Particulate Filter Products** In the event the Purchaser cancels the Contract after the date of such Contract, Purchaser agrees to pay the following charge as liquidated damages in lieu of actual damages, it being understood and agreed between the parties that actual damages to Seller would be impractical or extremely difficult, time consuming and expensive to ascertain:

% of Quoted Manufacturing Period Elapsed From Date of Contract to Time of Cancellation	% of Sales Price Not Including Shipping Costs
0 to 33 1/3%	50%
33 1/3 to 50%	75%
50 to 66 2/3%	85%
66 2/3 to 80%	95%
80% to 100%	100%

14. **Returns** Subject to Purchaser's payment in advance of a restocking fee, plus any associated shipping and handling costs, Seller will accept return of a standard Product (other than SCR or Diesel Particulate Filter Products) within 90 days following delivery of the Product to Purchaser if the Product is returned to Seller complete and uninstalled in new condition. The amount of such restocking fee will be determined in accordance with Seller's then current Return Material Authorization policy. Any return of a Product more than 90 days following delivery, including the terms thereof, shall be within the sole and absolute discretion of the Seller.

15. **Conflicting Provisions** In case of any conflict, the General Terms and Conditions contained herein shall supersede any and all specifications and/or other terms and conditions previously supplied by Purchaser in connection with or upon a letter of authorization, purchase order or any other agreement, as well as any custom, prior conduct or course of dealing. No agreement, oral representation or other understanding any way modifying or amending the General Terms and Conditions, or having the effect of enlarging the obligations of Seller hereunder, shall be binding upon the Seller unless such modification is clear, certain and in writing in the form of an amended letter of authorization, purchase order or other written agreement duly executed by Purchaser and an authorized representative of Seller.

APPENDIX D: PLAN APPROVAL APPLICATION FORMS

2700-PM-AQ0007 Rev. 7/2004

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Submit in Triplicate

PROCESSES

Application for Plan Approval to Construct, Modify or Reactivate an Air Contamination Source and/or Install an Air Cleaning Device

This application must be submitted with the General Information Form (GIF).

Before completing this form, read the instructions provided for the form.

Section A - Facility Name, Checklist And Certification

Organization Name or Registered Fictitious Name/Facility Name: Adelphia Pipeline Company - Marcus Hook Compressor Station

DEP Client ID# (if known): _____

Type of Review required and Fees:

- ☐ Source which is not subject to NSPS, NESHAPs, MACT, NSR and PSD: ..... $_____
- ☒ Source requiring approval under NSPS or NESHAPS or both: $1,700
- ☐ Source requiring approval under NSR regulations: ..... $_____
- ☐ Source requiring the establishment of a MACT limitation: ..... $_____
- ☐ Source requiring approval under PSD: ..... $_____

Applicant's Checklist

Check the following list to make sure that all the required documents are included.

- ☒ **General Information Form (GIF)**
- ☒ **Processes Plan Approval Application**
- ☒ **Compliance Review Form** or provide reference of most recently submitted compliance review form for facilities submitting on a periodic basis: _____
- ☒ **Copy and Proof of County and Municipal Notifications**
- ☒ **Permit Fees**
- ☐ **Addendum A:** Source Applicable Requirements (only applicable to existing Title V facility)

Certification of Truth, Accuracy and Completeness by a Responsible Official

I, **Mark F. Valori**, certify under penalty of law in 18 Pa. C. S. A. §4904, and 35 P.S. §4009(b) (2) that based on information and belief formed after reasonable inquiry, the statements and information in this application are true, accurate and complete.

(Signature): _____ Date: _____

Name (Print): Mark F. Valori Title: Vice President, Adelphia Gateway, LLC

OFFICIAL USE ONLY

Application No. _____ Unit ID _____ Site ID _____

DEP Client ID #: _____ APS. ID _____ AUTH. ID _____

Date Received _____ Date Assigned _____ Reviewed By _____

Date of 1st Technical Deficiency _____ Date of 2nd Technical Deficiency _____

Comments: _____

Section B - Processes Information

1. Source Information – Compressor Engines (S001 to S003)

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

Three (3) Caterpillar G3606 spark ignition 4-stroke lean burn engines (1,875 HP each), **or equivalent**, that combust pipeline quality natural gas. The engines are used to boost the pressure for the pipeline transmission of natural gas. .

Manufacturer	Model No.	Number of Sources
Caterpillar	G3606	3
Source Designation	**Maximum Capacity**	**Rated Capacity**
S001- S003	1,875 HP (each)	1,875 HP (each)

Type of Material Processed
Natural Gas

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	7	365	8760

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	7	365	8760

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – Compressor Engines (S001 to S003) - Each

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	13,955 SCFH	122 X 10^6 SCF	NA grain/100 SCF	NA	1,030 Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information

1. Source Information – Emergency Generator Engine (S004)

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

One (1) Caterpillar G3412C emergency generator engine (rated 670 hp), **or equivalent**, to provide emergency power at the facility.

Manufacturer	Model No.	Number of Sources
Cummins	GTA28	1
Source Designation	Maximum Capacity	Rated Capacity
S004	523 kilowatt (kW)	523 kW

Type of Material Processed
Natural Gas

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
As needed	As needed	As needed	500

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
As needed	As needed	As needed	500

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel – Emergency Generator (S004)

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	5,699 SCFH	2.8 X 10^6 SCF	NA grain/100 SCF	NA	1,030 Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information (Continued)

3. Burner N/A

Manufacturer	Type and Model No.	Number of Burners

Description:

Rated Capacity	Maximum Capacity

4. Process Storage Vessels – Produced Fluids Tank (S005)

A. For Liquids:

Name of material stored
Produced Fluids (from the pipeline)

Tank I.D. No.	Manufacturer	Date Installed
S005	Tank Builders Inc (TBL)	TBD

Maximum Pressure	Capacity (gallons/Meter^3)
~0.28 psia	1,000 gallons

Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)
Pressure set vent

Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)
0.75	< 1.5 psia

Type of Roof: Describe:
Vertical Fixed Roof

Total Throughput Per Year	
24,000 gallons/year	Number of fills per day (fill/day): varies Filling Rate (gal./min.): varies Duration of fill hr./fill): varies

4. Process Storage Vessels – Engine Oil Tank (S006)

A. For Liquids:

Name of material stored
Engine Oil

Tank I.D. No.	Manufacturer	Date Installed
S006	TBD	TBD

Maximum Pressure	Capacity (gallons/Meter^3)
~0.0075 psia	500 gallons

Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)
Pressure set vent

Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)
Est. < 1 psig	Negligible

Type of Roof: Describe:
Horizontal Tank

Total Throughput Per Year	
6,000 gallons	Number of fills per day (fill/day): varies Filling Rate (gal./min.): varies Duration of fill hr./fill): varies

4. Process Storage Vessels – TEG Tank (S007)

A. For Liquids:

Name of material stored Triethylene Tank		
Tank I.D. No. S007	Manufacturer TBD	Date Installed TBD
Maximum Pressure ~0.001 psia	Capacity (gallons/Meter^3) 500 gallons	
Type of relief device (pressure set vent/conservation vent/emergency vent/open vent) Pressure set vent		
Relief valve/vent set pressure (psig) Est. < 1 psig	Vapor press. of liquid at storage temp. (psia/kPa) Negligible	
Type of Roof: Describe: Horizontal Tank		
Total Throughput Per Year 6,000 gallons	Number of fills per day (fill/day): varies Filling Rate (gal./min.): varies Duration of fill hr./fill): varies	

5. Request for Confidentiality

Do you request any information on this application to be treated as "Confidential"? ☐ Yes ☒ No
If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

See process flow diagram

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Hours of operation will be monitored for all engines. Engine operating parameters such as RPM, percent load and fuel usage may be monitored for normal operating ranges while the station is manned.

Describe each proposed modification to an existing source.

NA

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

Based on preliminary estimates, there will be a total of 186 valves, 1,064 connectors, 532 flanges, 30 open ended lines and 20 other miscellaneous fugitive emission points in the entire facility following the completion of this proposed project. The emissions from these points have been estimated in the site-wide emissions calculations.

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

As the catalyst must be heated to a certain temperature before it reaches its rated reduction efficiency, emissions may be greater during startup of reciprocating engines. To ensure emissions will be minimized, the engines will be operated in accordance with manufacturer's specifications or recommendations.

There is no reason to anticipate excess emissions during shutdown of engines. The only reasonably anticipated upset condition would be malfunction of the catalyst. If such an upset were to occur, the engine would be shutdown until the catalyst was repaired or replaced.

In addition, all sources at the station will be operated in accordance with good engineering practices, according to manufacturer's specifications and in a manner which minimizes air pollution.

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: Q4 2018

ii. Expected completion date of construction/reconstruction/installation: As soon as possible

iii. Anticipated date of start-up: 2019

Section C - Air Cleaning Device

1. Precontrol Emissions* – Compressor Engine (S001 through S003)

Pollutant	Maximum Emission Rate - (each)				Calculation/ Estimation Method
	Specify Units	Pounds/Hour	Hours/Year	Tons/Year	
PM	0.01 lb/MMBtu	0.14	8,760	0.63	AP-42
PM_{10}	0.01 lb/MMBtu	0.14	8,760	0.63	AP-42
SO_x	0.001 lb/MMBtu	0.01	8,760	0.04	AP-42
CO	2.49 g/bhp-hr	10.29	8,760	45.08	Manufacturer
NO_x	0.3 g/bhp-hr	1.24	8,760	5.43	Manufacturer
VOC (NMNEHC)	0.32 g/bhp-hr	1.32	8,760	5.79	Manufacturer
Others: (e.g., HAPs)	-----	-----	-----	-----	-----
Formaldehyde	0.19 g/bhp-hr	0.79	8,760	3.44	Manufacturer

Emissions are based on current design. Final specifications will be at least equivalent.

* These emissions must be calculated based on the requested operating schedule and/or process rate, e.g., operating schedule for maximum limits or restricted hours of operation and/or restricted throughput. Describe how the emission values were determined. Attach calculations.

Section C - Air Cleaning Device (Continued)

10. ☐ **Selective Catalytic Reduction (SCR)**
☐ **Selective Non-Catalytic Reduction (SNCR)**
☒ **Non-Selective Catalytic Reduction (NSCR)**

Equipment Specifications

Manufacturer	Type	Model No.
Miratech	Catalyst	SP-NX-12-08F-EN1, or equivalent

Design Inlet Volume (SCFM)	Design operating temperature (°F)
3,513 (actual)	1,227

Is the system equipped with process controls for proper mixing/control of the reducing agent in gas stream? If yes, give details.

Nonselective catalytic reduction uses a catalyst reaction to simultaneously reduce NOx, CO, and hydrocarbon (HC) to water, carbon dioxide, and nitrogen.

Attach efficiency and other pertinent information (e.g., ammonia slip)

Attached the generator set specifications

Operating Parameters

Volume of gases handled 3,513 (ACFM) @ 1,227 °F

Operating temperature range for the SCR/SNCR/NSCR system (°F) From 850 °F To 1250 °F

Reducing agent used, if any	Oxidation catalyst used, if any
None	Yes

State expected range of usage rate and concentration.

Catalyst reaction is continuously.

Service life of catalyst	Ammonia slip (ppm)
~2 years	N/A

Describe fully with a sketch giving locations of equipment, controls systems, important parameters and method of operation.

Nonselective catalytic reduction (NSCR) is an add-on NOx control technology for exhaust streams with low O2 content. Nonselective catalytic reduction uses a catalyst reaction to simultaneously reduce NOx, CO, and hydrocarbon (HC) to water, carbon dioxide, and nitrogen. The catalyst is usually a noble metal.

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

The unit is guaranteed to meet the removal efficiency below throughout the unit's lifetime.

Emissions Data

Pollutant	Inlet	Outlet	Removal Efficiency (%)
NOx	~10.0 g/bhp-hr	2.0 g/bhp-hr	~80%
CO	~10.9 g/bhp-hr	4.0 g/bhp-hr	~60%

Section C - Air Cleaning Device (Continued)

11. Oxidizer/Afterburners – Oxidation Catalysts for Compressor Engines (S001 through S003)

Equipment Specifications

Manufacturer	Type	Model No.
Emit Technologies, Inc. (or equivalent)	☐ Thermal ☒ Catalytic	RT-3615-Z **(or equivalent)**

Design Inlet Volume (SCFM)	Combustion chamber dimensions (length, cross-sectional area, effective chamber volume, etc.) NA
~11,972 CFM	

Describe design features, which will ensure mixing in combustion chamber.

Oxidation catalysts consist of a substrate made up of thousands of small channels. Each channel is coated with a highly porous layer containing precious metal catalysts, such as platinum or palladium. As exhaust gas travels down the channel, hydrocarbons and carbon monoxide react with oxygen within the porous catalyst layer to form carbon dioxide and water vapor. The resulting gases then exit the channels and flow through the rest of the exhaust system.

Describe method of preheating incoming gases (if applicable). NA	Describe heat exchanger system used for heat recovery (if applicable). NA

Catalyst used	Life of catalyst	Expected temperature rise across catalyst (°F)	Dimensions of bed (in inches).
See above	1 year or 8,760 operating hours	Unknown	Height: ~36” Diameter or Width: ~15” Depth: ~3.5”

Are temperature sensing devices being provided to measure the temperature rise across the catalyst? ☐ Yes ☒ No

If yes, describe.

Describe any temperature sensing and/or recording devices (including specific location of temperature probe in a drawing or sketch.

Burner Information

Burner Manufacturer	Model No.	Fuel Used
NA		

Number and capacity of burners	Rated capacity (each)	Maximum capacity (each)

Describe the operation of the burner	Attach dimensioned diagram of afterburner

Operating Parameters

Inlet flow rate (ACFM) 11,972 @ 822 °F	Outlet flow rate (ACFM) 11,972 @ 822 (design ongoing) °F
State pressure drop range across catalytic bed (in. of water). <9.8 (backpressure)	Describe the method adopted for regeneration or disposal of the used catalyst. Catalyst may be cleaned periodically, or when performance declines.

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

As good practice, a high-temperature shutdown control or alarm may be in place to shut the engine down or warn the operator should the inlet exhaust temperature to the oxidation catalyst(s) approach a critical temperature.

Emissions Data

Pollutant	Inlet	Outlet	Removal Efficiency (%)
CO	2.49 g/bhp-hr	0.17 g/bhp-hr	≥93%
NMNEHC (Non-methane non-ethane hydrocarbons excluding HCHO)	0.32 g/bhp-hr	0.16 g/bhp-hr	~50%
HCHO	0.19 g/bhp-hr	0.04 g/bhp-hr	~80%

Section C - Air Cleaning Device (Continued)

12. Flares N/A

Equipment Specifications

Manufacturer	Type ☐ Elevated flare ☐ Ground flare ☐ Other _____ Describe	Model No.
Design Volume (SCFM)	Dimensions of stack (ft.) Diameter _____ Height _____	
Residence time (sec.) and outlet temperature (°F) (minimum)	Turn down ratio	Burner details

Describe the flare design (air/steam-assisted or nonassisted), essential auxiliaries including pilot flame monitor of proposed flare with a sketch.

Describe the operation of the flare's ignition system.

Describe the provisions to introduce auxiliary fuel to the flare.

Operation Parameters

Detailed composition of the waste gas	Heat content	Exit velocity
Maximum and average gas flow burned (ACFM)	Operating temperature (°F)	

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

Emissions Data

Pollutant	Inlet (tpy)	Outlet (tpy)	Removal Efficiency (%)

Section C - Air Cleaning Device (Continued)

13. Other Control Equipment N/A

Equipment Specifications

Manufacturer	Type	Model No.

Design Volume (SCFM)	Capacity

Describe pH monitoring and pH adjustment, if any.

Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.

Attach efficiency curve and/or other efficiency information.

Attach any additional date including auxiliary equipment and operation details to thoroughly evaluate the control equipment.

Operation Parameters

Volume of gas handled

_____ ACFM @ _____ °F _____ % Moisture

Describe fully giving important parameters and method of operation.

.

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

Emissions Data

Pollutant	Inlet	Outlet	Removal Efficiency (%)

Section C - Air Cleaning Device (Continued)

14. Costs N/A

Indicate cost associated with air cleaning device and its operating cost (attach documentation if necessary)

Device	Direct Cost	Indirect Cost	Total Cost	Annual Operating Cost

15. Miscellaneous

Describe in detail the removal, handling and disposal of dust, effluent, etc. from the air cleaning device including proposed methods of controlling fugitive emissions.

Non Applicable.

Attach manufacturer's performance guarantees and/or warranties for each of the major components of the control system (or complete system).

See Attached Specifications and Guarantees under Attachment C.

Attach the maintenance schedule for the control equipment and any part of the process equipment that if in disrepair would increase air contaminant emissions.

Adelphia will conduct maintenance on all control equipment as recommended by the respective manufacturer.

Section D - Additional Information

Will the construction, modification, etc. of the sources covered by this application increase emissions from other sources at the facility? If so, describe and quantify.

No - this is a greenfield construction project

If this project is subject to any one of the following, attach a demonstration to show compliance with applicable standards.

a. Prevention of Significant Deterioration permit (PSD), 40 CFR 52? ☐ YES ☒ NO

b. New Source Review (NSR), 25 Pa. Code Chapter 127, Subchapter E? ☐ YES ☒ NO

c. New Source Performance Standards (NSPS), 40 CFR Part 60? ☒ YES ☐ NO
(If Yes, which subpart) JJJJ, OOOOa

d. National Emissions Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 61? (If Yes, which subpart) _____ ☐ YES ☒ NO

e. Maximum Achievable Control Technology (MACT) 40 CFR Part 63? ☒ YES ☐ NO
(If Yes, which subpart) ZZZZ

Attach a demonstration showing that the emissions from any new sources will be the minimum attainable through the use of best available technology (BAT).

Please see Section 4 of Application Report.

Provide emission increases and decreases in allowable (or potential) and actual emissions within the last five (5) years for applicable PSD pollutant(s) if the facility is an existing major facility (PSD purposes).

N/A

Section D - Additional Information (Continued)

Indicate emission increases and decreases in tons per year (tpy), for volatile organic compounds (VOCs) and nitrogen oxides (NOx) for NSR applicability since January 1, 1991 or other applicable dates (see other applicable dates in instructions). The emissions increases include all emissions including stack, fugitive, material transfer, other emission generating activities, quantifiable emissions from exempted source(s), etc.

Permit number (if applicable)	Date issued	Indicate ***Yes*** or ***No*** if emission increases and decreases were used previously for netting	Source I. D. or Name	VOCs		NOx	
				Emission increases in potential to emit (tpy)	Creditable emission decreases in actual emissions (tpy)	Emission increases in potential to emit (tpy)	Creditable emission decreases in actual emissions (tpy)
N/A							

If the source is subject to 25 Pa. Code Chapter 127, Subchapter E, New Source Review requirements,

a. Identify Emission Reduction Credits (ERCs) for emission offsets or demonstrate ability to obtain suitable ERCs for emission offsets. **N/A**

b. Provide a demonstration that the lowest achievable emission rate (LAER) control techniques will be employed (if applicable). **N/A**

c. Provide an analysis of alternate sites, sizes, production processes and environmental control techniques demonstrating that the benefits of the proposed source outweigh the environmental and social costs (if applicable). **N/A**

Attach calculations and any additional information necessary to thoroughly evaluate compliance with all the applicable requirements of Article III and applicable requirements of the Clean Air Act adopted thereunder. The Department may request additional information to evaluate the application such as a standby plan, a plan for air pollution emergencies, air quality modeling, etc.

Section E - Compliance Demonstration (Compressor Engines - S001 and S003)

Note: Complete this section if source is not a Title V facility. Title V facilities must complete Addendum A.

Method of Compliance Type: Check all that apply and complete all appropriate sections below

☒ Monitoring ☒ Testing ☒ Reporting

☒ Recordkeeping ☐ Work Practice Standard

Monitoring:

a. Monitoring device type (Parameter, CEM, etc): Adelphia will track hours of operation of the compressor engines with a SCADA system as well as fuel using gas meters.

b. Monitoring device location: Fuel will be monitored via a master gas meter (for the site) as well as individual compressor engine meters.

c. Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Fuel and operation will be continuously monitored using the instrumentation noted above.

Testing:

a. Reference Test Method: Citation: 40 CFR 60.4243(b)(2)(ii) requires initial performance testing as well as subsequent compliance testing every 8,760 hours or three years, whichever comes first. Testing to be conducted in accordance with 40 CFR 60.4244.

b. Reference Test Method: Description: EPA approved test methods - 7E (NOx concentration), 10 (CO concentration), 25A/320 (NMHC concentration), and 19 (exhaust mass emissions rate)

Recordkeeping:

Describe what parameters will be recorded and the recording frequency:

Records of all notifications submitted to comply with NSPS Subpart JJJJ, records of maintenance conducted on the engine and performance testing reports maintained in accordance with 40 CFR 60.4245(a).

Compressor engine fuel and hours of operation will be recorded on a calendar month basis.

Reporting:

a. Describe what is to be reported and frequency of reporting:

Initial Notification of the date construction commences no later than 30 days after such date in accordance with 40 CFR 60.7(a)(1) and 60.4245 (c) and performance testing results within 60 days of test completion in accordance with 40 CFR 60.4245(d).

b. Reporting start date: 60 days after first performance test

Work Practice Standard:

Describe each: Prepare and adhere to a maintenance plan to maintain and operate the engine, to the extent practicable, in a manner consistent with good air pollution control practices for minimizing emissions as required by 40 CFR 60.4243(b)(2)(ii).

Section F - Flue and Air Contaminant Emissions – Compressor Engine (S001 through S003)

1. Estimated Atmospheric Emissions* Post-Control @ 8760 hrs/yr (Each Engine)

Pollutant	Maximum emission rate			Calculation/ Estimation Method
	specify units	lbs/hr	tons/yr.	
PM	0.01 lb/MMBtu	0.14	0.63	AP-42
PM_{10}	0.01 lb/MMBtu	0.14	0.63	AP-42
SO_x	0.001 lb/MMBtu	0.01	0.04	AP-42
CO	0.17 g/bhp-hr	0.70	3.08	Vendor Guarantee
NO_x	0.30 g/bhp-hr	1.24	5.43	Vendor Guarantee
VOC (including formaldehyde)	0.20 g/bhp-hr	0.83	3.62	Vendor Guarantee
Others: (e.g., HAPs)	-----	-----	-----	-----
Formaldehyde	0.04 g/bhp-hr	0.17	0.72	Vendor Guarantee

Final design specifications will be, at least, equivalent to those listed here.

* These emissions must be calculated based on the requested operating schedule and/or process rate e.g., operating schedule for maximum limits or restricted hours of operation and /or restricted throughput. Describe how the emission values were determined. Attach calculations.

2. Stack and Exhauster

Stack Designation/Number P001 – P003

List Source(s) or source ID exhausted to this stack:	% of flow exhausted to stack: 100
Three (3) CAT G3606 Compressor Engines (one stack per engine)	

Stack height above grade (ft.) ~40 Grade elevation (ft.) ~38	Stack diameter (ft) or Outlet duct area (sq. ft.) ~2.5	f. Weather Cap ☐ YES ☒ NO

Distance of discharge to nearest property line (ft.). Locate on topographic map.

~75 ft (see site plan drawing provided as part of September 2018 supplemental materials)

Does stack height meet Good Engineering Practice (GEP)?

Yes

If modeling (estimating) of ambient air quality impacts is needed, attach a site plan with buildings and their dimensions and other obstructions. NA

Location of stack** Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

Stack exhaust
Volume 11,972 ACFM Temperature 822 °F Moisture TBD, Design ongoing %

Indicate on an attached sheet the location of sampling ports with respect to exhaust fan, breeching, etc. Give all necessary dimensions.
TBD, design ongoing

Exhauster (attach fan curves) _____ in. of water _____ HP @ _____RPM.

** If the data and collection method codes differ from those provided on the General Information Form-Authorization Application, provide the additional detail required by that form on a separate form.

Section F - Flue and Air Contaminant Emissions – Emergency Generator (S004)

1. Estimated Atmospheric Emissions* Emergency Generator @ 500 hrs/yr

Pollutant	Maximum emission rate			Calculation/ Estimation Method
	specify units	lbs/hr	tons/yr.	
PM	9.50E-3 lb/MMbtu	0.11	0.03	AP-42
PM_{10}	9.50E-3 lb/MMbtu	0.11	0.03	AP-42
SO_x	0.003 lb/MMBtu	<0.01	<0.01	AP-42
CO	4.0 g/bhp-hr	6.18	1.55	Manufacturer's Spec
NO_x	2.0 g/bhp-hr	3.09	0.77	Manufacturer's Spec
VOC (including formaldehyde)	1.0 g/bhp-hr + formaldehyde	1.67	0.42	Manufacturer's Spec and AP-42
Others: (e.g., HAPs)	-----	-----	-----	-----
Formaldehyde	2.05E-02 lb/MMBtu	0.12	0.03	AP-42

Final design specifications will be, at least, equivalent to those listed here.

* These emissions must be calculated based on the requested operating schedule and/or process rate e.g., operating schedule for maximum limits or restricted hours of operation and /or restricted throughput. Describe how the emission values were determined. Attach calculations.

2. Stack and Exhauster

Stack Designation/Number P-004

List Source(s) or source ID exhausted to this stack:
One (1) Emergency Generator (S004)

% of flow exhausted to stack: 100

Stack height above grade (ft.) ~6
Grade elevation (ft.) ~35

Stack diameter (ft) or Outlet duct area (sq. ft.)
~1

f. Weather Cap
☐ YES ☒ NO

Distance of discharge to nearest property line (ft.). Locate on topographic map.
~130

Does stack height meet Good Engineering Practice (GEP)?
Yes

If modeling (estimating) of ambient air quality impacts is needed, attach a site plan with buildings and their dimensions and other obstructions. NA

Location of stack** Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

Stack exhaust
Volume 3,513 ACFM Temperature 1,227 °F Moisture TBD, Design ongoing %

Indicate on an attached sheet the location of sampling ports with respect to exhaust fan, breeching, etc. Give all necessary dimensions.
TBD, design ongoing

Exhauster (attach fan curves) _____ in. of water _____ HP @ _____RPM.

** If the data and collection method codes differ from those provided on the General Information Form-Authorization Application, provide the additional detail required by that form on a separate form.

Section G - Attachments

Number and list all attachments submitted with this application below:

- Narrative Report
  - Section 2: Project Description
  - Section 3: Applicable Regulations Review (Includes Aggregation Analysis)
  - Section 4: Best Available Technology (BAT) Analysis
  - Section 5: Sample Emission Source Calculations
- Appendix A : Area Maps and Process Flow Diagram
- Appendix B : Detailed Emission Calculations and BAT Analysis
- Appendix C : Manufacturer's Specifications
- Appendix D: Plan Approval Application Forms
- Appendix E: General Information Form (GIF)
- Appendix F: Compliance Review Form
- Appendix G: County & Municipal Notifications
- Appendix H: Application Fee

APPENDIX E: GENERAL INFORMATION FORM (GIF)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

GENERAL INFORMATION FORM – AUTHORIZATION APPLICATION

Before completing this General Information Form (GIF), read the step-by-step instructions provided in this application package. This version of the General Information Form (GIF) must be completed and returned with any program-specific application being submitted to the Department.

Related ID#s (If Known)		DEP USE ONLY
Client ID#	**APS ID#**	Date Received & General Notes
Site ID#	**Auth ID#**	
Facility ID#		

CLIENT INFORMATION

DEP Client ID#	Client Type / Code
	LLC

Organization Name or Registered Fictitious Name	Employer ID# (EIN)	Dun & Bradstreet ID#
Adelphia Pipeline Company, LLC		

Individual Last Name	First Name	MI	Suffix	SSN
N/A				

Additional Individual Last Name	First Name	MI	Suffix	SSN
N/A				

Mailing Address Line 1	Mailing Address Line 2
Adelphia Gateway, LLC	1415 Wyckoff Road

Address Last Line – City	State	ZIP+4	Country
Wall	NJ	07719	USA

Client Contact Last Name	First Name	MI	Suffix
Valori	Mark	F	

Client Contact Title	Phone	Ext
Vice President	(732) 938-1169	

Email Address	FAX
mvalori@NJResources.com	N/A

SITE INFORMATION

DEP Site ID#	Site Name
	Marcus Hook Compressor Station

EPA ID# **Estimated Number of Employees to be Present at Site** 0 (unmanned)

Description of Site
A natural gas compression facility

County Name	Municipality	City	Boro	Twp	State
Delaware	Lower Chichester	☐	☐	☒	PA

Site Location Line 1	Site Location Line 2
West Ridge Rd	

Site Location Last Line – City	State	ZIP+4
Marcus Hook	PA	19061

Detailed Written Directions to Site
From I-95 South take exit 1 for Chichester Avenue (then travel 02 miles). Turn left onto Pleasant Ave (travel 300 feet). Turn left onto Chichester Ave (travel 0.2 miles). Turn right onto Columbia Ave (travel 0.3 miles). Turn left at the 1st cross street onto Blueball Ave (travel 0.4 miles). Turn right at the 1st cross street onto Ridge Rd (travel 0.6 miles). The station will be on your left.

Site Contact Last Name	First Name	MI	Suffix
Valori	Mark	F	

Site Contact Title	Site Contact Firm
Vice President	Adelphia Gateway, LLC

Mailing Address Line 1	Mailing Address Line 2
1415 Wyckoff Road	

Mailing Address Last Line – City	State	ZIP+4
Wall	NJ	07719

Phone	Ext	FAX	Email Address
(732) 938-1169			mvalori@NJResources.com

NAICS Codes (Two- & Three-Digit Codes – List All That Apply) **6-Digit Code** (Optional)
486210

Client to Site Relationship
Owner/Operator

FACILITY INFORMATION

Modification of Existing Facility	Yes	No
1. Will this project modify an existing facility, system, or activity?	☐	☒
2. Will this project involve an addition to an existing facility, system, or activity?	☐	☒

If "Yes", check all relevant facility types and provide DEP facility identification numbers below.

	Facility Type	DEP Fac ID#		Facility Type	DEP Fac ID#
☐	Air Emission Plant		☐	Industrial Minerals Mining Operation	
☐	Beneficial Use (water)		☐	Laboratory Location	
☐	Blasting Operation		☐	Land Recycling Cleanup Location	
☐	Captive Hazardous Waste Operation		☐	MineDrainageTrmt/LandRecyProjLocation	
☐	Coal Ash Beneficial Use Operation		☐	Municipal Waste Operation	
☐	Coal Mining Operation		☐	Oil & Gas Encroachment Location	
☐	Coal Pillar Location		☐	Oil & Gas Location	
☐	Commercial Hazardous Waste Operation		☐	Oil & Gas Water Poll Control Facility	
☐	Dam Location		☐	Public Water Supply System	
☐	Deep Mine Safety Operation -Anthracite		☐	Radiation Facility	
☐	Deep Mine Safety Operation -Bituminous		☐	Residual Waste Operation	
☐	Deep Mine Safety Operation -Ind Minerals		☐	Storage Tank Location	
☐	Encroachment Location (water, wetland)		☐	Water Pollution Control Facility	
☐	Erosion & Sediment Control Facility		☐	Water Resource	
☐	Explosive Storage Location		☐	Other:	

Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
	39	48	53.82	-75	26	19.56

Horizontal Accuracy Measure Feet --*or*-- Meters

Horizontal Reference Datum Code
- ☐ North American Datum of 1927
- ☐ North American Datum of 1983
- ☒ World Geodetic System of 1984

Horizontal Collection Method Code

Reference Point Code

Altitude Feet ~35 --*or*-- Meters

Altitude Datum Name
- ☐ The National Geodetic Vertical Datum of 1929
- ☐ The North American Vertical Datum of 1988 (NAVD88)

Altitude (Vertical) Location Datum Collection Method Code

Geometric Type Code

Data Collection Date

Source Map Scale Number Inch(es) = Feet
--*or*-- Centimeter(s) = Meters

PROJECT INFORMATION

Project Name
Marcus Hook Compressor Station

Project Description
Adelphia Pipeline Company, LLC plans to construct a new natural gas compression facility consisting of three (3) Caterpillar G3606 reciprocating internal combustion compressor engines (1,875 hp each) equipped with oxidation catalysts for air pollution control, one (1) Caterpillar G3412C emergency-use reciprocating internal combustion generator engine (670 hp) equipped with a non-selective catalytic reduction (NSCR or "three-way") catalyst for air pollution control, one (1) 1,000 gallon produced fluid tank, two (2) miscellaneous storage tanks (each 500 gallons or less); and miscellaneous associated piping and components..

Project Consultant Last Name	First Name	MI	Suffix
Donaldson	Ian		

Project Consultant Title	Consulting Firm
Managing Consultant	Trinity Consultants

Mailing Address Line 1	Mailing Address Line 2
4500 Brooktree Rd.	Suite 103

Address Last Line – City	State	ZIP+4
Wexford	PA	15090

Phone	Ext	FAX	Email Address
(724) 935-2611	3		idonaldson@trinityconsultants.com

Time Schedules	Project Milestone (Optional)
Upon Approval	Proposed start of construction (4th Quarter 2018)

1. Have you informed the surrounding community and addressed any concerns prior to submitting the application to the Department? ☐ Yes ☒ No

2. Is your project funded by state or federal grants? ☐ Yes ☒ No

Note: If "Yes", specify what aspect of the project is related to the grant and provide the grant source, contact person and grant expiration date.

Aspect of Project Related to Grant

Grant Source: _____

Grant Contact Person: _____

Grant Expiration Date: _____

3. Is this application for an authorization on Appendix A of the Land Use Policy? (For referenced list, see Appendix A of the Land Use Policy attached to GIF instructions) ☒ Yes ☐ No

Note: If "No" to Question 3, the application is not subject to the Land Use Policy.

If "Yes" to Question 3, the application is subject to this policy and the Applicant should answer the additional questions in the **Land Use Information** section.

LAND USE INFORMATION

Note: Applicants are encouraged to submit copies of local land use approvals or other evidence of compliance with local comprehensive plans and zoning ordinances.

1. Is there an adopted county or multi-county comprehensive plan? ☒ Yes ☐ No

2. Is there an adopted municipal or multi-municipal comprehensive plan? ☒ Yes ☐ No

3. Is there an adopted county-wide zoning ordinance, municipal zoning ordinance or joint municipal zoning ordinance? ☒ Yes ☐ No

Note: If the Applicant answers "No" to either Questions 1, 2 or 3, the provisions of the PA MPC are not applicable and the Applicant does not need to respond to questions 4 and 5 below.

If the Applicant answers "Yes" to questions 1, 2 and 3, the Applicant should respond to questions 4 and 5 below.

4. Does the proposed project meet the provisions of the zoning ordinance or does the proposed project have zoning approval? If zoning approval has been received, attach documentation. ☒ Yes ☐ No

Note: EQT will ensure that the proposed project meets all applicable zoning requirements.

5. Have you attached Municipal and County Land Use Letters for the project? ☐ Yes ☒ No

COORDINATION INFORMATION

Note: The PA Historical and Museum Commission must be notified of proposed projects in accordance with DEP Technical Guidance Document 012-0700-001 and the accompanying Cultural Resource Notice Form.

If the activity will be a mining project (i.e., mining of coal or industrial minerals, coal refuse disposal and/or the operation of a coal or industrial minerals preparation/processing facility), respond to questions 1.0 through 2.5 below.

If the activity will not be a mining project, skip questions 1.0 through 2.5 and begin with question 3.0.

1.0	**Is this a coal mining project?** If "Yes", respond to 1.1-1.6. If "No", skip to Question 2.0.	☐	Yes	☒	No
1.1	**Will this coal mining project involve coal preparation/ processing activities in which the total amount of coal prepared/processed will be equal to or greater than 200 tons/day?**	☐	Yes	☐	No
1.2	**Will this coal mining project involve coal preparation/ processing activities in which the total amount of coal prepared/processed will be greater than 50,000 tons/year?**	☐	Yes	☐	No
1.3	**Will this coal mining project involve coal preparation/ processing activities in which thermal coal dryers or pneumatic coal cleaners will be used?**	☐	Yes	☐	No
1.4	**For this coal mining project, will sewage treatment facilities be constructed and treated waste water discharged to surface waters?**	☐	Yes	☐	No
1.5	**Will this coal mining project involve the construction of a permanent impoundment meeting one or more of the following criteria: (1) a contributory drainage area exceeding 100 acres; (2) a depth of water measured by the upstream toe of the dam at maximum storage elevation exceeding 15 feet; (3) an impounding capacity at maximum storage elevation exceeding 50 acre-feet?**	☐	Yes	☐	No
1.6	**Will this coal mining project involve underground coal mining to be conducted within 500 feet of an oil or gas well?**	☐	Yes	☐	No
2.0	**Is this a non-coal (industrial minerals) mining project?** If "Yes", respond to 2.1-2.6. If "No", skip to Question 3.0.	☐	Yes	☒	No
2.1	**Will this non-coal (industrial minerals) mining project involve the crushing and screening of non-coal minerals other than sand and gravel?**	☐	Yes	☐	No
2.2	**Will this non-coal (industrial minerals) mining project involve the crushing and/or screening of sand and gravel with the exception of wet sand and gravel operations (screening only) and dry sand and gravel operations with a capacity of less than 150 tons/hour of unconsolidated materials?**	☐	Yes	☐	No
2.3	**Will this non-coal (industrial minerals) mining project involve the construction, operation and/or modification of a portable non-metallic (i.e., non-coal) minerals processing plant under the authority of the General Permit for Portable Non-metallic Mineral Processing Plants (i.e., BAQ-PGPA/GP-3)?**	☐	Yes	☐	No
2.4	**For this non-coal (industrial minerals) mining project, will sewage treatment facilities be constructed and treated waste water discharged to surface waters?**	☐	Yes	☐	No
2.5	**Will this non-coal (industrial minerals) mining project involve the construction of a permanent impoundment meeting one or more of the following criteria: (1) a contributory drainage area exceeding 100 acres; (2) a depth of water measured by the upstream toe of the dam at maximum storage elevation exceeding 15 feet; (3) an impounding capacity at maximum storage elevation exceeding 50 acre-feet?**	☐	Yes	☐	No
3.0	**Will your project, activity, or authorization have anything to do with a well related to oil or gas production, have construction within 200 feet of, affect an oil or gas well, involve the waste from such a well, or string power lines above an oil or gas well?** If "Yes", respond to 3.1-3.3. If "No", skip to Question 4.0.	☐	Yes	☒	No

3.1	**Does the oil- or gas-related project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a watercourse, floodway or body of water (including wetlands)?**	☐	Yes	☐	No
3.2	**Will the oil- or gas-related project involve discharge of industrial wastewater or stormwater to a dry swale, surface water, ground water or an existing sanitary sewer system or storm water system?** If "Yes", discuss in *Project Description*.	☐	Yes	☐	No
3.3	**Will the oil- or gas-related project involve the construction and operation of industrial waste treatment facilities?**	☐	Yes	☐	No
4.0	**Will the project involve a construction activity that results in earth disturbance?** If "Yes", specify the total disturbed acreage. **4.0.1 Total Disturbed Acreage** ~1 acres	☒	Yes	☐	No
5.0	**Does the project involve any of the following?** If "Yes", respond to 5.1-5.3. If "No", skip to Question 6.0.	☐	Yes	☒	No
5.1	**Water Obstruction and Encroachment Projects – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a watercourse, floodway or body of water?**	☐	Yes	☐	No
5.2	**Wetland Impacts – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a wetland?**	☐	Yes	☐	No
5.3	**Floodplain Projects by the commonwealth, a Political Subdivision of the commonwealth or a Public Utility – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a floodplain?**	☐	Yes	☐	No
6.0	**Will the project involve discharge of stormwater or wastewater from an industrial activity to a dry swale, surface water, ground water or an existing sanitary sewer system or separate storm water system?**	☐	Yes	☒	No
7.0	**Will the project involve the construction and operation of industrial waste treatment facilities?**	☐	Yes	☒	No
8.0	**Will the project involve construction of sewage treatment facilities, sanitary sewers, or sewage pumping stations?** If "Yes", indicate estimated proposed flow (gal/day). Also, discuss the sanitary sewer pipe sizes and the number of pumping stations/treatment facilities/name of downstream sewage facilities in the *Project Description*, where applicable. **8.0.1 Estimated Proposed Flow (gal/day)**	☐	Yes	☒	No
9.0	**Will the project involve the subdivision of land, or the generation of 800 gpd or more of sewage on an existing parcel of land or the generation of an additional 400 gpd of sewage on an already-developed parcel, or the generation of 800 gpd or more of industrial wastewater that would be discharged to an existing sanitary sewer system?**	☐	Yes	☒	No
	9.0.1 Was Act 537 sewage facilities planning submitted and approved by DEP? If "Yes" attach the approval letter. Approval required prior to 105/NPDES approval.	☐	Yes	☐	No
10.0	**Is this project for the beneficial use of biosolids for land application within Pennsylvania?** If "Yes" indicate how much (i.e. gallons or dry tons per year). **10.0.1 Gallons Per Year (residential septage)** _____ **10.0.2 Dry Tons Per Year (biosolids)**	☐	Yes	☒	No
11.0	**Does the project involve construction, modification or removal of a dam?** If "Yes", identify the dam. **11.0.1 Dam Name**	☐	Yes	☒	No
12.0	**Will the project interfere with the flow from, or otherwise impact, a dam?** If "Yes", identify the dam. **12.0.1 Dam Name**	☐	Yes	☒	No

13.0	**Will the project involve operations (excluding during the construction period) that produce air emissions (i.e., NOX, VOC, etc.)?** If "Yes", identify each type of emission followed by the amount of that emission.	☒	Yes	☐	No
	13.0.1 Enter all types & amounts of emissions; separate each set with semicolons. See attached emission calculations				
14.0	**Does the project include the construction or modification of a drinking water supply to serve 15 or more connections or 25 or more people, at least 60 days out of the year?** If "Yes", check all proposed sub-facilities.	☐	Yes	☒	No
	14.0.1 Number of Persons Served				
	14.0.2 Number of Employee/Guests				
	14.0.3 Number of Connections				
	14.0.4 Sub-Fac: Distribution System	☐	Yes	☐	No
	14.0.5 Sub-Fac: Water Treatment Plant	☐	Yes	☐	No
	14.0.6 Sub-Fac: Source	☐	Yes	☐	No
	14.0.7 Sub-Fac: Pump Station	☐	Yes	☐	No
	14.0.8 Sub Fac: Transmission Main	☐	Yes	☐	No
	14.0.9 Sub-Fac: Storage Facility	☐	Yes	☐	No
15.0	**Will your project include infiltration of storm water or waste water to ground water within one-half mile of a public water supply well, spring or infiltration gallery?**	☐	Yes	☒	No
16.0	**Is your project to be served by an existing public water supply?** If "Yes", indicate name of supplier and attach letter from supplier stating that it will serve the project.	☐	Yes	☒	No
	16.0.1 Supplier's Name				
	16.0.2 Letter of Approval from Supplier is Attached	☐	Yes	☐	No
17.0	**Will this project involve a new or increased drinking water withdrawal from a stream or other water body?** If "Yes", should reference both Water Supply and Watershed Management.	☐	Yes	☒	No
	17.0.1 Stream Name				
18.0	**Will the construction or operation of this project involve treatment, storage, reuse, or disposal of waste?** If "Yes", indicate what type (i.e., hazardous, municipal (including infectious & chemotherapeutic), residual) and the amount to be treated, stored, re-used or disposed.	☐	Yes	☒	No
	18.0.1 Type & Amount				
19.0	**Will your project involve the removal of coal, minerals, etc. as part of any earth disturbance activities?**	☐	Yes	☒	No
20.0	**Does your project involve installation of a field constructed underground storage tank?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit.	☐	Yes	☒	No
	20.0.1 Enter all substances & capacity of each; separate each set with semicolons.				
21.0	**Does your project involve installation of an aboveground storage tank greater than 21,000 gallons capacity at an existing facility?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit.	☐	Yes	☒	No
	21.0.1 Enter all substances & capacity of each; separate each set with semicolons.				
22.0	**Does your project involve installation of a tank greater than 1,100 gallons which will contain a highly hazardous substance as defined in DEP's Regulated Substances List, 2570-BK-DEP2724?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit.	☐	Yes	☒	No
	22.0.1 Enter all substances & capacity of each; separate each set with semicolons.				

23.0	**Does your project involve installation of a storage tank at a new facility with a total AST capacity greater than 21,000 gallons?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit.	☒	Yes	☐	No
23.0.1	**Enter all substances & capacity of each; separate each set with semicolons.**	See Attached Emission Calculations for storage tank capacities and contents			
24.0	**Will the intended activity involve the use of a radiation source?**	☐	Yes	☒	No

CERTIFICATION

I certify that I have the authority to submit this application on behalf of the applicant named herein and that the information provided in this application is true and correct to the best of my knowledge and information.

Type or Print Name **Mark F. Valori**

	Vice President	
Signature	**Title**	**Date**

APPENDIX F: COMPLIANCE REVIEW FORM

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

AIR POLLUTION CONTROL ACT COMPLIANCE REVIEW FORM

Fully and accurately provide the following information, as specified. Attach additional sheets as necessary.

Type of Compliance Review Form Submittal (check all that apply)

☒ Original Filing
☐ Amended Filing

Date of Last Compliance Review Form Filing: _____/_____/_____

Type of Submittal

☒ New Plan Approval ☐ New Operating Permit ☐ Renewal of Operating Permit
☐ Extension of Plan Approval ☐ Change of Ownership ☐ Periodic Submission (@ 6 mos)
☐ Other: _____

SECTION A. GENERAL APPLICATION INFORMATION

Name of Applicant/Permittee/("applicant")
(non-corporations-attach documentation of legal name)
Adelphia Gateway, LLC

Address 1415 Wyckoff Rd
Wall, NJ 07719

Telephone 732.938.1000 **Taxpayer ID#** 82-3224011

Permit, Plan Approval or Application ID#

Identify the form of management under which the applicant conducts its business (check appropriate box)

☐ Individual ☐ Syndicate ☐ Government Agency
☐ Municipality ☐ Municipal Authority ☐ Joint Venture
☐ Proprietorship ☐ Fictitious Name ☐ Association
☒ Public Corporation ☐ Partnership ☐ Other Type of Business, specify below:
☐ Private Corporation ☐ Limited Partnership

Describe below the type(s) of business activities performed.
Natural Gas Transmission

SECTION B. GENERAL INFORMATION REGARDING "APPLICANT"

If applicant is a corporation or a division or other unit of a corporation, provide the names, principal places of business, state of incorporation, and taxpayer ID numbers of all domestic and foreign parent corporations (including the ultimate parent corporation), and all domestic and foreign subsidiary corporations of the ultimate parent corporation with operations in Pennsylvania. Please include all corporate divisions or units, (whether incorporated or unincorporated) and privately held corporations. (A diagram of corporate relationships may be provided to illustrate corporate relationships.) Attach additional sheets as necessary.

Unit Name	Principal Places of Business	State of Incorporation	Taxpayer ID	Relationship to Applicant
NJR Pipeline Company	1415 Wyckoff Road, Wall NJ 07719	NJ	22-2950247	Immediate Parent
NJR Midstream Holdings Corporation	1415 Wyckoff Road, Wall NJ 07719	NJ	22-3377110	Parent of NJR Pipeline Company
NJR Energy Investments Corporation	1415 Wyckoff Road, Wall NJ 07719	NJ	22-3164424	Parent of NJR Midstream Holdings Corporation
New Jersey Resources Corporation	1415 Wyckoff Road, Wall NJ 07719	NJ	22-2376465	Ultimate Parent
Ringer Hill Wind, LLC	1415 Wyckoff Road, Wall NJ 07719	DE	27-3785821	Affiliate (100% common ownership)
Steckman Ridge, LP	5400 Westheimer Court, Houston, TX 77056	DE	20-8631129	Affiliate (50% common ownership)
NJR Energy Services Company	1415 Wyckoff Road, Wall NJ 07719	NJ	22-3486298	Affiliate (100% common ownership)

SECTION C. SPECIFIC INFORMATION REGARDING APPLICANT AND ITS "RELATED PARTIES"

Pennsylvania Facilities. List the name and location (mailing address, municipality, county), telephone number, and relationship to applicant (parent, subsidiary or general partner) of applicant and all Related Parties' places of business, and facilities in Pennsylvania. Attach additional sheets as necessary.

Unit Name	Street Address	County and Municipality	Telephone No.	Relationship to Applicant
Ringer Hill Wind, LLC	118 Baxter Street, Confluence, PA 15424	Somerset County, Confluence	732-403-5193	Affiliate (100% common ownership)
Steckman Ridge, LP	1809 Rock Hill Church Road, Clearville, PA	Bedford County, Clearville	713-627-5415	Affiliate (50% common ownership)
NJR Energy Services Company	835 Hamilton Street, Suite 150, Allentown, PA 18101	Lehigh County, Allentown	610-601-0115	Affiliate (100% common ownership)

Provide the names and business addresses of all general partners of the applicant and parent and subsidiary corporations, if any.

Name	Business Address
None	

List the names and business address of persons with overall management responsibility for the process being permitted (i.e. plant manager).

Name	Business Address
Mark F. Valori, Vice President	1415 Wyckoff Road, Wall NJ 07719
Keith Edmonds, Project Manager	1415 Wyckoff Road, Wall NJ 07719

Plan Approvals or Operating Permits. List all plan approvals or operating permits issued by the Department or an approved local air pollution control agency under the APCA to the applicant or related parties that are currently in effect or have been in effect at any time 5 years prior to the date on which this form is notarized. This list shall include the plan approval and operating permit numbers, locations, issuance and expiration dates. Attach additional sheets as necessary.

Air Contamination Source	Plan Approval/ Operating Permit#	Location	Issuance Date	Expiration Date

Compliance Background. (Note: Copies of specific documents, if applicable, must be made available to the Department upon its request.) List all documented conduct of violations or enforcement actions identified by the Department pursuant to the APCA, regulations, terms and conditions of an operating permit or plan approval or order by applicant or any related party, using the following format grouped by source and location in reverse chronological order. Attach additional sheets as necessary. See the definition of "documented conduct" for further clarification. Unless specifically directed by the Department, deviations which have been previously reported to the Department in writing, relating to monitoring and reporting, need not be reported.

Date	Location	Plan Approval/ Operating Permit#	Nature of Documented Conduct	Type of Department Action	Status: Litigation Existing/Continuing or Corrected/Date	Dollar Amount Penalty
						$
						$
						$
						$
						$
						$
						$
						$
						$
						$

List all incidents of deviations of the APCA, regulations, terms and conditions of an operating permit or plan approval or order by applicant or any related party, using the following format grouped by source and location in reverse chronological order. This list must include items both currently known and unknown to the Department. Attach additional sheets as necessary. See the definition of "deviations" for further clarification.

Date	Location	Plan Approval/ Operating Permit#	Nature of Deviation	Incident Status: Litigation Existing/Continuing Or Corrected/Date

<u>CONTINUING OBLIGATION</u>. Applicant is under a continuing obligation to update this form using the Compliance Review Supplemental Form if any additional deviations occur between the date of submission and Department action on the application.

VERIFICATION STATEMENT
Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. Section 4009(b)(2), I verify under penalty of law that I am authorized to make this verification on behalf of the Applicant/Permittee. I further verify that the information contained in this Compliance Review Form is true and complete to the best of my belief formed after reasonable inquiry. I further verify that reasonable procedures are in place to ensure that "documented conduct" and "deviations" as defined in 25 Pa Code Section 121.1 are identified and included in the information set forth in this Compliance Review Form.
Signature — 4/17/2018 (Date)
Mark F. Valori (Name (Print or Type))
Vice President (Title)

APPENDIX G: COUNTY & MUNICIPAL NOTIFICATIONS

May 9, 2018

Delaware County Council
201 W Front St,
Media, PA 19063

USPS Tracking No. 7017 2400 0000 1529 3960

Dear County Council Members:

Adelphia Gateway, LLC (Adelphia) has submitted an application to the Pennsylvania Department of Environmental Protection's (PADEP) Air Quality Program to construct a new natural gas compressor station (Marcus Hook Compressor Station) in Lower Chichester Township, Delaware County, PA.

Specifically, the application requests authorization to install and operate the following sources:

- Three (3) Caterpillar G3606 reciprocating internal combustion compressor engines (1,875 hp each) equipped with oxidation catalysts for air pollution control;
- One (1) Caterpillar G3412C emergency-use reciprocating internal combustion generator engine (670 hp) equipped with a non-selective catalytic reduction (NSCR or "three-way") catalyst for air pollution control;
- One (1) 1,000 gallon produced fluid tank;
- Two (2) miscellaneous storage tanks (each 500 gallons or less); and
- Miscellaneous associated piping and components.

Pennsylvania Code Title 25 (Environmental Protection – Air Resources) Section 127.413 requires municipal notification including a 30-day comment period regarding the permit application, which begins upon receipt of this formal notification. During this comment period, DEP will accept such comments. Comments are to be sent to:

Air Quality Program
PADEP – Southeast Regional Office
2E Main Street
Norristown, PA 19401

If you have any questions or need any additional information, please contact me directly by phone at (484) 775-0485 or by email at Jonathan.Hess@nv5.com.

Respectfully,

Jonathan Hess
Project Manager – NV5

May 9, 2018

Board of Commissioners
Lower Chichester Township
1410 Market Street
Linwood, PA 19061

USPS Tracking No. 7017 2400 0000 1529 3953

Dear Commissioners:

Adelphia Gateway, LLC (Adelphia) has submitted an application to the Pennsylvania Department of Environmental Protection's (PADEP) Air Quality Program to construct a new natural gas compressor station (Marcus Hook Compressor Station) in Lower Chichester Township, Delaware County, PA.

Specifically, the application requests authorization to install and operate the following sources:

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Air Quality Program
PADEP – Southeast Regional Office
2E Main Street
Norristown, PA 19401

If you have any questions or need any additional information, please contact me directly by phone at (484) 775-0485 or by email at Jonathan.Hess@nv5.com.

Respectfully,

Jonathan Hess
Project Manager – NV5

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MARCUS HOOK, PA 19061

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- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

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Street and Apt. No., or PO Box No.: 1410 Market Street
City, State, ZIP+4®: Linwood PA 19061

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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Extra Services & Fees (check box, add fee as appropriate)
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- [x] Return Receipt (electronic) $0.00
- [ ] Certified Mail Restricted Delivery $0.00
- [ ] Adult Signature Required $0.00
- [ ] Adult Signature Restricted Delivery $

$2.75

Postage $1.00

Total Postage and Fees $7.20

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Sent To: Delaware County Council
Street and Apt. No., or PO Box No.: 201 W Front Street
City, State, ZIP+4®: Media PA 19063

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7017 2400 0000 1529 3960

APPENDIX H: APPLICATION FEE