LAMBERTVILLE EAST EXPANSION PROJECT

RESOURCE REPORT 9
Air and Noise Quality

FERC Docket No. CP18-___-000

December 2017

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RESOURCE REPORT 9—AIR AND NOISE QUALITY		
	Filing Requirement	**Location in Environmental Report**
☒	Describe the existing air quality, including background levels of nitrogen dioxide and other criteria pollutants which may be emitted above U.S. Environmental Protection Agency-identified significance levels.	Section 9.2.2
☒	Quantitatively describe existing noise levels at noise-sensitive areas, such as schools, hospitals, or residences and include any areas covered by relevant state or local noise ordinances. – Report existing noise levels as the Leq (day), Leq (night), and Ldn and include the basis for the data or estimates. – For existing compressor stations, include the results of a sound level survey at the site property line and nearby noise-sensitive areas while the compressors are operated at full load. – For proposed new compressor station sites, measure or estimate the existing ambient sound environment based on current land uses and activities. – Include a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement.	Section 9.3.2 and Appendix 9F
☒	Quantify existing and proposed emissions of compressor equipment, plus construction emissions, including nitrogen oxides (NO_X) and carbon monoxide (CO), and the basis for these calculations. Summarize anticipated air quality impacts for the project. (§ 380.12(k)(3)) – Provide the emission rate of NO_X from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rate, and annual hours of operation.	Section 9.2.4, Appendix 9A and Appendix 9D
☒	Provide a quantitative estimate of the impact of the project on noise levels at noise-sensitive areas, such as schools, hospitals, or residences. – Include step-by-step supporting calculations or identify the computer program used to model the noise levels, the input and raw output data and all assumptions made when running the model, far-field sound level data for maximum facility operation, and the source of the data. – Include sound pressure levels for unmuffled engine inlets and exhausts, engine casings, and cooling equipment; dynamic insertion loss for all mufflers; sound transmission loss for all compressor building components, including walls, roof, doors, windows and ventilation openings; sound attenuation from the station to nearby noise-sensitive areas; the manufacturer's name, the model number, the performance rating; and a description of each noise source and noise control component to be employed at the proposed compressor station. For proposed compressors the initial filing must include at least the proposed horsepower, type of compression, and energy source for the compressor. – Far-field sound level data measured from similar units in service elsewhere, when available, may be substituted for manufacturer's far-field sound level data.	Section 9.3.2 and Appendix 9F

RESOURCE REPORT 9—AIR AND NOISE QUALITY	
Filing Requirement	**Location in Environmental Report**

– If specific noise control equipment has not been chosen, include a schedule for submitting the data prior to certification.
– The estimate must demonstrate that the project will comply with applicable noise regulations and show how the facility will meet the following requirements:
    – The noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed a day-night sound level (Ldn) of 55 decibels on the A-weighted scale at any pre-existing noise-sensitive area (such as schools, hospitals, or residences).
    – New compressor stations or modifications of existing stations shall not result in a perceptible increase in vibration at any noise-sensitive area.	

☒ Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emission control systems, installation of filters, mufflers, or insulation of piping and buildings, and orientation of equipment away from noise-sensitive areas.	Sections 9.2.4 and 9.3.3

ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
AQCR	air quality control region
A-wt.	A-weighted
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
dB	decibels
dBA	A-weighted decibels
Elizabethtown Gas	Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas
ESD	emergency shutdown
FERC	Federal Energy Regulatory Commission
GHG	greenhouse gas
HAP	hazardous air pollutant
hp	horsepower
L_d	day sound level in decibels
L_{dn}	day-night sound level in decibels
L_{eq}	equivalent sound level in decibels
L_n	night sound level in decibels
LDAR	Leak Detection and Repair
m^3	cubic meters
mg/m^3	milligrams per cubic meter
MMBtu/hr	million British thermal units per hour
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NEMA	National Electrical Manufacturers Association
NESHAP	National Emission Standards for Hazardous Air Pollutants
NJAAQS	New Jersey Ambient Air Quality Standards
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJ RACT	New Jersey Reasonably Achievable Control Technology
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NNSR	Nonattainment Area New Source Review
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
O_3	ozone
PADEP	Pennsylvania Department of Environmental Protection
Pb	lead
pCi/L	picocuries per liter
PM	particulate matter
PM_{10}	particulate matter with a diameter $\leq$ 10 microns
$PM_{2.5}$	particulate matter with a diameter $\leq$ 2.5 microns
ppb	parts per billion
ppm	parts per million
ppmvd @ 15% O_2	parts per million on a dry volume basis at 15 percent oxygen
Project	Lambertville East Expansion Project

PSD	Prevention of Significant Deterioration
PSEG	PSEG Power LLC
RICE	reciprocating internal combustion engines
RSI	Risk Sciences International
SI ICE	spark ignition internal combustion engines
SO_2	sulfur dioxide
Texas Eastern	Texas Eastern Transmission, LP
TPY	tons per year
USDOE	U.S. Department of Energy
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	volatile organic compound

9.0 RESOURCE REPORT 9 – AIR AND NOISE QUALITY

9.1 Introduction

Texas Eastern Transmission, LP ("Texas Eastern") is seeking a certificate of public convenience and necessity from the Federal Energy Regulatory Commission ("FERC") pursuant to Sections 7(b) and 7(c) of the Natural Gas Act to construct, install, own, operate, and maintain the Lambertville East Expansion Project ("Project").

The Project's purpose is to expand the compression facilities at the Lambertville Compressor Station located in West Amwell Township, Hunterdon County, New Jersey to provide incremental pipeline transportation service to existing city-gates in New Jersey on behalf of two local utility customers, PSEG Power LLC ("PSEG") and Pivotal Utility Holdings, Inc. d/b/a Elizabethtown Gas ("Elizabethtown Gas"), as well as to comply with new air emissions regulations under the New Jersey Reasonably Achievable Control Technology ("NJ RACT") program. This new firm transportation capacity will enable PSEG and Elizabethtown Gas to serve their growing residential and commercial demand in their respective service territories. To accomplish this, Texas Eastern will install two new Solar Taurus 70 natural gas-fired turbine compressor units to replace two existing higher emitting Clark DC-990 natural gas-fired turbine compressor units at the station. The replacement of the two existing units will also require removal of a building, coolers and auxiliary equipment associated with the compressor units to be removed and installation of replacement buildings, coolers and auxiliary equipment for the compressor units to be installed.

In addition, Texas Eastern will perform system maintenance activities for certain facilities at Texas Eastern's existing Lambertville Compressor Station including the removal of four retired reciprocating compressor units and associated building, coolers and auxiliary equipment, and the removal of a warehouse and other building. Texas Eastern will also perform yard piping modifications as part of this scope.

This Resource Report 9 (Air and Noise Quality) addresses air quality and noise effects related to the construction and operation of the proposed Project facilities. A checklist showing the status of the FERC filing requirements for Resource Report 9 is included following the table of contents.

9.2 Air Quality

The following subsections discuss air emissions associated with construction activities as well as operation of the proposed Project facilities. This discussion includes the existing air quality of the region, potential permitting requirements, air emissions associated with Project construction and operation, and potential mitigation measures.

9.2.1 Proposed Project Facilities

As described in Section 1.3 of Resource Report 1, the Project is located at Texas Eastern's existing Lambertville Compressor Station in West Amwell Township, Hunterdon County, New Jersey (*see* Figure 1.3-1, Resource Report 1). Total horsepower proposed is 17,200 horsepower ("hp"), of which 10,200 hp is to replace existing horsepower from the Clark DC-990 units and the difference of 7,000 hp is to provide additional capacity required to provide the requested additional Project capacity. It should be noted that the full horsepower rating from the two new Solar Taurus 70 units is 18,800 hp (National Electrical Manufacturers Association ["NEMA"] rated at 80 degrees F and 1000-foot elevation). To cap the horsepower to match the requirement of the Project, Texas Eastern will install software control to limit total horsepower output at 17,200 hp. With the software limit in place, the maximum output of the units would be 17,200 hp, matching the Project requirement. Total station horsepower, after this Project, would be

31,600 hp, including 4,400 hp from the two existing reciprocating engines and 10,000 hp from one existing electric driven unit. Additional compressor turbine fuel gas heaters, gas cooling, and a replacement emergency generator is also proposed.

The following provides a description of the existing and proposed air emission point sources at the Project. All horsepower ratings are provided using NEMA ratings, unless otherwise indicated.

The existing Texas Eastern Lambertville Compressor Station includes the following compressor drivers and other emission sources:

- Two 5,100 hp Clark DC-990 natural gas-fired turbine compressor units;
- One 10,000 hp Solar/Siemens electric driven compressor unit;
- Two 2,200 hp Cooper-Bessemer GMVR-10 natural gas-fired reciprocating compressor engines;
- One Caterpillar G-398 natural gas-fired emergency generator with a power output rating of 625 hp;
- One Waukesha VS11GSI natural gas-fired emergency generator with a power output rating of 250 hp;
- Several miscellaneous small natural gas-fired heating devices (less than 1 million British thermal units per hour [“MMBtu/hr”] rated heat input capacity each); and
- Two 2,940-gallon condensate tanks.

The proposed work at the Lambertville Compressor Station is detailed below.

- Replace the two existing Clark DC-990 natural gas-fired turbine compressor units with two new 8,600 hp[1] Solar Taurus 70-10802S4 natural gas-fired turbine compressor units;
- Install gas cooling for the new turbine compressor units;
- Install one new Waukesha VGF36GL natural gas-fired emergency generator with a power output rating of 880 hp;
- Remove the existing 625 hp Caterpillar G398 emergency generator;
- Install two new natural gas-fired turbine compressor fuel heaters with a rated maximum heat input capacity of 0.404 MMBtu/hr each;
- Install one new filter separator; and
- Station piping modifications.

Table 9.2-1 provides a summary of existing and proposed compressor engines at the Lambertville Compressor Station.

TABLE 9.2-1

Summary of Existing and Proposed Compressor Engines at the Lambertville Compressor Station

Unit ID	Make and Model	Rated Output (hp)		
		Station Existing	Station Proposed	Station Total Additional Proposed
LAMT-TBC-01	Replace Clark DC-990 Turbine Engine with Solar Taurus 70 Turbine Engine	5,100	8,600	3,500

[1] The two new Solar Taurus 70 turbine compressor units will be limited by software control to a certificated horsepower of 8,600 hp. However, the state air permit application will be based on the maximum rated horsepower output of 10,915 hp at International Standard Operations standard conditions.

TABLE 9.2-1 Summary of Existing and Proposed Compressor Engines at the Lambertville Compressor Station				
Unit ID	**Make and Model**	**Rated Output (hp)**		
		Station Existing	**Station Proposed**	**Station Total Additional Proposed**
LAMT-TBC-02	Replace Clark DC-990 Turbine Engine with Solar Taurus 70 Turbine Engine	5,100	8,600	3,500
LAMT-ELC-03	Siemens Electric Driven Motor	10,000	10,000	--
LAMT-EN-05	Cooper Bessemer GMVR-10 Reciprocating Engine	2,200	2,200	--
LAMT-EN-06	Cooper Bessemer GMVR-10 Reciprocating Engine	2,200	2,200	--
	PROJECT TOTAL	24,600	31,600	7,000

9.2.2 Existing Conditions

This subsection discusses the existing air quality conditions near the Project.

9.2.2.1 Climate Discussion for Proposed Project Location

The climate at the Project is primarily continental in character, but is subjected to modification by the Atlantic Ocean; the proper classification for the climate is "modified continental." The mid-latitude site location and proximity to the Atlantic Ocean exposes the region to a variety of meteorological conditions and events. Almost any weather can occur in the area of the Project, including blizzards, tropical storms, thunderstorms, and droughts, and extreme occurrences of such events have been recorded. The mid-latitude location exposes the area to large annual ranges in temperatures. Cold outbreaks originating from the northern latitudes contrast significantly with the heat and humidity that is often transported from the Gulf of Mexico. The primary interaction point between these mid-latitude regions results in weather characterized by frequent, sometimes powerful, change. At times, mesoscale influences alter this meteorological variety.

Stagnation in the weather pattern will expose the area to extended periods of a particular type of weather. When there is stagnation in the weather pattern, the weather experienced will depend on what local meteorological feature is being trapped by the stagnation. High pressure stalled in the Atlantic Ocean in the summer often results in extended periods of heat, humidity, and at times, drought. Conversely, a stalled frontal boundary can result in extended periods of rain, ice, or snow in the winter.

Mid-latitude cyclones (i.e., nor'easters or coastal storms) are a frequent synoptic scale weather pattern occurring most often in the fall and winter months. Such storms produce, on occasion, considerable amounts of precipitation. Typically, coastal storms are responsible for record rains, snows, and high winds. However, destructive force winds rarely occur with coastal storms, and usually are associated with severe weather related to intense thunderstorms. On occasion, the area also may be affected by a tropical system that can bring extremely heavy rain and strong winds to the area.

The climate in the west central region of New Jersey is continental despite the proximity of the Atlantic Ocean because airflow and weather systems that affect the area are primarily of continental origin (Seifried 1994). Still, storm systems often move northward along the Atlantic coast. Winters are short and moderately cold lasting into mid-March. Summers are warm with periods of oppressive heat and humidity, while autumn is characterized by mild temperatures extending into November.

The National Climatic Data Center's ("NCDC") 1981-2010 Climate Normals (NCDC 2012) were evaluated from the nearest meteorological station to the Project, which is Lambertville, New Jersey. Temperatures near the Project are generally highest in July and lowest in January. Maximum temperatures of 90 degrees Fahrenheit or higher occur about 26 days per year on average, while minimum temperatures of 0 degrees Fahrenheit or lower occur about two days per year on average. The mean annual precipitation is about 49.3 inches, with monthly average precipitation ranging from a low of about 3 inches in February to a maximum of about 5 inches in July. Precipitation of 0.01 inch or greater occurs on about 121 days per year on average. Precipitation of 1.0 inch or greater occurs on average about 14 days per year. The average annual snowfall for the region is approximately 18.5 inches per year.

9.2.2.2 National and State Ambient Air Quality Standards

The U.S. Environmental Protection Agency ("USEPA") has promulgated National Ambient Air Quality Standards ("NAAQS") to protect human health and welfare. The NAAQS include primary standards, which are designed to protect human health, including the health of sensitive subpopulations such as children and those with chronic respiratory problems. The NAAQS also include secondary standards designed to protect public welfare, including economic interests, visibility, vegetation, animal species, and other concerns not related to human health.

NAAQS currently apply to the following criteria pollutants: particulate matter ("PM") with a nominal aerodynamic diameter of 10 microns or less ("PM_{10}"); PM with a nominal aerodynamic diameter of 2.5 microns or less ("$PM_{2.5}$"); sulfur dioxide ("SO_2"); nitrogen dioxide ("NO_2"); carbon monoxide ("CO"); ozone ("O_3"); and lead ("Pb"). Each NAAQS is expressed in terms of a concentration level and an associated averaging period. The current NAAQS for these criteria pollutants are summarized in Table 9.2-2. Footnotes to Table 9.2-2 explain how compliance with each NAAQS is assessed.

TABLE 9.2-2

National Ambient Air Quality Standards

Pollutant	Averaging Period	Standards	
		Primary	Secondary
Sulfur dioxide (SO_2)	1-hour [12,13]	75 ppb 196 µg/m^3	
	3-hour [2]	--	0.5 ppm 1300 µg/m^3
	Annual [1,13]	0.03 ppm 80 µg/m^3	--
	24-hour [2,13]	0.14 ppm 365 µg/m^3	--
PM_{10}	24-hour [4]	150 µg/m^3	150 µg/m^3
$PM_{2.5}$ (2012 Standard)	Annual [5,14]	12.0 µg/m^3	15.0 µg/m^3
$PM_{2.5}$ (2006 Standard)	24-hour [6]	35 µg/m^3	35 µg/m^3
Nitrogen Dioxide (NO_2)	Annual [1]	0.053 ppm (53 ppb) 100 µg/m^3	0.053 ppm (53 ppb) 100 µg/m^3
	1-hour [3]	100 ppb 188 ug/m^3	--
Carbon Monoxide (CO)	8-hour [2]	9 ppm 10,000 µg/m^3	--
	1-hour [2]	35 ppm 40,000 µg/m^3	--

TABLE 9.2-2

National Ambient Air Quality Standards

Pollutant	Averaging Period	Standards	
		Primary	Secondary
Ozone (2008 Standard)	8-hour [7,8]	0.075 ppm	0.075 ppm
Ozone (2015 Standard)	8-Hour[9]	0.070 ppm	0.070 ppm
Ozone (O_3)	1-hour [10,11]	0.12 ppm	0.12 ppm
Lead (Pb)	Rolling 3-month [1]	0.15 µg/m^3	0.15 µg/m^3

Notes:
[1] Not to be exceeded.
[2] Not to be exceeded more than once per year.
[3] Compliance based on 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area.
[4] Not to be exceeded more than once per year on average over 3 years.
[5] Compliance based on 3-year average of weighted annual mean $PM_{2.5}$ concentrations at community-oriented monitors.
[6] Compliance based on 3-year average of 98th percentile of 24-hour concentrations at each population-oriented monitor within an area.
[7] Compliance based on 3-year average of fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area.
[8] The 2008 8-hour ozone standard will remain in effect until one year after an area is designated for the 2015 8-hour ozone standard. Area designations are not expected to be completed until late 2017.
[9] Permit applications that have not met USEPA's grandfathering criteria would have to demonstrate that the proposed project does not cause or contribute to a violation of any revised ozone standards that are in effect when the permit is issued, including the 2015 revised standards.
[10] Maximum 1-hour daily average not to be exceeded more than one day per calendar year on average.
[11] The 1-hour ozone standard has been revoked in all areas in which Project activities will occur.
[12] Compliance based on 3-year average of 99th percentile of the daily maximum 1-hour average at each monitor within an area.
[13] The 24-hour and annual average primary standards for SO_2 remain in effect until one year after an area is designated for the 1-hour standard.

ppm = parts per million by volume.
ppb = parts per billion by volume.
µg/m^3 = micrograms per cubic meter.

In addition to the NAAQS, states and municipalities are free to adopt standards that are more stringent than the NAAQS. The New Jersey Department of Environmental Protection ("NJDEP") has adopted ambient air quality standards that differ in some respects from the current NAAQS. Table 9.2-3 summarizes the current New Jersey Ambient Air Quality Standards as promulgated in New Jersey Administrative Code ("N.J.A.C."), Title 7, Chapter 27, Subchapter 13 (N.J.A.C. 7:27-13).

TABLE 9.2-3

New Jersey Ambient Air Quality Standards ("NJAAQS")

Pollutant	Averaging Period [a]	NJAAQS	
		Primary	Secondary
Sulfur dioxide (SO_2)	12-month [b]	80 µg/m^3 (0.03 ppm)	60 µg/m^3 (0.02 ppm)
	24-hour [c]	365 µg/m^3 (0.14 ppm)	260 µg/m^3 (0.10 ppm)
	3-hour [c]	--	1,300 µg/m^3 (0.5 ppm)

TABLE 9.2-3

New Jersey Ambient Air Quality Standards ("NJAAQS")

Pollutant	Averaging Period [a]	NJAAQS	
		Primary	Secondary
Total Suspended Particulate (TSP)	12-month [b, d]	75 µg/m^3	60 µg/m^3
	24-hour [c]	260 µg/m^3	150 µg/m^3
Nitrogen Dioxide (NO_2)	12-month [b]	100 µg/m^3 (0.05 ppm)	100 µg/m^3 (0.05 ppm)
Carbon Monoxide (CO)	8-hour [c]	10 mg/m^3 (10,000 µg/m^3) (9 ppm)	10 mg/m^3 (10,000 µg/m^3) (9 ppm)
	1-hour [c]	40 mg/m^3 (40,000 µg/m^3) (35 ppm)	40 mg/m^3 (40,000 µg/m^3) (35 ppm)
Ozone (O_3)	1-hour [c]	0.12 ppm (235 µg/m^3)	0.08 ppm (160 µg/m^3)
Lead (Pb)	3-month [b]	1.5 µg/m^3	1.5 µg/m^3

Notes:
[a] All averages calculated as running or moving averages.
[b] Not to be exceeded.
[c] Not to be exceeded more than once per year.
[d] Compliance based on geometric mean of all 24-hour averages.

ppm = parts per million by volume.
ppb = parts per billion by volume.
µg/m^3 = micrograms per cubic meter.
mg/m^3 = milligrams per cubic meter.

9.2.2.3 Existing Ambient Air Quality

The Project will involve construction in Hunterdon County in New Jersey. This county and those nearby to the Project contain ambient air quality monitors that collect data of existing levels of various air pollutants. Summary data from the USEPA AirData database were reviewed to characterize maximum or near-maximum existing concentrations representative of Hunterdon County in which Project components will be constructed (USEPA 2017). In all cases, ambient air quality concentrations from the nearest monitoring station for the Project were taken.

Ambient air quality monitoring data from the 3-year period 2014-2016 are summarized in Table 9.2-4 for those monitoring stations nearest to the proposed Project. Table 9.2-4 lists the maximum annual mean concentration and/or a near-maximum short-term concentration in each year. Second-high short-term concentrations are listed for most pollutants, but Table 9.2-4 includes the fourth-highest 8-hour average concentration for ozone, the 98th percentile 1-hour average concentration for NO_2, the 98th percentile 24-hour average concentration for $PM_{2.5}$, and the 99th percentile 1-hour average concentration for SO_2, consistent with the structure of the NAAQS for those pollutants and averaging periods.

TABLE 9.2-4

Ambient Air Quality Concentrations Representative of the Project Area

Pollutant	Averaging Period	Rank	2014	2015	2016	Units	Monitoring Station ID
SO_2	1-hour	99th	13	8	9	ppb	42-017-0012 [a]
	24-hour	2nd	6.7	4.0	4.6	ppb	
	Annual	Mean	1.7	0.6	0.8	ppb	
PM_{10}	24-Hour	2nd	60	48	53	µg/m^3	42-101-0048 [b]
$PM_{2.5}$	24-Hour	98%	24	24	17	µg/m^3	34-021-0008 [c]
	Annual	Mean	8.7	8.2	7.3	µg/m^3	
NO_2	1-Hour	98%	51	49	49	ppb	42-101-0075 [d]
	Annual	Mean	15.5	14.7	13.6	ppb	
CO	1-Hour	2nd	1.9	1.9	2.1	ppm	42-101-0075 [d]
	8-Hour	2nd	1.4	1.6	1.6	ppm	
O_3	8-Hour	4th	0.071	0.075	0.074	ppm	34-021-9991 [e]

[a] Rockview Lane, Bristol, Bucks County, Pennsylvania
[b] North East Waste, 3000 Lewis Street, Philadelphia, Philadelphia County, Pennsylvania
[c] Trenton, 120 Academy Street, Trenton, Mercer County, New Jersey
[d] Torresdale Station, 4901 Grant Avenue, Philadelphia, Philadelphia County, Pennsylvania
[e] Washington Crossing, Washington Crossing State Park, Titusville, Mercer County, New Jersey

9.2.2.4 Attainment Status

Perhaps the most meaningful way to characterize existing air quality in a given area is to identify the attainment status of the air quality control region ("AQCR") in which it is located. An AQCR, as defined in Section 107 of the Clean Air Act, is a federally-designated area in which NAAQS must be met. An implementation plan is developed for each AQCR describing how ambient air quality standards will be achieved and maintained.

USEPA designates the attainment status of an area on a pollutant-specific basis based on whether an area meets the NAAQS. Areas that meet the NAAQS are termed "attainment areas." Areas that do not meet the NAAQS are termed "nonattainment areas." Areas for which insufficient data are available to determine attainment status are termed "unclassified areas." Areas formerly designated as nonattainment areas that have subsequently reached attainment are termed "maintenance areas."

The attainment status designations appear in the Code of Federal Regulations ("CFR") at 40 CFR Part 81. The attainment status of a region, in conjunction with projected emission rates or emissions increases, determines the regulatory review process for a new project. Table 9.2-5 summarizes the attainment status of the AQCR in which the Project will be located. Hunterdon County is within the New York-New Jersey-Long Island, NY-NJ-CT nonattainment area, which has a marginal nonattainment for the 8-hour O3 (2008) standards. In addition, all of New Jersey is within the Ozone Transport Region. Table 9.2-5 summarizes the nonattainment and maintenance status for the Project location.

TABLE 9.2-5

Attainment Status of Project Location

Project Component	County, State	AQCR	Attainment/ Unclassifiable	Nonattainment	Maintenance
Lambertville Compressor Station	Hunterdon County, NJ	AQCR 043 NJ-NY-CT Interstate	SO_2, CO, PM_{10}, $PM_{2.5}$, NO_2, Pb	O_3	None

9.2.3 Potentially Relevant Air Quality Requirements

9.2.3.1 New Source Review Permitting/Licensing

Preconstruction air permitting programs that regulate the construction of new stationary sources of air pollution and the modification of existing stationary sources are commonly referred to as New Source Review ("NSR"). NSR can be divided into two categories: major NSR and minor NSR. Major NSR has two components: the Prevention of Significant Deterioration ("PSD") permitting program and the nonattainment area NSR ("NNSR") permitting program. Major NSR requirements are established on a federal level but may be implemented by state or local permitting authorities under either a delegation agreement with USEPA or as a State Implementation Plan program approved by USEPA. As a result, the major NSR thresholds vary by state and by location within a state. New sources that emit less than the major NSR thresholds are considered minor NSR sources and may need to obtain a state NSR permit from the state or local permitting authority. The requirements for the PSD, NNSR, and state NSR program in New Jersey are discussed below.

New Jersey

The requirements of 40 CFR 51.166, which apply to a new or modified major facility located in an attainment area, is administered through NJDEP's permitting process. The NJDEP accepted delegation of the administration of the PSD program from USEPA on February 22, 1983. NNSR is administered through N.J.A.C. 7:27-18: Control and Prohibition of Air Pollution from New or Altered Sources Affecting Ambient Air Quality (Emissions Offset Rules), which establishes preconstruction requirements for new and modified major facilities located in nonattainment areas.

NJDEP authorizes both construction and operation of minor sources under N.J.A.C. 7:27-8: Permits and Certificates for Minor Facilities (and Major Facilities without an Operating Permit) and N.J.A.C. 7:27-22: Operating Permits. Facilities apply for and are issued preconstruction permits (for minor NSR sources) under N.J.A.C. 7:27-8. The operation of a major source is authorized under N.J.A.C. 7:27-22 (Subchapter 22 - Operating Permits). Preconstruction and operation for modifications to existing Title V sources is handled through the Subchapter 22 permitting process.

PSD requirements are triggered at an existing source when a major modification occurs. A major modification is defined as a change that results in a significant emissions increase and a significant net emissions increase as the result of a project. A net emissions increase is the sum of emissions increases from a particular physical change or change in the method of operation at a stationary source and any other increases and decreases in actual emissions at the major stationary source that are contemporaneous with the particular change and are otherwise creditable. An increase or decrease in actual emissions is contemporaneous if it occurs between the date five years before construction of the project commences and the date the increase associated with the project occurs.

NNSR is administered through N.J.A.C. 7:27-18 (Subchapter 18). In addition to addressing NNSR, Subchapter 18 contains provisions for attainment pollutant control and modeling (that are in addition to or beyond PSD type regulation) to ensure all ambient air quality standards are maintained. Subchapter 18 requires all major facilities, such as the Lambertville Compressor Station, to perform a netting analysis in accordance with N.J.A.C. 7:27-18.7 to determine if a proposed project would result in a significant net emission increase.

Lambertville Compressor Station - Hunterdon County, New Jersey

The Lambertville Compressor Station is located in West Amwell Township, Hunterdon County, New Jersey. Hunterdon County is currently designated as attainment or unclassifiable for SO_2, NO_2, CO, PM_{10}, $PM_{2.5}$ and Pb. Hunterdon County is also currently designated as moderate nonattainment for the 8-hour ozone standard (2008), however it was also designated as severe nonattainment for the 1-hour ozone standard which was revoked by USEPA effective December 17, 2006 and as moderate nonattainment for the 1997 8-hour ozone standard. New Jersey regulations retain the 1-hour standard for previously designated nonattainment areas, therefore, the area is considered a severe ozone nonattainment area for permitting purposes.

An application for a significant modification to the Lambertville Compressor Station existing Title V permit, in accordance with N.J.A.C. 7:27-22.24, was submitted to NJDEP in November 2017 for the two Solar Taurus 70 natural gas-fired turbine compressor units and ancillary equipment (emergency generator and heaters) to be installed under the Project. A copy of the application for the Title V permit modification, which covers the installation of the new emission units, along with detailed emission calculations, is provided as Appendix 9A.

Based on the facility's current Title V permit, the Lambertville Compressor Station is considered a major stationary source under the PSD program because the potential-to-emit for nitrogen oxides ("NO_X") is currently in excess of the 250 tons per year ("TPY") major source threshold. However, post-Project the facility-wide NO_X emissions will be below the major source threshold and emission increases from the proposed Project for all PSD pollutants except for carbon dioxide equivalents ("CO_2e") do not exceed the applicable significant emission rates. Further, in accordance with the June 13, 2014 ruling by the United State Supreme Court, the USEPA no longer requires stationary sources to obtain PSD permits due solely to increases in CO_2e. Therefore, the Project does not trigger PSD permitting requirements.

The facility is also an existing major source under Subchapter 18. Since the facility emits greater than 25 tons of NO_X and VOC in an area classified as nonattainment for ozone, the NNSR requirements under Subchapter 18 would apply if the project resulted in a significant net emissions increase of NO_X and/or VOC. In addition, Subchapter 18 contains provisions for attainment pollutant control and requirements to perform an air quality impact assessment. In accordance with N.J.A.C. 7:27-18.7, sources are required to perform a netting analysis for all pollutants to determine applicability to Subchapter 18. As demonstrated in the air permit application provided in Appendix 9A, the Project is not subject to the NNSR or air quality impact assessment requirements under Subchapter 18 since the Project does not result in a significant net emissions increase for any pollutant. Nevertheless, a full air quality analysis for the Lambertville Compressor Station to evaluate air quality impacts of the facility after the proposed Project is constructed, as well as a risk assessment with respect to potential HAP emissions, will be completed once NJDEP reviews and approves the proposed modeling protocols included with the air permit application.

Class I Areas

Federal Class I areas are areas established by Congress, such as wilderness areas and national parks, that are afforded special protection under the Clean Air Act. Once designated as a Class I area, that area cannot be redesignated to another (lower) classification. Class I areas are allowed the smallest degree of air quality deterioration through major NSR permitting and special considerations must be made during the NSR permitting process when a Class I area is located close to a proposed site. The Class I area nearest to the Lambertville Compressor Station is identified in Table 9.2-6 even though the Project does not trigger major NSR permitting. Since the Project will not require PSD review, Class I modeling is not required regardless of the Project's distance from the Class I area.

TABLE 9.2-6

Proximity of Lambertville Compressor Station to Federal Class I Areas

Facility	County, State	Nearest Class I Area	Managing Agency	Approximate Distance to Class I Area
Lambertville Compressor Station	Hunterdon County, NJ	Brigantine Division of Edwin B. Forsythe National Wildlife Refuge, Oceanville, NJ	U.S. Fish and Wildlife Service	120 kilometers Southwest

9.2.3.2 State and Title V Operating Permit Programs

The Title V permit program in 40 CFR Part 70 requires major sources of air pollutants to obtain federal operating permits. The major source thresholds under the Title V program, as defined in 40 CFR 70.2 and which are different from the federal NSR major source thresholds, are 100 TPY of any air pollutant, 10 TPY of any single hazardous air pollutant ("HAP"), or 25 TPY of total HAPs. More stringent Title V major source thresholds apply for volatile organic compounds ("VOC") and NO_X in ozone nonattainment areas, namely 50 TPY of VOC or NO_X in areas defined as serious, 25 TPY in areas defined as severe, and 10 TPY in areas classified as extreme.

New Jersey

The State of New Jersey's Title V Operating Permit Program is administered through a USEPA approved program at N.J.A.C. 7:27-22. NJDEP also administers a state operating permit program through N.J.A.C. 7:27-8 for non-Title V facilities.

Lambertville Compressor Station - Hunterdon County, New Jersey

The Lambertville Compressor Station is an existing Title V facility operating under Permit Activity No. BOP140001. The current permit renewal was approved on December 1, 2014 and expires on June 30, 2020. The proposed Project modifications at Lambertville Compressor Station are considered a significant modification to the existing Title V permit. As previously indicated, the air permit application for the Title V permit modification was submitted to NJDEP in accordance with N.J.A.C. 7:27-22.24 in November 2017. A copy of the application for the Title V permit modification is provided as Appendix 9A.

9.2.3.3 Standards of Performance for New Stationary Sources

New Source Performance Standards ("NSPS") in 40 CFR Part 60 regulate certain emissions from specific source categories. The Project includes equipment in some source categories that could be subject to NSPS requirements as discussed below.

40 CFR Part 60, Subpart Dc (Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units)

40 CFR Part 60, Subpart Dc (Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units) applies to steam generating units, as defined in 40 CFR 60.41c, with a maximum design heat input capacity of greater than or equal to 10 MMBtu/hr but less than or equal to 100 MMBtu/hr for which construction, modification, or reconstruction is commenced after June 9, 1989. Based on current design information, there are no subject steam generating units with a maximum design heat input capacity of greater than or equal to 10 MMBtu/hr proposed for the Project. Therefore, the requirements of Subpart Dc do not apply to the Project.

40 CFR Part 60, Subpart Kb (Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984)

40 CFR Part 60, Subpart Kb (Standards of Performance for Volatile Organic Liquid Storage Vessels [Including Petroleum Liquid Storage Vessels] for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984) potentially applies to storage vessels with a capacity greater than 75 cubic meters (“m^{3}”) that will store volatile organic liquids. A capacity of 75 m^3 is equal to approximately 19,813 gallons. Based on current design information, tanks with a capacity greater than 75 m^3 are not proposed to be constructed, reconstructed, or modified as part of the Project. Therefore, the requirements of Subpart Kb do not apply to the Project.

40 CFR Part 60, Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

40 CFR Part 60, Subpart JJJJ, applies to owners and operators of new or existing stationary spark ignition internal combustion engines (“SI ICE”) that commence construction, modification, or reconstruction after June 12, 2006. The Project includes a new emergency stationary SI ICE greater than 25 hp at the Lambertville Compressor Station. Therefore, requirements of Subpart JJJJ will apply to the proposed Project.

40 CFR Part 60, Subpart KKKK (Standards of Performance for Stationary Combustion Turbines)

40 CFR Part 60, Subpart KKKK applies to stationary combustion turbines with a heat input rate at peak load of 10 MMBtu/hr or greater that commenced construction, modification (as defined in 40 CFR 60.14), or reconstruction (as defined in 40 CFR 60.15) after February 18, 2005. Subpart KKKK limits emissions of NO_X as well as the sulfur content of fuel that is combusted from subject units. The Project involves the installation of new stationary combustion turbines at the Lambertville Compressor Station. Therefore, the Project will trigger the emissions limitations as well as the monitoring, reporting, recordkeeping, and testing requirements under Subpart KKKK of Part 60.

40 CFR Part 60, Subpart OOOOa (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

40 CFR Part 60, Subpart OOOOa applies to sources that are constructed/modified after September 18, 2015, including centrifugal compressors, reciprocating compressors, pneumatic controllers, pneumatic pumps, storage vessels, equipment leaks and sweetening units within the crude oil and natural gas sector. In the natural gas transmission segment, Subpart OOOOa has standards for each of these affected facilities, except for pneumatic pumps and sweetening units.

Centrifugal compressors with wet seals constructed after September 18, 2015 are subject to the control, recordkeeping, and reporting requirements of Subpart OOOOa. Texas Eastern will not be installing any centrifugal compressors with wet seals as a part of the Project. In addition, no reciprocating compressors are being constructed or modified as part of the Project. Therefore, the Lambertville Compressor Station will not be subject to the rod packing replacement or control requirements for compressors. Any new natural gas pneumatic controller installed will have a bleed rate less than or equal to six standard cubic feet per hour, as required by Subpart OOOOa. While storage vessels have the potential to be subject to Subpart OOOOa requirements, the Project does not include any new, modified, or reconstructed storage vessels, as those terms are defined at 40 CFR 60.14, 60.15, and 40 CFR 60.5430a. As such, the requirements of Subpart OOOOa do not apply.

Subpart OOOOa has added Leak Detection and Repair ("LDAR") requirements for new or modified compressor stations in the transmission segment. For purposes of OOOOa applicability to fugitive emissions components, a modification to a compressor station occurs when one or more compressors at the station is replaced with one or more compressors of greater total horsepower than the compressors being replaced. As such, the Project is considered a modification and the fugitive emissions components at the Lambertville Compressor Station will be subject to the LDAR requirements of Subpart OOOOa.

It should be noted that in June 2017, USEPA published a notice of reconsideration and partial stay of certain provisions of Subpart OOOOa, including the fugitive emissions monitoring requirements. On July 3, 2017, the U.S. Court of Appeals for the D.C. Circuit vacated USEPA's 90-day stay of portions of the rule. In response to the Court's decision, USEPA filed a motion on July 7, 2017, to recall its mandate to provide USEPA with the standard short period of time in which to evaluate its options before the decision becomes effective. At this time, the fugitive emissions monitoring requirements are in effect.

9.2.3.4 National Emission Standards for Hazardous Air Pollutants

The USEPA has established National Emission Standards for Hazardous Air Pollutants ("NESHAP") for specific pollutants and industries in 40 CFR Part 61. The Project does not include any of the specific sources for which NESHAP have been established in Part 61. Therefore, Part 61 NESHAP requirements will not apply to the Project.

The USEPA has also established NESHAP requirements in 40 CFR Part 63 for various source categories. The Part 63 NESHAP apply to certain emission units at facilities that are major sources of HAP. Some NESHAP apply or may apply in the future to non-major sources (area sources) of HAP. The Project includes units that could potentially be subject to certain Part 63 NESHAP, such as those in Subpart YYYY (NESHAP for Stationary Combustion Turbines), Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines), and Subparts DDDDD and JJJJJJ (NESHAP for Industrial, Commercial, and Institutional Boilers and Process Heaters).

40 CFR Part 63, Subpart HHH (National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities)

40 CFR Part 63, Subpart HHH is for natural gas transmission and storage facilities that are major sources of HAP and that transport or store natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company). The affected source is each new and existing glycol dehydration unit located at the facility. The owner or operator of a facility that does not contain an affected source is not subject to the requirements of this subpart. The Lambertville Compressor Station is an area source of HAP, therefore, the requirements of Subpart HHH do not apply to the Project.

40 CFR Part 63, Subpart YYYY (National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines)

40 CFR Part 63, Subpart YYYY applies to stationary combustion turbines at major sources of HAPs. Emissions and operating limitations under Subpart YYYY apply to new and reconstructed stationary combustion turbines. The Lambertville Compressor Station is an area source of HAP. Therefore, the requirements for Subpart YYYY will not apply to the Project.

40 CFR Part 63, Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines)

40 CFR Part 63, Subpart ZZZZ, applies to existing, new, and reconstructed stationary reciprocating internal combustion engines ("RICE") depending on size, use, and whether the engine is located at a major or area source of HAP.

The Project includes the installation of one new emergency stationary RICE with a site rating greater than 500 hp. New stationary RICE located at area sources of HAP, such as the emergency engine proposed for the Project, must meet the requirements of Subpart ZZZZ by meeting the NSPS. As discussed above in Section 9.2.3.3, the new emergency engine proposed for the Lambertville Compressor Station is subject to the NSPS at 40 CFR Part 60, Subpart JJJJ, therefore the requirements of Subpart ZZZZ will be met.

40 CFR Part 63, Subpart DDDDD (National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters)

40 CFR Part 63, Subpart DDDDD applies to certain new and existing boilers and process heaters at major HAP sources. The Lambertville Compressor Station is an area source of HAP and no new boilers or heaters are proposed as part of the Project. Therefore, the requirements for Subpart DDDDD will not apply to the Project.

40 CFR Part 63, Subpart JJJJJJ (National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources)

40 CFR Part 63, Subpart JJJJJJ applies only to certain new and existing boilers at area sources, where a boiler is defined as "an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam and/or hot water." The rule does not apply to natural gas-fired boilers and does not apply to process heaters at area sources. The Lambertville Compressor Station is an area source of HAP, but no new boilers are proposed as part of the Project; therefore, the Project will not be subject to Subpart JJJJJJ requirements.

9.2.3.5 Applicable NJDEP State Regulations

Air pollution control regulations from Chapter 7:27 of the N.J.A.C. determined to be applicable to the Project are identified below:

Control and Prohibition of Smoke from Combustion of Fuel – N.J.A.C. 7:27 - 3.5

Subchapter 3 of N.J.A.C. 7:27 limits the opacity from internal combustion engines and stationary combustion turbines to less than 20 percent opacity, exclusive of condensed water vapor for a period of more than 10 consecutive seconds. The combustion turbines and emergency generator will normally have opacity near zero; the units are expected to comply with this opacity standard.

Control and Prohibition of Particles Combustion of Fuel – N.J.A.C. 7:27 - 4.2(a)

Subchapter 4 of N.J.A.C. 7:27 limits the mass emission of particulates from the proposed turbines and emergency generator. The potential to emit for PM_{10} and $PM_{2.5}$ from the proposed new turbines and emergency generator are all well below their respective standards under Subchapter 4 due to the combustion of natural gas.

Ambient Air Quality Standards – N.J.A.C. 7:27-13

The air quality impacts from the proposed Project are predicted not to exceed the standards presented in Subchapter 13 of N.J.A.C. 7:27. Once NJDEP reviews and approves the proposed modeling protocol included with the air permit application in Appendix 9A, the air quality analysis will be filed with the FERC and NJDEP.

Control and Prohibition of Air Pollution by Volatile Organic Compounds – N.J.A.C. 7:27-16.9

Subchapter 16 of N.J.A.C. 7:27 establishes VOC and CO limits of 50 parts per million on a dry volume basis at 15 percent oxygen ("ppmvd @ 15% O_2") and 250 ppmvd @ 15% O_2, respectively, for stationary gas turbines. The proposed limits for the two new Solar Taurus 70 turbine compressor units are well below these values for all operating scenarios. Subchapter 16 does not apply to the emergency generator.

Control and Prohibition of Air Pollution by Oxides of Nitrogen – N.J.A.C. 7:27-19.5(l)

Subchapter 19 of N.J.A.C. 7:27, which establishes the NJ RACT standards, has been amended and will go into effect on November 6, 2017. The rule limits NO_X emissions from simple cycle combustion turbines burning natural gas and compressing gaseous fuel at major NO_X facilities to no more than 42 ppmvd @ 15 % O_2. The proposed NO_X limit for the two new Solar Taurus 70 turbine compressor units will comply with the amended NJ RACT program.

Operating Permits – N.J.A.C. 7:27-22.8

Subchapter 22 of N.J.A.C. 7:27 requires new sources and modifications to perform a risk assessment for any hazardous air pollutant with potential emissions greater than or equal to the NJDEP reporting thresholds. The facility will perform a risk assessment to demonstrate the Project does not have the potential to pose a health risk as part of the air permit application process. Once NJDEP reviews and approves the proposed modeling protocol included with the air permit application in Appendix 9A, a copy of the risk assessment will be filed with the FERC and NJDEP.

9.2.3.6 Risk Management Program

USEPA has established accidental release prevention and risk management plan requirements as part of 40 CFR Part 68 (Chemical Accident Prevention Provisions). Part 68 lists regulated substances along with thresholds for determining the applicability of the associated requirements. If a regulated substance is handled, stored, or processed in greater than threshold quantities at a stationary source, then a risk management plan must be prepared.

Even if a facility is not required to prepare a risk management plan, requirements of the General Duty Clause in the CAA still apply if the facility produces, processes, handles, or stores regulated substances or other extremely hazardous substances on site. Compliance with the General Duty Clause requires that owners of facilities be continuously vigilant about potential hazards and methods of minimizing the consequences of accidental releases.

Except for constituents of natural gas, such as ethane and methane, the Project is not expected to produce, process, handle, or store any substance regulated under Part 68 in quantities exceeding applicability thresholds. Natural gas pipelines are not subject to Part 68 if they are subject to U.S. Department of Transportation ("USDOT") requirements or to a state natural gas program certified by USDOT. In addition, the storage of natural gas incidental to transportation (i.e., natural gas taken from a pipeline during non-peak periods, placed in storage fields, and then returned to the pipeline when needed) is not subject to Part 68. Consequently, the Project will not be subject to Part 68 requirements.

9.2.3.7 Construction Activities

Construction of the Project will require the use of equipment powered by diesel fuel or gasoline engines and construction activities may also result in the temporary generation of fugitive dust due to disturbance of the ground surface and other dust generating actions. The applicable air quality regulations during the construction period are provided in Table 9.2-7 below.

TABLE 9.2-7

Air Quality Regulations Applicable to Construction Activities

FEDERAL REGULATIONS	
40 CFR Part 80	Limits diesel fuel sulfur content to 15 ppm.
40 CFR Parts 89, 1039, and 1068	Limits emissions from nonroad diesel engines based upon year of manufacture.
STATE REGULATIONS	
New Jersey	
N.J.A.C. 7:27-9	Limits diesel fuel sulfur content to 500 ppm and emissions to 0.0530 lb/MMBtu.
N.J.A.C. 7:27-14	Limits idling to less than 3 minutes.
N.J.A.C. 7:27-32	Diesel retrofit program.
N.J.A.C. 7:27-28 and 7:27-32	Heavy-duty diesel new engine standards and requirements program.
N.J.A.C. 7:27B-4	Lists the procedures to test opacity for diesel-powered vehicles.
COUNTY REGULATIONS	
N/A	None identified
LOCAL REGULATIONS	
N/A	None identified

Texas Eastern will comply with these regulations through contractual agreements with its construction companies/contractors. Air quality mitigation and emissions from construction activities are discussed further in Section 9.2.4.1.

9.2.3.8 General Conformity

General conformity regulations in 40 CFR Part 93, Subpart B, are designed to ensure that actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's ability to attain or maintain compliance with NAAQS. The Project is a federal action, since a Federal agency (i.e., FERC) will be licensing, permitting, or otherwise approving portions of the Project. The proposed Project activities will occur in federally designated nonattainment and maintenance areas. Consequently, a general conformity applicability analysis is required to determine if a conformity determination is required. A conformity determination, if required, documents that a federal action will conform to the applicable implementation plan for the nonattainment or maintenance area and meet other requirements of Subpart B of Part 93.

As part of the general conformity applicability determination process, the sum of non-exempt direct and indirect emissions of nonattainment pollutants or designated precursors associated with a federal action is compared to annual general conformity applicability emissions thresholds in 40 CFR § 93.153. If an applicability threshold is exceeded, then general conformity applies, and a conformity determination is required. If emissions are below the applicability thresholds, then the emissions are considered to be *de minimis*, general conformity requirements do not apply, and a conformity determination is not required.

The general conformity regulations were revised on April 5, 2010, and the changes to the regulations became effective on July 6, 2010. Under the revised general conformity regulations, emissions from stationary sources that are covered by any NSR permit (major or minor) are exempt from general conformity. Therefore, emissions covered by a NSR permit do not count towards the general conformity applicability thresholds. None of the Project components will be covered by an NSR permit. Thus, emissions from Project activities, such as emissions from construction, need to be considered. Under the revised regulations, USEPA clarified that if emissions from a federal action occur in more than one nonattainment or maintenance area, then each area is evaluated separately. Emissions from separate nonattainment or maintenance areas are treated as if they result from separate actions.

The proposed Project area is in Hunterdon County, which is currently classified as nonattainment for ozone, therefore the Project is subject to a general conformity applicability analysis.

A general conformity applicability analysis is provided in Appendix 9B to demonstrate the non-exempt Project emissions will be below the applicable general conformity applicability thresholds (i.e., *de minimis*).

9.2.4 Anticipated Air Quality Impacts

9.2.4.1 Air Quality Mitigation Measures

The new emissions from the Lambertville Compressor Station will need to meet rigorous technology and operational requirements to obtain and comply with the required air emissions permit. Specifically, in New Jersey, State-of-the-Art Technology requirements will apply to NO_X, CO, and SO_2 emissions from the turbine operations. Measures proposed to minimize air quality impacts include the use of clean burning natural gas as the fuel for all combustion devices and use of $SoLoNO_X^{TM}$ combustion technology to control NO_X and CO emissions from the new turbines. The proposed new turbines will also be equipped with oxidation catalysts to further reduce CO, VOC, and HAP emissions. Compliance with applicable federal and state air regulations and state permit requirements will ensure that the air quality impacts from the Project are minimized.

Fugitive gas releases from meters and regulators, valves and other piping components, and from operation and maintenance activities may occur. Implementing Texas Eastern's preventive maintenance program at the Lambertville Compressor Station, as discussed further in Resource Report 11, to identify and prevent leaks will minimize fugitive emissions. Texas Eastern's maintenance program ensures that any leaks that are found are repaired quickly and operations are optimized to limit the frequency and extent of maintenance requiring evacuating the gas from aboveground facilities and/or portions of the pipeline ("blowdowns").

Texas Eastern's pipeline system is designed to be a closed system and result in very small amounts of fugitive releases of natural gas. Minor leakage from various piping components, fittings, and aboveground equipment can occur, but through proper operation and maintenance, these emissions are minimized. Texas Eastern participates in the USEPA Natural Gas Star Program to share best practices for methane reduction technologies. Fugitive equipment leaks at compressor stations are mitigated by implementing, at a minimum, annual leak surveys conducted in accordance with Compressor Station Leak Survey SOP 4-2160. In addition to these practices, Texas Eastern reports greenhouse gas emissions as required by the 40 CFR Part 98, Subpart W reporting program and will comply with 40 CFR Part 60, Subpart OOOOa LDAR requirements.

Blowdowns occur on a planned basis in order to conduct preventive maintenance checks and to complete needed maintenance on the pipeline system. Occasionally, an unplanned blowdown can occur at a compressor station when an automated station operating system detects an abnormal condition and engages the designed safety features of the facility.

These operations and maintenance releases are carefully managed to minimize the amount of each release by:

- Conducting required annual emergency shutdown ("ESD") system tests while the blowdown vents are capped thus allowing verification of all ESD components without the release of gas (i.e., YALE closures);
- Utilizing pump-down techniques to lower gas line pressure before maintenance. Lowering the pressure in the compressor station, pipeline, or in targeted equipment is accomplished by use of compression and/or "line transfer" where feasible;
- Executing pressurized holds on turbines;
- Scheduling multiple maintenance activities concurrently to reduce the number of independently required blowdowns;
- Performing routine inspection and testing of blowdown systems electronically (i.e., no blowdown occurs);
- Conducting in-service repairs rather than replacing sections of pipe. Steel or composite sleeves are used for anomaly repairs whenever possible (i.e., clock spring or other types of permanent sleeves) to avoid the need for blowdowns; and/or
- Utilizing "hot taps" when making new connections to the pipeline system whenever possible. This technique allows for welding to occur on pipe that contains high pressure gas and avoids the need for blowdowns.

During construction, Texas Eastern will make best efforts to use ultra-low sulfur diesel in construction equipment and utilize non-road engines either retrofitted with best available technology or certified to meet USEPA's Tier IV Exhaust Emissions Standards without the need for additional retrofitting. Best available technology for reducing emissions of PM, hydrocarbons, and/or CO from non-road engines may include diesel retrofit devices specifically named on either the USEPA Verified Technology List or the California Air Resources Board Verified Technology List, such as diesel particulate filters, diesel oxidation catalysts, or catalyzed wire mesh filters. Texas Eastern will also limit the idling of engines to a maximum of five minutes whenever the construction equipment is not in use. In addition, construction equipment will be properly tuned, and operated only on an as-needed basis to minimize the combustion emissions from diesel and gasoline engines.

Fugitive dust emissions during construction will be mitigated, as necessary, in accordance with the Dust Control Plan included in Appendix 9C by spraying water on unpaved areas subject to frequent vehicle traffic.

9.2.4.2 Lambertville Compressor Station

The air permit application was submitted to NJDEP in November 2017. Further information about the proposed air emission sources, detailed emission calculations, the basis for emission calculations, and proposed facility emissions is provided in the compressor station air permit application in Appendix 9A.

Air Quality Analysis

As previously stated, the Project is not subject to New Jersey's Subchapter 18 requirements, including air quality impact analyses. Nevertheless, once NJDEP reviews and approves the proposed modeling protocols included with the air permit application in Appendix 9A, a full air quality analysis for the Lambertville Compressor Station to evaluate air quality impacts of the facility after the proposed Project is constructed, as well as a risk assessment with respect to potential HAP emissions, will be completed and submitted to FERC and NJDEP.

9.2.4.3 Construction Activities

Texas Eastern estimated construction-related emissions of criteria pollutants and greenhouse gases for the Project. Tables 9.2-9 through 9.2-13 provide a summary of estimated emissions from construction activities. Detailed construction emissions calculations along with the methodology and emissions factors are provided in Appendix 9D. Construction of the Project will result in temporary increases in emissions of some pollutants due to the use of equipment powered by diesel fuel or gasoline engines. Construction activities may also result in the temporary generation of fugitive dust due to disturbance of the ground surface and other dust generating actions. There may also be some temporary indirect emissions attributable to construction workers commuting to and from work sites during construction.

Fugitive Dust Emissions

Construction activities for the Project will result in emissions of fugitive dust from vehicular traffic and soil disturbance, and combustion emissions from diesel and gasoline fired construction equipment. Such air quality effects, however, will generally be temporary and localized, and are not expected to cause or significantly contribute to an exceedance of the NAAQS. Large earth-moving equipment and other mobile sources are sources of combustion-related emissions, including criteria pollutants (i.e., NO_X, CO, VOC, SO_2, and PM_{10}) and small amounts of HAPs. Air pollutants from the construction equipment will be limited to the immediate vicinity of the construction area and will be temporary.

Fugitive dust will result from excavation, concrete work, and vehicle traffic on paved and unpaved roads. The amount of dust generated will be a function of construction activity, soil type, soil moisture content, wind speed, precipitation, vehicle traffic, vehicle types, and roadway characteristics. Emissions will be greater during dry periods and in areas of fine-textured soils subject to surface activity. Texas Eastern will employ proven construction-related practices to control fugitive dust such as application of water on unpaved areas subject to frequent vehicle traffic. In addition, construction equipment will be operated only on an as-needed basis.

Table 9.2-8 provides estimates of fugitive dust emissions associated with construction activities.

TABLE 9.2-8 Fugitive Dust Emissions from Construction Activities (TPY)		
Year	**PM_{10}**	**$PM_{2.5}$**
2019	14.9	1.6

Construction Engine Emissions

Construction-related emission estimates are based on a typical construction equipment list, hours of operation, and vehicle miles traveled by the construction equipment and supporting vehicles. This is a very conservative estimate based on worst case assumptions and USEPA emission factors. Nevertheless, the estimated air emissions from construction of the Project are expected to be transient in nature, with negligible impact on the regional air quality.

There will be some emissions attributable to vehicles delivering materials to the construction site and from on-road support vehicles at the construction site (i.e., mechanic trucks, water trucks, pickup trucks, etc.). Emission factors in grams per vehicle mile traveled for on-road vehicles were obtained from the USEPA MOVES (Motor Vehicle Emission Simulator) model. Emissions from non-road construction equipment engines used during Project construction were estimated based on the anticipated types of non-road equipment and their associated levels of use. Emission factors in grams per hp-hour were obtained using the most recent version of USEPA's NONROAD model (NONROAD2008a).

Table 9.2-9 summarizes the estimated emissions of criteria pollutants and total HAPs from construction equipment and material deliveries.

TABLE 9.2-9 Non-Road and On-Road Construction Emissions of Criteria Pollutants and HAPs (TPY)						
Year	**NO_x**	**VOC**	**CO**	**SO_2**	**$PM_{10}/PM_{2.5}$**	**Total HAPs**
2019	2.4	0.9	37.5	0.008	0.2	0.01

Table 9.2-10 summarizes the estimated greenhouse gas emissions ("GHG") emissions from construction equipment and material deliveries. For the types of sources of GHG emissions associated with Project construction, total carbon dioxide ("CO_2") is essentially the same as CO_2e.

TABLE 9.2-10 Non-Road and On-Road Construction Emissions of Greenhouse Gases (TPY)	
Year	**CO_2**
2019	925

Emissions from Commuting

There also will be some emissions attributable to vehicles driven by construction workers commuting to and from the Project area during construction. Emission factors in grams per vehicle mile traveled for on-road vehicles were obtained from the USEPA MOVES model.

Table 9.2-11 provides estimates of tailpipe emissions of criteria pollutants from vehicles used by commuting construction workers.

TABLE 9.2-11 Construction Worker Commuting Emissions of Criteria Pollutants and HAPs (TPY)						
Year	**NO_x**	**VOC**	**CO**	**SO_2**	**$PM_{10}/PM_{2.5}$**	**Total HAPs**
2019	0.22	0.06	2.5	0.002	0.05	0.06

Table 9.2-12 provides estimates of emissions of GHG emissions from vehicles used by commuting construction workers.

TABLE 9.2-12 Construction Worker Commuting Emissions of Greenhouse Gases (TPY)	
Year	**CO_2**
2019	293.5

Detailed construction emissions calculations along with the methodology and emissions factors used are provided in Appendix 9D.

Emissions from Open Burning

Open burning of land clearing debris will not occur as part of the Project; therefore, emissions from open burning are not presented and are not included in the general conformity emissions estimate presented in Appendix 9D.

9.2.4.4 Radon

Radon is a naturally occurring radioactive gas that is odorless and tasteless. It is produced by the radioactive decay of radium-226, which is found in uranium ores; phosphate rock; shales; igneous and metamorphic rocks such as granite, gneiss, and schist; and, to a lesser degree, in common rocks such as limestone. Radioactive decay is a natural, spontaneous process in which an atom of one element decays or breaks down to form another element by losing atomic particles (protons, neutrons, or electrons) (USGS, 2015). Radon can be entrained in fossil fuels including natural gas.

Health studies conducted for the U.S. Department of Energy ("USDOE") and the USEPA, Office of Radiation Programs,[2] reports prepared by Dr. Lynn R. Anspaugh[3] and Risk Sciences International ("RSI"),[4] and most recently a study conducted by the Pennsylvania Department of Environmental Protection ("PADEP"),[5] have found that radon in natural gas does not pose a health risk to end users of the natural

[2] Texas Eastern Transmission, LP, 141 FERC ¶ 61,043 at n. 78 (2012) (Texas Eastern) (Gogolak, C., Review of 222RN in Natural Gas Produced from Unconventional Sources. Prepared for the U.S. Department of Energy, Environmental Measurements Laboratory as DOE/EML-385, New York, New York (1980), and Johnson, R., D. Bernhardt, N. Nelson, and H. Calley, Assessment of Potential Radiological Health Effects from Radon in Natural Gas, Prepared for the U.S. Environmental Protection Agency, Office of Radiation Programs as EPA-520/1-83-004, Washington, D.C. (1973)).
[3] Id. at n. 82 (Lynn R. Anspaugh, Scientific Issues Concerning Radon in Natural Gas (July 5, 2012)).
[4] Id. at n. 82 and 86 (RSI, An Assessment of the Lung Cancer Risk Associated with the Presence of Radon in Natural Gas Used for Cooking in Homes in New York State (July 4, 2012)).
[5] Perma-Fix Environmental Services, Inc, Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) Study Report. Prepared for the Pennsylvania Department of Environmental Protection (January 2015).

gas. The Gogolak/USDOE study looked at the radon concentration in natural gas from eight wells in West Virginia and Kentucky and found an average radon concentration of 151 picocuries per liter ("pCi/L"). The Johnson/USEPA study found an average concentration of radon in natural gas of 37 pCi/L from over 2,000 wells nationwide. The Anspaugh study focused on gas samples taken at eight locations on the Texas Eastern system in West Virginia, Pennsylvania and New Jersey and found an average radon concentration of 29 pCi/L. In addition to these studies, the U.S. Geological Survey ("USGS") released a report in 2012 regarding radon activities in natural gas from certain wells.[6] The USGS found an average concentration of radon of 37 pCi/L based on gas samples from eleven wells in Pennsylvania.

In December 2013, Texas Eastern had an independent expert conduct gas sampling at six locations on the Texas Eastern system in Pennsylvania, New Jersey, and New York. The average radon concentration from these samples was 27 pCi/L. These recent samples of radon concentration of Marcellus shale gas are neither at variance with the Gogolak/USDOE, Johnson/USEPA, or Anspaugh studies, nor are they inconsistent with the USGS report. A summary of the Texas Eastern sampling results is provided in Appendix 9E.

The Gogolak/USDOE and Johnson/USEPA studies examined the deterioration/reduction of radon in the gas during transmission, processing, and at combustion. These studies concluded that due to radon's deterioration half-life of less than four days, the amount of radon entrained in natural gas rapidly diminishes as the natural gas is gathered from the wellhead, is processed to remove liquids and other elements, and is stored or delivered into a natural gas transmission pipeline system.

The PADEP Study encompassed radiological surveys at well sites, wastewater treatment plants, landfills, gas distribution and end use, and roads treated with brine produced from oil and gas wells. The media sampled included solids, liquids, natural gas, ambient air, and surface radioactivity. The PADEP Study included the observation that there is little or limited potential for radiation exposure to workers and the public from the development, completion, production, transmission, processing, storage, and end use of natural gas.

In its consideration of this issue in the New Jersey-New York Expansion Project, Algonquin Incremental Market Project, and the Constitution Pipeline and Wright Interconnect Projects certificate proceedings, the FERC considered many of these same studies and, based on those studies, concluded that the transportation of gas by the Projects did not result in a significant risk of exposure to radon and would not pose a health hazard to end users.[7] Similarly, radon exposure related to the Project will not pose a health hazard and no mitigation measures are necessary.

9.3 Noise Quality

This section of Resource Report 9 and Appendix 9F provide an overview of applicable noise standards; an assessment of the existing ambient noise levels at nearby noise-sensitive areas ("NSAs") such as a residence, school, hospital, etc.; a noise impact analysis of the proposed project modifications at the Lambertville Compressor Station; and a summary of noise mitigation measures that could be implemented

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[6] Rowan, E.L. and Kraemer, T.F., Radon-222 Content of Natural Gas Samples from Upper and Middle Devonian Sandstone and Shale Reservoirs in Pennsylvania: Preliminary Data, Prepared for the U.S. Department of the Interior, U.S. Geological Survey, Open-File Report Series 2012–1159, Reston, Virginia (2012).

[7] Texas Eastern Transmission, LP, 141 FERC ¶ 61,043 at P 56; Final Environmental Impact Statement, Constitution Pipeline and Wright Interconnect Projects, FERC Docket Nos. CP13-499-000 and CP13-502-00, Volume I at pages 4-187 to 4-188, published October 2014, by the Federal Energy Regulatory Commission; Final Environmental Impact Statement, Algonquin Incremental Market Project, FERC Docket No. CP14-96-000, Volume I at pages 4-241 to 4-245, published January 2015, by the Federal Energy Regulatory Commission.

to ensure operation of the Lambertville Compressor Station complies with the FERC noise guidelines after the Project. Information about the noise impact from construction activities is also provided.

An on-site ambient sound survey and acoustical analysis for the Lambertville Compressor Station were conducted by Hoover & Keith Inc., an acoustical engineering company headquartered in Houston, Texas.

In general, the operation of the modifications associated with the Project will result in a decrease in noise levels near the compressor station over the life of the facility. However, the project-related construction activities will result in short-term increases in noise near those activities.

9.3.1 Applicable Noise Regulations

The unit of noise measurement is the decibel ("dB"), which measures the energy of noise. Because the human ear is not uniformly sensitive to all noise frequencies, the A-weighted ("A-wt.") frequency scale (denoted as "dBA") was devised to correspond with the ear's sensitivity. The equivalent sound level ("L_{eq}", an A-wt. sound level or "dBA") is considered an average A-wt. sound level measured during a period of time, including any fluctuating sound levels during that period. The L_{eq} is equal to the level of a steady (in time) A-wt. sound level that would be equivalent to the sampled A-wt. sound level on an energy basis for a specified measurement interval. The concept of the measuring L_{eq} has been used broadly to relate individual and community reaction to aircraft and other environmental noises.

The daytime sound level ("L_d") is the equivalent dBA for a 15-hour period, between 07:00 to 22:00 Hours (7:00 a.m. to 10:00 p.m.). The nighttime sound level ("L_n") is the equivalent dBA for a 9-hour period, between 22:00 to 07:00 Hours (10:00 p.m. to 7:00 a.m.).

The day-night average sound level ("L_{dn}") is an energy average of the measured daytime L_{eq} (i.e., L_d) and the measured nighttime L_{eq} (i.e., L_n) plus 10 dB. The 10-dB adjustment to the L_n is intended to compensate for nighttime sensitivity. For a steady sound source that operates continuously over a 24-hour period and controls the environmental sound level, an L_{dn} is approximately 6.4 dB above the measured L_d. Consequently, an L_{dn} of 55 dBA corresponds to an L_{eq} of 48.6 dBA. If both the L_d and L_n are measured and/or estimated, then the L_{dn} is calculated using the following formula:

$$L_{\mathrm{dn}} = 10\log_{10}\left(\frac{15}{24}10^{L_{\mathrm{d}}/10} + \frac{9}{24}10^{(L_{\mathrm{n}}+10)/10}\right)$$

9.3.1.1 Federal Energy Regulatory Commission

FERC sound guidelines and typical certificate conditions require that the sound attributable to a new aboveground facility not exceed a day-night average sound level (*i.e.*, L_{dn}) of 55 dBA at any nearby NSA, unless such NSAs are established after facility construction. For an existing aboveground facility where the existing sound level contribution at any nearby NSA is above 55 dBA (L_{dn}), typical certificate conditions require that the sound level attributable to the facility, after installation of the modifications (*e.g.*, horsepower addition and/or addition of a new gas cooler), should not exceed the existing sound level produced by the existing facility at any nearby NSA. If the sound level contribution from an existing aboveground facility is equal to or lower than 55 dBA (L_{dn}) at any nearby NSA, the sound level attributable to the existing facility, after installation of the modifications, should not exceed 55 dBA (L_{dn}). In addition, FERC guidelines typically require that the operation of a new compressor station, or operation of an existing compressor station after modifications, should not result in a perceptible increase in vibration at any nearby NSA. A sound level of 55 dBA (L_{dn}) can be used as a "benchmark sound criterion/guideline" for assessing the noise impact of temporary or intermittent noise such as site construction noise and a blowdown event at a compressor station.

9.3.1.2 State and Local Noise Regulations

State of New Jersey

The State of New Jersey regulates noise pursuant to the State Noise Pollution Code at N.J.A.C 7:29. In summary, the regulation states that the continuous airborne sound from an industrial, commercial, or community service facility not exceed 65 dBA (day or night) at the property line of any other commercial or community service facility, and not exceed 65 dBA at the property line of any residential property line during the daytime (7:00 AM to 10:00 PM) or 50 dBA during the nighttime (10:00 PM to 7:00 AM). There are also unweighted octave band sound pressure levels and maximum impulsive sound levels that should not be exceeded at any property line. For an essentially steady sound source that operates continuously over a 24-hour period and controls environmental sound levels, such as a natural gas compressor station, the typical L_{dn} is approximately 6.4 dB above the measured L_{eq}. Therefore, the FERC sound level requirement of 55 dBA (L_{dn}) corresponds to a L_{eq} of 48.6 dBA and is considered slightly more stringent than the State Noise Pollution Code.

West Amwell Township, Hunterdon County

There are no county or local noise ordinances applicable to the Project, however Part III of the Code of the Township of West Amwell does have a local nuisance code at Paragraph 4 of Chapter 166: Nuisances, Public Health (§ 166-4).

9.3.2 Noise Quality Analysis

9.3.2.1 Lambertville Compressor Station

Table 9.3-1 summarizes the general location of the Lambertville Compressor Station and the proposed project modifications that could result in a noise impact at nearby NSAs.

TABLE 9.3-1

Summary of the Existing and New Compressor Stations associated with the Project

Compressor Station	Location (County, State)	Planned Project Modifications with Potential Noise Impact
Lambertville Compressor Station	Hunterdon, NJ	Retire two existing Clark DC-990 turbine compressor units and replace with two new Solar Taurus 70 turbine compressor units

The Lambertville Compressor Station is located off State Highway 179 in West Amwell Township, Hunterdon County, New Jersey, approximately two miles northeast of the Town of Lambertville, New Jersey. The closest NSAs to the station are located between 600 and 1,250 feet from the station site center. The following describes the identified nearby NSAs in each cardinal direction in which existing sound levels have been measured.

- NSA #1: Residence on west side of State Highway 179, located approximately 600 feet south-southeast of the station site center and approximately 685 feet south-southeast of the anticipated location of the new turbine compressor units;

* NSA #2: Residence on the west side of Mt. Airy Village Road, located approximately 850 feet south-southeast of the station site center and approximately 900 feet southeast of the anticipated location of the new turbine compressor units; and
* NSA #3: Two residences near the intersection of State Highway 179 and Mt. Airy Village Road, located 1,250 feet east-northeast of the station site center and 1,150 feet east-northeast of the anticipated location of the new turbine compressor units.

An acoustical analysis was conducted for the existing Lambertville Compressor Station as related to the proposed modifications associated with the Project. The results of sound surveys were utilized to establish the existing sound levels at the compressor station. A noise-related report entitled *Lambertville Compressor Station (Hunterdon County and West Amwell Township, New Jersey): Results of a Pre-Construction Sound Survey and an Acoustical Analysis of Station Modifications Associated with the Texas Eastern Lambertville East Expansion Project* is provided in Appendix 9F and includes an area layout of the compressor station showing the surrounding NSAs.

Since only the two Clark DC-990 turbine compressor units were in operation at the time of the most recent ambient sound survey in March 2017, the total station sound level at the NSAs with all compressor units operating at full load is estimated based on a previous sound survey in which the Siemens electric driven compressor unit and two Cooper Bessemer GMVR-10 reciprocating compress engines were operating. The acoustical analysis for the Lambertville Compressor Station considers the noise that will be produced by all continuous-operating equipment at the compressor station that could impact the sound contribution at nearby NSAs. The potential change in the sound contribution of the total station noise is estimated at the closest identified NSAs based on the following significant sound sources for the new equipment associated with the Project modifications as well as implementation of recommended noise control measures described in Section 9.3.2.1:

* Noise generated by the new turbine compressor units that penetrates the compressor building;
* Turbine exhaust noise (primary noise source that could generate perceptible vibration);
* Noise radiated from aboveground gas piping and related piping components;
* Noise of the outdoor lube oil cooler and the outdoor gas cooler associated with the new turbine compressor units; and
* Noise generated by the turbine air intake systems.

Table 9.3-2 provides a Noise Quality Analysis for the Lambertville Compressor Station, and assuming operation of the new and existing station equipment at full load, summarizes the existing sound level at the Lambertville Compressor Station site (i.e., sound level prior to the Project), the estimated station sound level contribution of the Project modifications at the closest NSAs during operation, and the total cumulative sound level at the closest NSAs (i.e., existing station sound level plus the sound level contribution of Project modifications). Note that the estimated A-wt. sound level was used to infer a representative L_{dn}. A description of the acoustical analysis methodology and source of sound data related to the Noise Quality Analyses is provided in the noise report in Appendix 9F.

TABLE 9.3-2

Noise Quality Analysis for Lambertville Compressor Station assuming Project Modifications

Closest NSA	Distance and Direction of NSA to Site Center	Existing Station L_{dn} (dBA)	Estimated Sound Level L_{dn} of Project Modifications (dBA)	Estimated Total Station L_{dn} after Project Modifications (dBA)	Change in the Existing Station Sound Level (dB)
NSA #1	600 feet (SSE)	59.8	51.3	56.1	-3.7

TABLE 9.3-2

Noise Quality Analysis for Lambertville Compressor Station assuming Project Modifications

Closest NSA	Distance and Direction of NSA to Site Center	Existing Station L_{dn} (dBA)	Estimated Sound Level L_{dn} of Project Modifications (dBA)	Estimated Total Station L_{dn} after Project Modifications (dBA)	Change in the Existing Station Sound Level (dB)
NSA #2	850 feet (SSE)	58.5	48.6	55.1	-3.4
NSA #3	1,250 feet (ENE)	60.9	46.1	57.3	-3.6

Notes:
Existing station sound level (L_{dn}) at the NSAs is based on sound data measured during an ambient sound survey.
L_{dn} is an energy average of the measured daytime Leq (i.e., L_d) and the measured nighttime L_{eq} (i.e., L_n) plus 10 dB. The 10 dB adjustment to the L_n is intended to compensate for nighttime sensitivity.
dBA = A-weighted decibel
L_d = daytime equivalent sound level
L_n = nighttime equivalent sound level
L_{dn} = day-night average sound level

The results of the acoustical analysis for the Lambertville Compressor Station indicate that the existing station sound levels at the nearby NSAs is above 55 dBA. The noise attributable to the station after installation of the Project modifications at the nearby NSAs will be lower than the existing station sound levels, as required by FERC noise guidelines, and is expected to also meet the State Noise Pollution Code.

Sound Contribution of a Blowdown Event for any new Compressor Unit

A unit blowdown is not considered a significant noise source if an adequate blowdown silencer is employed. The noise of a unit blowdown event for the two new turbine compressor units at the Lambertville Compressor Station will occur via a gas blowdown silencer specified to meet an A-wt. sound level of 60 dBA at 300 feet. Consequently, the noise of a unit blowdown event for the new turbine compressor units will be approximately 47 dBA (i.e., an L_{dn} of 53 to 54 dBA) at the nearby NSAs. Although the noise of a unit blowdown event could be audible at the nearby NSAs, it is not expected to present an adverse noise impact given that a unit blowdown event occurs infrequently for a short time frame (e.g., 1- to 3-minute period).

9.3.2.2 Construction Activities

The noise impact and noise contribution at nearby NSAs of construction-related activities related to the installation of Project modifications at the Lambertville Compressor Station is expected to be lower than 55 dBA (L_{dn}), and therefore will not exceed the existing noise levels associated with the facility. Consequently, site construction noise associated with the installation of new equipment (e.g., new turbine compressor unit, related buildings and gas cooler) should have a negligible impact on the nearby NSAs, noting that the construction will be primarily limited to daytime hours. The most prevalent sound source during construction will be internal combustion engines used to power construction equipment. Construction related to new equipment will consist of some earth work (e.g., site grading, clearing, and grubbing related to construction of any new building and installation of new equipment). Construction activities will be performed with standard heavy equipment such as a track-excavator and backhoe, as well as use of a bulldozer, dump truck(s), and concrete trucks. Many construction machines operate intermittently and the types of machines in use at a construction site changes with the construction phase. For these reasons, it is not anticipated that construction-type noise at the Project facilities will have significant impacts on the surrounding environment.

The equipment likely to be used during construction is listed below in Table 9.3-3. Construction equipment noise levels will typically be less than 85 dBA at 50 feet when equipment is operating at full load. People at nearby residences and buildings will hear the construction noise but the overall impact will be short-lived and insignificant. Construction will not result in the generation of, or exposure of persons to, excessive noise or vibration levels for lengthy periods.

TABLE 9.3-3

Noise Levels of Major Construction Equipment a/

Equipment Type	Sound Level at 50 Feet (dBA)
Trucks	85
Crane	85
Roller	85
Bulldozers	85
Pickup Trucks	55
Backhoes	80

a/ U.S. Department of Transportation, Federal Highway Administration. 2011. FHWA Highway Construction Noise Handbook. Available online at: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

9.3.2.3 Blasting

As described in Section 1.5.3 of Resource Report 1, blasting is not anticipated to be required at the Project site.

9.3.3 Noise Mitigation Measures

9.3.3.1 Lambertville Compressor Station

Texas Eastern continues to evaluate noise control measures to be implemented at the Lambertville Compressor Station through the detailed design of the facility. The noise report in Appendix 9F provides detailed recommendations for noise control measures for noise sources and equipment sound specifications for new station equipment along with other assumptions that may affect the noise and vibration generated by the new equipment. The following is a summary list of noise mitigation measures that Texas Eastern is evaluating and are expected to be employed for the new equipment at the compressor station. The recommended noise mitigation measures have proven to be very effective for similar equipment and facilities.

- Enclose the new turbine compressor units inside an acoustically insulated metal building constructed from appropriate building materials;
- Install an adequate silencer system on each turbine air intake and exhaust system;
- Cover outdoor aboveground gas piping with acoustical pipe insulation;
- Install a low-noise lube oil cooler for each new turbine compressor unit;
- Install a low-noise gas cooler for the new turbine compressor units; and
- Install silencers on new unit blowdown vents.

Texas Eastern will employ these noise mitigation measures (as described above and in the noise report in Appendix 9F) or equal noise mitigation measures, as necessary, to demonstrate compliance with the FERC's 55 dBA (L_{dn}) noise standard.

9.3.3.2 Construction Activities

Because of the temporary nature of the construction noise during installation of the Project modifications at the Lambertville Compressor Station, no adverse or long-term effects are anticipated. Noise mitigation measures to be employed during construction include ensuring that sound muffling devices that are provided as standard equipment by the construction equipment manufacturer are kept in good working order. Construction noise, while varying according to equipment in use, will be mitigated by the attenuating effect of distance and the intermittent and short-lived character of the noise. If needed, additional noise abatement techniques and other measures can be implemented during the construction phase to mitigate construction-related noise disturbances at nearby NSAs.

9.3.4 Post-Construction Sound Survey(s)

Within 60 days of placing the new equipment in operation at the Lambertville Compressor Station, a "post-construction" sound survey will be performed to ensure that the sound level attributable to the Project modifications at full load operation, does not exceed the FERC sound level requirements and/or any applicable state/local noise regulations. The results of the post-construction sound surveys will be filed with the Secretary.

9.4 References

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APPENDIX 9A

Compressor Station Air Permit Application and Emission Calculations

TITLE V SIGNIFICANT MODIFICATION APPLICATION

Texas Eastern Transmission LP > Lambertville Compressor Station

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Project 173101.0075

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1.1. INTRODUCTION

Texas Eastern Transmission, L.P. (Texas Eastern) operates a natural gas compressor station in Lambertville, Hunterdon County, New Jersey (Lambertville Compressor Station). The Lambertville Compressor Station is currently operating under Title V Operating Permit Number BOP140001, issued on December 1, 2014. This application seeks approval from the New Jersey Department of Environmental Protection (NJDEP) for three separate and independent permitting actions as follows:

- **Reconciliation** of Texas Eastern's current understanding of potential emissions from non-source fugitive emissions from station piping components and for miscellaneous gas releases associated with maintenance activities with historical estimates made in air permit applications submitted for the Lambertville Compressor Station.

- The **Lambertville East Expansion Project** involves the replacement of the two existing natural gas-fired Dresser Clark model DC 990 compressor turbines (Emission Unit U1) with two new lower NO_X-emitting natural gas-fired Solar Taurus 70 compressor turbines. This project is being implemented as part of a system-wide project scheduled to begin construction in 2019. The project will also provide for compliance with the recently published amendments to Title 7, Chapter 27 of the New Jersey Administrative Code, N.J.A.C. 7:27, which pertain to Reasonably Available Control Technology (RACT) requirements for NO_X (N.J.A.C. 7:27-19: Control and Prohibition of Air Pollution from Oxides of Nitrogen or "NO_X RACT rule").

- The **PennEast Interconnect Project** involves the construction of connecting piping and associated flow control devices (metering and regulating equipment) in order to receive natural gas via the PennEast pipeline, owned and operated by PennEast Pipeline Company, LLC (PennEast), at the Lambertville Compressor Station.

Additional background information related to each of these items is included in the following section.

1.2. APPLICATION BACKGROUND

1.2.1. Title V Permit PTE Reconciliation for Station Piping Components and Gas Releases

The original Title V Operating Permit, Number BOP990001, was issued to Texas Eastern for the Lambertville Compressor Station on July 7, 2005. The original permit listed a PTE of 4.189 tpy volatile organic compounds (VOCs) and 1.01 tpy hazardous air pollutants (HAPs) for non-source fugitive emissions identified as piping components. It also listed a PTE of 4.144 tpy VOC and a PTE of 0.282 tpy HAPs for gas releases identified as insignificant sources IS2 through IS15. In the years since these original PTE estimates were provided to the NJDEP in the original Title V permit application for the Lambertville Compressor Station, Texas Eastern has gained a more thorough understanding of emissions from these types of sources and, as such, seeks to update these estimates to make them more accurate.

1.2.2. Lambertville East Expansion Project

Under this project, Texas Eastern is proposing to install the following new equipment at the Lambertville Compressor Station:

- Two new 10,915 HP (ISO) Solar Taurus 70 natural gas-fired turbines, which will replace the two existing 5,800 HP (ISO) Dresser Clark DC 990 natural gas-fired compressor turbines (Emission Unit U1);
- A new 880 bhp Waukesha VGF36GL natural gas-fired emergency generator which will replace the existing Caterpillar G-398 emergency generator (Emission Unit U3); and
- Two new natural gas-fired gas heaters associated with the new turbine compressors (rated at < 1 MMBtu/hr heat input);
- Four new natural gas-fired warehouse space heaters (all rated at < 1 MMBtu/hr heat input);
- Two new 44-gallon storage tanks, which will replace existing tanks; and new gas release vents associated with the new turbines.

The portion of the existing piping components (listed in the Title V permit as FG1) associated with the DC990 units will also be replaced with the replacement of these turbines. However, the estimated PTE (VOC and HAPs) of station-wide piping components is the same before and after the Lambertville East Expansion project.

The two existing DC 990 turbines are currently limited to NO_X emissions of 172.5 ppmvd corrected to 15% O_2, in accordance with Title V Operating Permit BOP140001, U1, OS1 and OS2, Reference #8. The potential to emit (PTE) for the DC 990 units reflected in the Title V Operating Permit is 142.35 tpy NO_X per unit, or a total PTE of 284.7 tpy NO_X. The two new Taurus 70 turbines have a combined PTE of 25 tpy NO_X.

On November 6, 2017 the New Jersey Department of Environmental Protection (NJDEP) published amendments to the N.J.A.C. 7:27-19 NO_X RACT rule. The amended NO_X RACT rule establishes new NO_X emission limits for existing natural gas-fired simple cycle compressor turbines at major NO_X facilities to which the two DC990 compressor turbines at Lambertville Compressor Station are subject. As part of this project, the DC 990 turbines will be replaced with "beyond RACT", State of the Art (SOTA)-compliant turbine(s) resulting in a reduction of NO_X concentration in the turbine exhaust from172.5 ppmvd to 9 ppmvd @ 15% O_2 under normal operating conditions.

This project is also subject to authorization by the Federal Energy Regulatory Commission (FERC). Texas Eastern will be filing an application for a certificate of public convenience and necessity from the FERC pursuant to Sections 7(b) and 7(c) of the Natural Gas Act.

1.2.3. PennEast Interconnect Project

Under this project, Texas Eastern is installing the piping, metering and regulating equipment needed to connect both the Algonquin and Texas Eastern pipeline systems (both owned by Enbridge) to the proposed PennEast Pipeline at the Lambertville Compressor Station. PennEast owns the property adjacent to the Lambertville Compressor Station. The pending agreement between Texas Eastern and PennEast indicates that Texas Eastern will design and construct this equipment, however ownership and operations will be divided as follows between the two companies:

- Equipment to be owned and operated by PennEast includes connecting piping, pig receiver; two (2) filter separators (i.e., piping components and potential gas releases), one (1) pipeline liquids tank, and truck loading operations associated with the transfer of pipeline liquids.

- Equipment to be owned and operated by Enbridge/Texas Eastern includes overpressure protection and tee taps (i.e., piping components);
- Equipment to be owned by PennEast but operated by Enbridge/Texas Eastern includes two (2) meter runs, pressure regulation, flow control and interconnecting piping (i.e., piping components), two (2) coolant tanks and coolant truck loading area, one (1) Caterpillar G3412C emergency generator, as well as eight (8) 10 MMBtu/hr step down heaters.

1.3. AIR PERMITTING SUMMARY FOR PROPOSED PROJECTS

While the Lambertville East Expansion and PennEast Interconnect projects are separate and unrelated projects, the potential emissions for all of the new equipment from both projects listed above have been aggregated to conservatively assess applicability of Prevention of Significant Deterioration (PSD) as discussed in Section 5.2 and of Subchapter 18 Nonattainment New Source Review (NNSR) as discussed in Section 5.3. Both the PSD and the Subchapter 18 applicability analyses show that new source review will not be triggered by these projects at the Lambertville Compressor Station. Even though the proposed projects do not trigger PSD or NNSR, Texas Eastern is conducting a full air quality analysis for the Lambertville Compressor Station to evaluate the air quality impacts of the facility after the proposed projects are constructed. This analysis will include criteria pollutant modeling against the National Ambient Air Quality Standards as well as a risk assessment with respect to potential air toxics emissions. These modeling analyses will be completed after the NJDEP reviews and approves the proposed protocols submitted with this application in Appendices C and D.

After construction, the PennEast Station and the Lambertville Compressor Station will be operated by separate work forces. Ultimately, two separate permits will be requested based on this application submittal:

1. A modification to the existing Title V permit for the Lambertville Compressor Station (BOP140001), and
2. A Subchapter 8 Preconstruction Permit for the equipment to be owned and operated by PennEast as outlined above.

However, at this time, Texas Eastern and PennEast are in the process of finalizing an agreement regarding ownership and operation. Therefore, in the interim, the PennEast owned and operated sources[1] are included in the Title V significant modification application for the Lambertville East Expansion Project submitted herein in accordance with N.J.A.C.7:27-22.24. In addition, this application includes the proposed equipment associated with the PennEast Interconnect Project that will be owned and/or operated by Texas Eastern after construction. These sources will remain in the Lambertville Compressor Station Title V permit after the agreement is finalized.

The new turbines will be subject to 40 CFR 60, Subpart KKKK, New Source Performance Standards (NSPS) for Stationary Gas Turbines as well as the applicable state regulations as outlined in Section 5 of this report. The new emergency generators will be subject to 40 CFR 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines and compliance with this regulations also constitutes compliance with 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Engines. The Lambertville Compressor Station will also be subject to the leak detection and repair (LDAR) requirements of 40 CFR 60, Subpart OOOOa, NSPS for Crude Oil and Natural Gas Production, Transmission, and Distribution due to the modification of the station with the Lambertville East Expansion Project. Finally, the eight new step down heaters at the PennEast Meter and Regulation (M&R) Station will be subject to the notification and recordkeeping requirements under 40 CFR 60, Subpart Dc, Standards of Performance for Small Industrial, Commercial, and Institutional Steam Generating Units.

[1] As indicated in communications with NJDEP, PennEast will own and operate the connecting piping, pig receiver, filter separator, and associated pipeline liquids storage and handling operations. These sources will be separated out of Lambertville's Title V permit once a final agreement has been executed between Enbridge and PennEast.

1.4. APPLICATION OVERVIEW

This Title V Significant Modification Application is organized as follows:

- Section 2 – PTE Reconciliation
- Section 3 – Overview of Proposed Projects
- Section 4 – Project Emissions Quantification
- Section 5 – Regulatory Applicability
- Section 6 – State of the Art (SOTA) control technology analysis
- Section 7 – Dispersion Modeling Analysis
- Attachment A – NJDEP RADIUS Application (Title V Significant Modification to BOP140001)

- Appendix A – Detailed Emissions Calculations
- Appendix B – Subchapter 18 eNAT Tool
- Appendix C – Criteria Pollutant Modeling Protocol
- Appendix D – Air Toxic Modeling Protocol

1.5. PROJECT SCHEDULES

1.5.1. Lambertville East Expansion Project

Texas Eastern is expecting to begin removal of the two existing DC 990 turbines in the second quarter of 2019 in order to meet the NO_X RACT rule compliance date of November 6, 2019.[2] The planned in-service date for the new turbines and associated emission units is Fall of 2019.

1.5.2. PennEast Interconnect Project

Construction on the PennEast Interconnect Project is also scheduled to begin in Spring 2019, which is why both of these separate and independent projects are included in a single major modification application to NJDEP. The anticipated in-service date for the PennEast Interconnect Project is Fall 2019.

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[2] The Lambertville Compressor Station is submitting a Title V significant modification application concurrently with this application which requests an Alternative Emission Limit (AEL) in accordance with N.J.A.C. 7:27-19.3(f)(2) and N.J.A.C. 7:27-19.13. Texas Eastern will comply with the AEL until the DC 990s are taken out of service, no later than May 6, 2021, should the permitting be delayed for any reason.

2.1. BACKGROUND

The original Title V Operating Permit, Number BOP990001, was issued to Texas Eastern for the Lambertville Compressor Station on July 7, 2005. In preparing the application for that permit, Texas Eastern developed reasonable estimates of potential VOC and HAP emissions from fugitive sources and various insignificant sources based on the best available data at that time. Table 2-1 below provides these estimates as they are currently listed in the Title V permit for the facility.

Table 2-1. Fugitive Piping Component and Gas Release Emissions Estimates in Current Permit

BOP140001 NJID	Description of Emissions Activity	2005 Estimate of Emissions	
		VOC (TPY)	HAP (TPY)
FG1	Piping Components	4.189	1.009
IS2	V1-307: Valve Leakage (≤0.1 lb/hr potential Group 1 or 2 TXS emissions)	0.015	0.0010
IS3	V1-307: Compressor and Station Yard Blowdowns and Purges (maintenance/repair activities)	0.906	0.0618
IS4	V1-322: Valve Leakage (≤0.1 lb/hr potential Group 1 or 2 TXS emissions)	0.008	0.0005
IS5	V1-322: Compressor and Station Yard Blowdowns and Purges (maintenance/repair activities)	0.285	0.0194
IS6	V1-322E: Valve Leakage (≤0.1 lb/hr potential Group 1 or 2 TXS emissions)	0.004	0.0003
IS7	V1-322E: Compressor and Station Yard Blowdowns and Purges (maintenance/repair activities)	0.465	0.0317
IS8	V2-307: Pigging, Draining, and Valve Actuation (maintenance/repair activities)	1.088	0.0741
IS9	V2-322: Dry Seal Leakage (≤0.1 lb/hr potential Group 1 or 2 TXS emissions)	0.024	0.0016
IS10	V2-322: Pigging, Draining, and Valve Actuation (maintenance/repair activities)	1.299	0.0885
IS11	V3-322: Gas Starters replaced with Electric Starters (≤0.1 lb/hr potential Group 1 or 2 TXS emissions)	0.000	0.0000
IS12	V4S-307: Draining and Valve Actuation (maintenance/repair activities)	0.005	0.0003
IS13	V4D-307: Draining and Valve Actuation (maintenance/repair activities)	0.002	0.0002
IS14	V4S/D-322: Draining and Valve Actuation (maintenance/repair activities)	0.005	0.0004
IS15	V7-322: Pilot Gas Tanks Blowdowns and Purges (maintenance/repair activities)	0.038	0.0026
Total Emissions Estimate for IS2 through IS15		4.144	0.2825

Since the time that these estimates were made, Texas Eastern has gathered additional information regarding the potential emissions from piping components.

2.2. RECONCILIATION OF PIPING COMPONENT COUNTS

Enbridge (formerly Spectra Energy) owns Texas Eastern as well as several other natural gas transmission pipelines throughout the US. In order to estimate the number of piping components at the compressor stations across its pipeline systems, Enbridge has consulted design drawings and construction surveys to develop conservative estimates that are based on equipment type (e.g., reciprocating compressors, turbine-driven compressors). These estimates also include piping components that are buried underground.

The resulting component counts used by Enbridge to permit fugitives at its compressor stations are higher than the estimates submitted with the original Title V permit application for non-source fugitives at the Lambertville Compressor Station (which did not include buried components). The reconciled PTE for existing piping components at the Lambertville Compressor Station is 8.41 tpy VOC and 0.81 tpy HAPs. As previously noted, this estimate of PTE due to fugitive piping components at the Lambertville Station will not change as a result of the proposed Lambertville East Expansion project. That is, since the basic footprint of the station will not be changing with the replacement of two turbines, the estimated total maximum number of piping components pre-project will remain the same as the estimated total maximum number of piping components post-project.

2.3. RECONCILIATION OF GAS RELEASE ESTIMATES

Similar to piping components, Enbridge has gathered recent data related to the VOC and HAP emissions from gas releases since the PTE estimates were provided in the Lambertville Compressor Station's original Title V permit application in 2005. To do this, Enbridge compiled available extended gas analyses on samples of tariff-conforming pipeline quality natural gas (421 samples total) taken across its pipeline systems over the past six years. Based on statistical analyses of these data, Enbridge has developed a speciation profile of natural gas being transported through its pipelines. Hence, Enbridge is seeking to update the estimates of emissions from sitewide gas releases to reflect the current understanding. Gas releases are currently reflected as insignificant sources IS2 through IS15 of the current Title V permit for the Lambertville Compressor Station. The reconciled PTE for existing gas releases is 8.40 tpy VOC and 0.21 tpy HAPs in the natural gas potentially released and an additional 1.98 tpy VOC and 0.12 tpy HAPs due to potential flashing emissions associated with blowdown separators collecting pipeline liquids. This estimate of gas release emissions at the Lambertville Station will increase by an additional 3.62 tpy VOC as a result of the replacement of the DC 990 turbines with Solar Taurus 70 turbines under the Lambertville East Expansion project. This increase is accounted for in the Subchapter 18 netting.

Appendix A, Table 1 provides an overview of the requested reconciliation outlined in Sections 2.2 and 2.3 above.

3.1. SITE/PROCESS DESCRIPTION

Texas Eastern Transmission, L.P. (Texas Eastern) operates a natural gas compressor station in Lambertville, Hunterdon County, New Jersey (Lambertville Compressor Station). The Lambertville Compressor Station currently operates under Title V Operating Permit Number BOP140001, issued on December 1, 2014.

Existing, permitted emission units at the Lambertville Compressor Station include the following:

- Emission Unit U1: Two (2) Dresser Clark DC 990 5,800 horsepower (HP) natural gas-fired turbines;
- Emission Unit U3: One (1) Caterpillar G-398 natural gas-fired emergency generator;
- Emission Unit U5: One (1) Waukesha natural gas-fired emergency generator;
- Emission Unit U6: Two (2) 2,940 gallon aboveground pipeline liquids storage tanks;
- Emission Unit U7: Two-(2) Cooper Bessemer GMVR-10 2,310 HP natural gas-fired reciprocating compressor engines;
- Insignificant Sources including natural gas fired heaters (< 1 MMBtu/hr), gas releases associated with maintenance repair activities, compressor unit seal and valve leakage, truck loading and pipeline liquids storage; and
- Non-source Fugitive Emissions (piping components).

Note that throughout this application report, all turbine horsepower ratings are provided at International Organization of Standardization (ISO) conditions, all engine horsepower ratings are manufacturers' rated output per National Electric Manufacturers Association (NEMA) standards, and all heat inputs are provided at the higher heating value (HHV).

3.2. LAMBERTVILLE EAST EXPANSION PROJECT DESCRIPTION

Under the Lambertville East Expansion Project, Texas Eastern is proposing to install the following emission sources at the Lambertville Compressor Station:

- Two new 10,915 HP (ISO) Solar Taurus 70 natural gas-fired turbines, which will replace the two existing 5,800 HP (ISO)[3] Dresser Clark DC 990 natural gas-fired compressor turbines (Emission Unit U1);
- One new 880 bhp Waukesha VGF36GL natural gas-fired emergency generator which will replace the existing Caterpillar G-398 emergency generator (Emission Unit U3);
- Two new natural gas-fired fuel gas heaters associated with the new turbine compressors (rated at < 1 MMBtu/hr heat input);
- Four new natural gas-fired warehouse space heaters (all rated at < 1 MMBtu/hr heat input);
- Two new 44-gallon storage tanks, which will replace existing tanks; and
- New gas release vents associated with the new turbines.

Existing piping components (non-source fugitives) associated with the two DC 990 turbines will be replaced with similar piping components for the two new turbines. The PTE estimates for piping components will remain unchanged as a result of the Lambertville East Expansion Project.

[3] International Organization for Standardization (ISO).

The following subsections further describe the proposed equipment and its operation proposed under the Lambertville East Expansion Project.

3.2.1. Turbines

The proposed turbines will be two identical 10,915 (ISO) Solar Taurus 70 natural-gas fired turbines. Each turbine drives a centrifugal compressor, which recompresses the natural gas. Increasing the pressure of the natural gas creates the energy needed to move the gas through the transmission pipeline. The turbines will use natural gas from the pipeline as fuel.

The new turbines will have a simple cycle design and will utilize an oxidation catalyst to control CO, VOC, and organic HAP emissions and dry low NO_X (DLN) combustion technology, or SoLoNO$_X$™, to reduce NO_X emissions. Emissions of SO_2 and PM/PM_{10}/$PM_{2.5}$ will be minimized through the use of pipeline quality natural gas and efficient combustion controls.[4]

3.2.1.1. SoLoNO$_X$™ Dry Low Emissions Technology

The turbines selected for the Lambertville Compressor Station will be built with the SoLoNO$_X$™ dry low emissions (DLE) technology. Solar®'s proprietary SoLoNO$_X$™ dry emissions system will reduce pollution by limiting the formation of NO_X, CO, and unburned hydrocarbons (UHC) to meet emission regulations. This system will use lean premix combustion to lower the maximum flame temperature and reduce pollution formation in the turbine exhaust gas.

3.2.1.2. Oxidation Catalyst

Exhaust gases from the turbine will be passed over a catalyst bed where excess air oxidizes the CO to carbon dioxide (CO_2). The oxidation catalyst will also reduce VOC and organic HAP emissions.

3.2.2. Emergency Generator Engine

Texas Eastern is proposing to install one new 880 bhp Waukesha VGF36GL four stroke lean burn natural gas-fired emergency generator (or equivalent) at the Lambertville Compressor Station. The operation of the emergency engine for maintenance checks and readiness testing will be limited to no more than 100 hr/yr.

3.2.3. Natural Gas Heaters

As part of the Lambertville East Expansion Project, four (4) new 0.060 MMBtu/hr (heat input) Reznor UDAP060 space heaters used to heat the warehouse building, and two (2) new 0.388 MMBtu/hr (heat input) Cameron Flameco SB12-8 fuel gas heaters will be installed at the Lambertville Compressor Station. The space heaters will be used to provide comfort heating within the warehouse building. Fuel gas heaters are installed to avoid the formation of hydrates, liquid hydrocarbons, and water as a result of pressure reduction when natural gas moves from the high pressure pipeline to the lower pressure fuel gas lines at the station. The gas heaters are designed to raise the temperature of the gas so that after pressure reduction, the temperature of the gas will be above the dew point temperature at operating conditions and maximum flow.

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[4] As defined in 40 CFR Subpart JJJJ, which is consistent with the definition of natural gas as defined in 40 CFR Subpart KKKK.

3.2.4. Tanks

Texas Eastern is proposing to replace two pipeline liquids storage tanks with two new 44-gallon storage tanks (SVV-V1-C4 and SVV-V1-C4). The new tanks will store pipeline liquids which condense out of the natural gas due to the drop in pressure when it arrives at the station.

3.2.5. Fugitive Components

Non-source fugitive emissions at the Lambertville Compressor Station currently include potential leaks from piping components. As previously stated, the existing piping components associated with the two DC 990 turbines will be replaced with similar piping components for the two new turbines. Since the basic footprint of the station will not be changing with the replacement of two turbines, the estimated total maximum number of piping components pre-project will remain the same as the estimated total maximum number of piping components post-project.

3.2.6. Gas Releases

Gas releases refer to the blowdown or purging of natural gas from process equipment and pipelines for maintenance and repair, valve leakage, etc. as described in the existing Title V permit under insignificant source IDs IS2 through IS15. Gas releases at the Lambertville Compressor Station include steady-state venting (e.g., dry gas seals) and intermittent venting of gas related to planned maintenance, startups and shutdown activities. Similar to piping components, estimated gas release volumes associated with the existing DC990 turbines will be the same estimate for the two new Taurus 70 turbines. Therefore, the estimated potential gas releases pre-project will remain the same as the estimate potential gas releases post-project.

3.3. PENNEAST INTERCONNECT PROJECT DESCRIPTION

Under this project, Texas Eastern is installing the piping, metering and regulating equipment needed to connect both the Algonquin and Texas Eastern pipeline systems (both owned by Enbridge) to the proposed PennEast Pipeline at the Lambertville Compressor Station. PennEast owns the property adjacent to the Lambertville Compressor Station. The agreement between Texas Eastern and PennEast is that Texas Eastern will design and construct this equipment, however ownership and operations will be divided as follows between the two companies:

- Equipment to be owned and operated by PennEast includes connecting piping, pig receiver, filter separator (i.e., piping components and potential gas releases), one (1) pipeline liquids tank, and truck loading operations associated with the transfer of pipeline liquids.
- Equipment to be owned and operated by Enbridge/Texas Eastern includes overpressure protection and tee taps (i.e., piping components);
- Equipment to be owned by PennEast but operated by Enbridge/Texas Eastern includes two (2) meter runs, pressure regulation, flow control and interconnecting piping (i.e., piping components), two (2) coolant tanks and coolant truck loading area, one (1) Caterpillar G3412C emergency generator, as well as eight (8) 10 MMBtu/hr step down heaters.

The following subsections further describe the proposed equipment and its operation proposed under the Lambertville East Expansion Project.

3.3.1. Emergency Generator Engine

The PennEast Interconnect project will require the installation of one new 755 bhp Caterpillar G3412C (or equivalent) natural gas fired emergency generator at the PennEast Station. The operation of the emergency engine for maintenance checks and readiness testing will be limited to no more than 100 hr/yr.

3.3.2. Natural Gas Heaters

As part of the PennEast Interconnect Project eight (8) new 10 MMBtu/hr (heat input) Cleaver Brooks natural gas-fired step down heaters will be installed at the PennEast Station. Step down heaters will be installed to avoid the formation of hydrates, liquid hydrocarbons, and water as a result of pressure reduction when natural gas moves from the high pressure pipeline to the lower pressure station interconnect piping. The gas heaters are designed to raise the temperature of the gas so that after pressure reduction, the temperature of the gas will be above the dew point temperature at operating conditions and maximum flow.

3.3.3. Tanks

The PennEast Interconnect project includes the installation of a new 1,000 gallon pipeline liquids storage tank (TK-V5-PE) at the PennEast Station. Although natural gas in pipelines is considered a dry gas, it is not uncommon for a certain amount of water and hydrocarbons to condense out of the gas stream while in transit. The new storage tank will store pipeline liquids which condense out of the pipeline.

Two new 560 gallon coolant storage tanks (TK-V11-PE1 and TK-V11-PE2) will also be installed at the PennEast Station. The ethylene glycol coolant is used for the processes at the facility.

3.3.4. Truck Loading

The collection of pipeline liquids and the storage of coolants will require a pipeline liquids truck loading area (TL-PL-PE) and a coolant truck loading area (TL-EC-PE) at the PennEast Station. At the loading areas, liquids and coolant will be loaded into tanker trucks.

3.3.5. Fugitive Components

The PennEast Interconnect project will involve the installation of new piping connections, flanges, and valves associated with the proposed meter runs, connecting piping, over pressure protection, tee taps and pressure regulation equipment at the PennEast Station. Component counts are estimated based on the design drawings of the proposed facility.

3.3.6. Gas Releases

The PennEast Interconnect project will result in potential intermittent gas releases associated with the proposed pig receiver, filter separators, and associated piping.

Appendix A, Table 2 provides a summary of the proposed change in PTE at the Lambertville Compressor Station as a result of both the Lambertville East Expansion and the PennEast Interconnect projects combined.

This section provides details on emissions calculations for the two new natural gas turbines, new fuel gas heaters, the new emergency generators, tanks, truck loading, fugitive components, and gas releases to be installed as part of the projects. Appendix A provides the detailed emission calculations for the project.

4.1. TURBINE EMISSIONS

Potential emissions from the two new compressor turbine units at the Lambertville Compressor Station are estimated for operation during normal steady-state operating conditions, operation during low temperature events, and operation during startup and shutdown events as described in the following sections.

4.1.1. Turbine Normal Steady-State Operation Hourly Emissions

Table 4-1 provides a summary of the uncontrolled emission factors used for each pollutant during normal steady-state operation.

Table 4-1: New Turbines Pre-Control Emission Factors – Normal Operations

Pollutant	Emission Factor [1]	Source
NO_X	9 ppmvd at 15% O_2	Vendor guaranteed emission rate
CO	25 ppmvd at 15% O_2	Vendor guaranteed emission rate
VOC	25 ppmvd TOC at 15% O_2 0.0021 lb/MMBtu (HHV) VOC	TOC: vendor guaranteed emission rate VOC: Table 3.1-2a of AP-42 scaled based on vendor guarantee of TOC and ratio of TOC:VOC in AP-42.
CH_4	25 ppmvd TOC at 15% O_2 0.0086 lb/MMBtu (HHV) CH_4	TOC: vendor guaranteed emission rate CH_4: Table 3.1-2a of AP-42 scaled using vendor data and AP-42 emission rates for TOC.
$PM_{10}/PM_{2.5}$	0.0066 lb/MMBtu (HHV)	Table 3.1-2a of AP-42
SO_2	14.29 lb/MMscf (HHV)	Table 3.1-2a of AP-42 scaled to 5 gr/100 scf fuel sulfur content
CO_2	53.06 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-1
N_2O	0.0001 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-2
Total HAPs	25 ppmvd TOC at 15% O_2 Multiple HAP factors	TOC: vendor guaranteed emission rate HAPs: Table 3.1-3 of AP-42 scaled using vendor data and AP-42 emission rates for TOC.

[1] The emission factors provided in this table represent emissions at temperatures above 0 °F without the effect of the oxidation catalyst.

The Taurus 70 turbines are designed to minimize combustion emissions through the use of state-of-the-art SoLoNO$_X$™ dry low NO_X emissions technology. For this project, Solar has guaranteed NO_X emissions for the proposed turbines at 9 ppmvd at 15 percent O_2 during steady-state operation at 50-100 percent engine load for all ambient temperatures above 0 °F. The oxidation catalyst vendor has guaranteed a destruction and removal efficiency (DRE) of 95 percent for applicable pollutants, resulting in the emission rate provided in this section and Appendix A. The oxidation catalyst will be 100 percent platinum-coated.

In order to calculate hourly emissions during normal operation, the emission factors provided in the table above are converted to factors in pounds per million standard cubic feet (lb/MMscf) as described in subsequent sections.

4.1.1.1. Turbine Emission Factors – NO_X, CO, and TOC

Nitrogen oxides (NOx), carbon monoxide (CO), and total organic carbon (TOC) emissions from the combustion turbines during normal operation are calculated based on the vendor guaranteed emission rates provided in Table 4-1. Although TOC is not a criteria pollutant, it is used to derive the emission factors for VOC, methane (CH_4, which is a GHG), and HAP. Vendor data for several ambient temperatures and vendor literature were compiled to develop the data listed below:

- Fuel: lower and higher heating value (BTU/scf);
- Turbine Performance: net output power (hp), heat input at LHV (MMBTU/hr), heat rate at LHV (BTU/hp-hr);
- Exhaust Parameters: exhaust temperature (°F), water fraction (%), O_2 content (%, dry), molecular weight (lb/lb-mol), and flowrate (lb/hr and acfm); and
- Guaranteed Emission Rates for NO_X, CO and TOC (ppmvd at 15 percent O_2).

Operating and emissions data at other ambient temperatures are estimated by fitting the vendor provided data to a curve that best represents the data and interpolating/extrapolating to the desired temperatures. Since the effectiveness of the emissions control inherent in the turbine's combustor design (i.e. SoLoNO_X) is only guaranteed at temperatures above 0 °F, the concentration values (parts per million) provided in Table 4-1 do not apply to sub-zero operating conditions. Further, the mass emission rates of NO_X, CO, and TOC at a given load decrease with increasing ambient temperature conditions (i.e., fuel consumption at 100 percent load is highest at lower ambient temperatures). As such, short-term, maximum hourly emission rates are estimated based on operating and emissions data at 0.01 °F to provide the most conservative estimate. Annual emissions estimates are based on the annual average ambient conditions at the Lambertville Compressor Station. Therefore, for annual emissions estimates, the operating data (turbine performance and exhaust gas parameters) are interpolated to estimate emissions at the average annual ambient temperature at the facility.[5] The emission factor at a given ambient temperature is calculated as illustrated in Equation 4-1 through Equation 4-3:

Equation 4-1:

$$\boldsymbol{NO_x, CO, TOC\ EF\ (ppmvw) = ppmvd, 15\%\ O_2 \times nonwater\% \times \frac{20.9 - (\ vol\%\ O_2, dry\ \times 100)}{5.9}}$$

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[5] A weighted daily average ambient temperature is used in estimating emissions for the Lambertville Compressor Station and is based on meteorological information in USEPA's TANKS 4.09d database. To determine ambient temperatures, the three meteorological stations in closest proximity to the Lambertville Compressor Station were reviewed, and the station with the lowest ambient temperatures was conservatively selected. The annual average temperature at the Lambertville Compressor Station is 51.11 °F.

Equation 4-2:

$$NO_x, CO, TOC\ hourly\ emissions\ \left(\frac{lb}{hr}\right) @\ T = \frac{ppmvw}{1{,}000{,}000} \times \left[\frac{lb\ exhaust}{hr}\right]_T \times \frac{\frac{lb\ pollutant}{lbmol}}{\left[\frac{lb\ exhaust}{lbmol}\right]_T} = \left[\frac{lb\ pollutant}{hr}\right]_T$$

Equation 4-3: $$NO_x, CO, TOC\ Emission\ Factor\ @\ T = \left[\frac{lb}{hr}\right]_T \times \frac{1{,}000{,}000\frac{scf}{MMscf}}{\left[\frac{scf\ fuel}{hr}\right]_T} = \left[\frac{lb}{MMscf}\right]_T$$

Where: *T = ambient temperature*[6]

4.1.1.2. Turbine Emission Factors – VOC, CH_4, and HAPs

VOC, CH_4, and HAP emitted by the combustion turbines are calculated using the vendor-guaranteed TOC emission rate and AP-42 emission factors, as VOC, CH_4, and HAP are constituents of TOC. The TOC emissions factor in terms of lb/MMscf at a given ambient temperature are calculated as outlined above in Section 3.1.1.1.

Standard emission factors for VOC, CH_4, HAP, and TOC from stationary gas turbines are provided in Chapter 3.1 of the U.S. Environmental Protection Agency's (USEPA's) Compilation of Air Pollutant Emission Factors (AP-42). Table 3.1-2a of AP-42 (version dated April 2000) provides emission factors of 0.0021 lb VOC per MMBtu, 0.0086 lb CH_4 per MMBtu, and 0.011 lb TOC per MMBtu from natural gas-fired turbines. Table 3.1-3 of AP-42 (version dated April 2000) provides emission factors for HAPs emitted from natural gas-fired turbines. These HAPs include:

- 1,3-Butadiene
- Acetaldehyde
- Acrolein
- Benzene
- Ethylbenzene
- Formaldehyde
- Naphthalene
- Polycyclic aromatic hydrocarbons (PAH)
- Propylene oxide
- Toluene
- Xylenes

A total HAP emission factor is calculated as the sum of all individual HAP emission factors.

Ratios of VOC, CH_4, and HAP to TOC from the AP-42 factors are applied to the TOC factor derived from vendor information to obtain emission factors for VOC, CH_4, and HAP. For normal operation, the uncontrolled VOC, CH_4, and HAP factors are derived as in Equation 4-4.

[6] Maximum hourly emissions are estimated at T = 0.01 °F.

Equation 4-4: $$VOC, CH_4, HAP\ EF = \frac{lb\ TOC}{MMscf} \times \frac{\left(\frac{lb\ pollutant}{MMBtu} \times 1{,}020\ \frac{MMBtu}{MMscf}\right)}{\left(0.011 \frac{lb\ TOC}{MMBtu} \times 1{,}020\ \frac{MMBtu}{MMscf}\right)} = \frac{lb}{MMscf}$$

4.1.1.3. Turbine Emission Factors – PM_{10}, $PM_{2.5}$, and SO_2

As indicated in Equation 4-5, particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2) emitted by the combustion turbines during normal operation are calculated based on the emission factors listed in Table 3.1-2a of AP-42 (version dated April 2000) for stationary gas turbines. The AP-42 SO_2 emission factor is scaled using the gas tariff sulfur content of 5 grains per 100 scf. It is conservatively assumed that all particulate emitted from natural gas combustion is less than 2.5 microns in diameter, so the emission rates for PM_{10} and $PM_{2.5}$ are assumed equal to the total PM emission rate. The AP-42 emission factors are converted to lb/MMscf as follows:

Equation 4-5: $$PM_{10}, PM_{2.5}\ or\ SO_2\ EF = \frac{lb}{MMBtu} \times 1{,}020\ \frac{MMBtu}{MMscf} = \frac{lb}{MMscf}$$

It is conservatively assumed that PM = PM_{10} = $PM_{2.5}$.

4.1.1.4. Turbine Emission Factors – CO_2, N_2O, and CO_2e

Emission factors for carbon dioxide (CO_2) and nitrous oxides (N_2O) emitted by the combustion of natural gas are calculated based on the HHV and the emission factors provided for pipeline natural gas combustion in 40 CFR 98, Subpart C, Tables C-1 and C-2, as follows:

Equation 4-6: $$CO_2\ EF = 53.06 \frac{kg}{MMBtu} \times 2.2046 \frac{lb}{kg} \times 1{,}026 \frac{MMBtu}{MMscf} = 120{,}017 \frac{lb\ CO_2}{MMscf}$$

Equation 4-7: $$N_2O\ EF = 0.0001 \frac{kg}{MMBtu} \times 2.2046 \frac{lb}{kg} \times 1{,}026 \frac{MMBtu}{MMscf} = 0.23 \frac{lb\ N_2O}{MMscf}$$

Total GHG emissions in terms of CO_2 equivalent (CO_2e) are equal to the sum of all individual GHGs emitted by the turbines, accounting for the respective global warming potential (GWP) of each GHG. The GWPs used to calculate CO_2e emissions for each pollutant emitted by the project are contained in Table 4-2.

Table 4-2: Applicable Global Warming Potentials

Pollutant[1]	GWP[2]
CO_2	1
CH_4	25
N_2O	298

[1] Only those GHGs for which quantifiable emissions increases are expected due to this project are listed.

[2] GWPs are based on a 100-year time horizon, as identified in Table A-1 to 40 CFR Part 98, Subpart A as amended on November 29, 2013 to incorporate revised GWPs as published in the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Report (AR4).

As such, the CO_2e factor is derived as follows:

Equation 4-8: $$CO_2e\ EF = \left(\frac{lb\ CO_2}{MMscf} \times 1\ GWP\right) + \left(\frac{lb\ CH_4}{MMscf} \times 25\ GWP\right) + \left(\frac{lb\ N_2O}{MMscf} \times 298\ GWP\right) = \frac{lb\ CO_2}{MMscf}$$

4.1.2. Turbine Low Temperature Operation Hourly Emissions

At low ambient temperatures (i.e., temperatures below 0°F), pound per hour (lb/hr) emissions of NO_X, CO, and VOC increase. Low temperature hourly emissions were estimated using the vendor estimated emission rates at sub-zero temperatures (provided in Table 4-3), and following the calculation methodology outlined in the previous section for normal steady-state operation.

Table 4-3: New Turbines Pre-Control Emission Factors – Low Temperature Operation

Pollutant	Emission Factor (0 °F ≥ Temp ≥ - 20 °F)	Emission Factor (Temp ≤ - 20 °F)	Source
NO_X	42 ppmvd at 15% O_2	120 ppmvd at 15% O_2	Vendor provided emission rate
CO	100 ppmvd at 15% O_2	150 ppmvd at 15% O_2	Vendor provided emission rate
TOC	50 ppmvd at 15% O_2	75 ppmvd at 15% O_2	Vendor provided emission rate

The same emission rates that are used for normal operation for PM_{10}, $PM_{2.5}$, SO_2, CO_2, and N_2O are used for low temperature operation. However, it should be noted that the maximum hourly fuel consumption increases during low temperature operation, so hourly emissions during low temperature operation are higher than hourly emissions during normal operation, even for those pollutants for which the emissions on a lb/MMscf basis are not impacted by low temperature operation.

4.1.3. Turbine Startup and Shutdown Operation Hourly Emissions

Emissions during startups and shutdowns are calculated based on vendor specified operation profiles which are used to determine the maximum pound of pollutant per startup or shutdown event as described in further detail in the following sections.

4.1.3.1. Turbine Startup Operation

The startup process for the turbine is estimated to take approximately nine minutes from the initiation of startup to normal operation (startup sequence ends at approximately 50 percent load for most Solar turbines). This includes three minutes of ignition-idle operation and six minutes of loading/thermal stabilization operation.

The turbine vendor specifies estimated emission rates for NO_X, CO and unburned hydrocarbons (UHC) during the ignition-idle and loading/thermal stabilization phases of each startup event. The speciation data for natural gas turbine exhaust provided in AP-42, Chapter 3.1 is used to estimate the emissions of VOC and various HAP components based on their ratio to TOC and the vendor supplied UHC emission factor. The vendor data is provided in Table B-1Cd of Appendix A.

It is assumed that the oxidation catalyst will not yet have a measurable DRE during startup, as it is designed to meet control specifications only during normal operation. Emission rate from the other criteria pollutants are assumed to be the same during startup as they are during normal operation. However, total emissions will vary based on the amount of fuel consumed, similar to low temperature operation.

All pollutants emitted by the combustion turbines during startup events are calculated based on the same methodology that is used to calculate emissions during normal operation. However, rather than calculate lb/MMscf emission factors, pounds per startup event (lb/event) are calculated for each pollutant based on the fuel consumed during the three-minute ignition-idle phase and during the six-minute loading/thermal stabilization phase as follows:

Equation 4-9:

$$EF_x \text{ during SU event} = \frac{lb\ Pollutant\ x}{MMBtu} \times 1{,}020\ \frac{MMBtu}{MMscf} \times \frac{scf\ fuel}{event} \times \frac{MMscf}{1{,}000{,}000\ scf} = \frac{lb\ Pollutant\ x}{event}$$

4.1.3.2. Turbine Shutdown Operation

The shutdown process for the turbines is estimated to take approximately 8.5 minutes from normal operation to shutdown. The shutdown event consists of loading/thermal stabilization operation.

As indicated above, the turbine vendor specifies estimated emission rates for NO_X, CO and UHC during the loading/thermal stabilization phase of shutdown events. The speciation data for natural gas turbine exhaust provided in AP-42, Chapter 3.1 is used to estimate the emissions of VOC and various HAP components based on their ratio to TOC and the vendor supplied UHC emission factor. The vendor data is provided in Table B-1Cd of Appendix A.

The calculation for emissions during shutdowns is identical to that for startups as shown in Equation 4-9 above, except that the oxidation catalyst DRE is accounted for in calculating potential emissions.

4.1.4. Turbine Annual Potential Emissions

The emission factors described in the previous sections are multiplied by the following activity data to estimate annual potential emissions:

- **Normal, Steady State Operation:** Annual fuel consumption as estimated from vendor provided turbine parameters at the annual average ambient temperature for the Lambertville Compressor Station. Annual potential to emit (PTE) estimates assume 100 percent utilization (8,760 hours per year). CO, VOC, and HAP PTE estimates take the control efficiency of the proposed oxidation catalyst into account. Further, since an oxidation catalyst provides more complete conversion of CO to CO_2 (also a regulated pollutant), the controlled portion of the CO emissions is added back to the CO_2 emissions rate.
- **Low Temperature Operation:** Fuel consumption during low temperature operation as estimated by extrapolating vendor-provided turbine parameters to an ambient temperature of -20 ^oF. It is conservatively assumed that low temperature operation between -20 ^oF and 0 ^oF will account for a total of 2 hours per year. Due to the fact that the meteorological data indicates that there are expected to be no hours at -20 ^oF or below, it is conservatively assumed that low temperature operation less than or equal to -20 ^oF will account for a total of 0 hours per year.[7]
- **Startup/Shutdown Operations:** The number of startup and shutdown events is conservatively estimated at 260 startup events and 260 shutdown events per year for each turbine. No credit for control by the oxidation catalyst is accounted for in the estimation of startup emissions. However, it is assumed that the oxidation catalyst will be operational during shutdown.

For some pollutants, emission rates from the combustion turbines are higher during normal steady-state operation than they are during low temperature operation or startup and shutdown. However, for other

[7] The 2 hours per year of low temperature operation is conservatively determined based on data extracted from USDOE-NREL's National Solar Radiation Database 1991-2010. The number of low temperature hours is determined based on data from the three stations in closest proximity to the Lambertville Compressor Station. Low temperature hours as well as distance to the station are considered in determining the number of low temperature hours at the station for emission calculation purposes.

pollutants, emission rates may be higher during low temperature operation or startup and shutdown than during normal operation. As such, maximum annual emissions for the turbine are the maximum of potential combinations of normal, startup, shutdown, and low temperature operation as summarized in Equations 4-10 through 4-14 below.

Equation 4-10:

$$Normal\left(\frac{ton}{yr}\right) = Average\,\frac{lb}{hr} \times \frac{8{,}760\ hr}{yr} \times \frac{ton}{2{,}000\ lb}$$

Equation 4-11:

$$Normal\ with\ Startup\ (SU)\ and\ Shutdown(SD)\left(\frac{ton}{yr}\right) = startup\,\frac{ton}{yr} + shutdown\,\frac{ton}{yr} + \left(normal\,\frac{ton}{yr} \times (1 - \frac{startup\ hrs + shutdown\ hrs}{8760})\right)$$

Equation 4-12:

$$Normal\ with\ Low\ Temp\ (LT)\left(\frac{ton}{yr}\right) = low\ temp\,\frac{ton}{yr} + \left(normal\,\frac{ton}{yr} \times (1 - \frac{low\ temp\ hrs}{8760})\right)$$

Equation 4-13:

$$Normal\ with\ SU, SD, and\ LT\left(\frac{ton}{yr}\right) = startup\,\frac{ton}{yr} + shutdown\,\frac{ton}{yr} + low\ temp\,\frac{ton}{yr} + \left(normal\,\frac{ton}{yr} \times (1 - \frac{startup\ hrs + shutdown\ hrs + low\ temp\ hrs}{8760})\right)$$

Equation 4-14:

$$Annual\ PTE\left(\frac{ton}{yr}\right)_{Pollutant\ i} = MAX\begin{bmatrix} Normal\left(\frac{ton}{yr}\right), Normal\ with\ SU, SD\left(\frac{ton}{yr}\right), \\ Normal\ with\ LT\left(\frac{ton}{yr}\right), Normal\ with\ SU, SD, LT\left(\frac{ton}{yr}\right) \end{bmatrix}_i$$

4.1.5. Short-Term Emission Limits

Texas Eastern is also requesting short term emission limits for the two new Solar Taurus 70 natural gas-fired turbines for the following alternate operating scenarios: (1) startup and shutdown; and (2) low temperature conditions between 0 °F and -20 °F. As such, the short term emission rates for each alternate operating scenario are provided in the NJDEP RADIUS electronic application.

4.2. NATURAL GAS HEATER EMISSIONS

As part of the Lambertville East Expansion Project, four (4) new 0.060 MMBtu/hr (heat input) Reznor UDAP060 space heaters used to heat the warehouse building, and two (2) new 0.388 MMBtu/hr (heat input) Cameron Flameco SB12-8 fuel gas heaters will be installed at the Lambertville Compressor Station. As part of the PennEast Interconnect Project eight (8) new 10 MMBtu/hr (heat input) Cleaver Brooks natural gas-fired step down heaters will be installed at the PennEast Station, which is adjacent to the Lambertville Compressor Station. Tables 4-4 through 4-6 provide information on the emission factors used to calculate emissions from the various heaters.

Table 4-4: Lambertville Space Heater Emission Factors

Pollutant	Emission Factor from Source	Source
NO_X	94.00 lb/MMscf	Table 1.4-1 of AP 42: Residential Furnace (<0.3 MMBtu/hr) - Uncontrolled
CO	40.00 lb/MMscf	Table 1.4-1 of AP 42: Residential Furnace (<0.3 MMBtu/hr) - Uncontrolled
TOC	13.58 lb/MMscf	Table 1.4-3 of AP-42
VOC	8.18 lb/MMscf VOC	Table 1.4-3 of AP-42
CH_4	2.30 lb/MMscf CH_4	Table 1.4-2 of AP-42
$PM_{10}/PM_{2.5}$	7.60 lb/MMscf	Table 1.4-2 of AP-42
SO_2	14.29 lb/MMscf	Table 1.4-2 of AP-42 scaled to 5 gr/100 scf fuel sulfur content
CO_2	53.06 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-1
N_2O	0.0001 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-2
Total HAPs	Multiple HAP factors	Table 1.4-3 of AP-42

Table 4-5: Lambertville Fuel Gas Heater Emission Factors

Pollutant	Lambertville Fuel Gas Heaters	Source
NO_X	98.43 lb/MMscf	Vendor specified emission rate
CO	150 lb/MMscf	Vendor specified emission rate
TOC	60.00 lb/MMscf	Vendor specified emission rate
VOC	60.00 lb/MMscf TOC 36.15 lb/MMscf VOC	TOC: vendor specified emission rate VOC: Table 1.4-3 of AP-42 scaled based on vendor guarantee of TOC and ratio of TOC:VOC in AP-42.
CH_4	60.00 lb/MMscf TOC 10.16 lb/MMscf CH_4	TOC: vendor specified emission rate CH_4: Table 1.4-2 of AP-42 scaled using vendor data and AP-42 emission rates for TOC.
$PM_{10}/PM_{2.5}$	7.60 lb/MMscf	Table 1.4-2 of AP-42
SO_2	14.29 lb/MMscf	Table 1.4-2 of AP-42 scaled to 5 gr/100 scf fuel sulfur content
CO_2	53.06 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-1
N_2O	0.0001 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-2
Total HAPs	60.00 lb/MMscf TOC Multiple HAP factors	TOC: vendor specified emission rate HAPs: Table 1.4-3 of AP-42 scaled using vendor data and AP-42 emission rates for TOC.

Table 4-6: PennEast Step Down Heater Emission Factors

Pollutant	PennEast Step Down Heaters	Source
NO_X	11.07 lb/MMscf	Vendor specified emission rate
CO	37.50 lb/MMscf	Vendor specified emission rate
TOC	4.68 lb/MMscf VOC 7.77 lb/MMscf TOC	VOC: Vendor specified emission rate TOC: sum of all TOCs from Table 1.4-3 of AP-42 scaled using vendor data and AP-42 emission rates for TOC components.
VOC	4.68 lb/MMscf VOC	Vendor specified emission rate
CH_4	4.68 lb/MMscf VOC 1.32 lb/MMscf CH_4	VOC: vendor specified emission rate CH_4: Table 1.4-2 of AP-42 scaled using vendor data and AP-42 emission rates for VOC.
$PM_{10}/PM_{2.5}$	7.60 lb/MMscf	Table 1.4-2 of AP-42
SO_2	14.29 lb/MMscf	Table 1.4-2 of AP-42 scaled to 5 gr/100 scf fuel sulfur content
CO_2	53.06 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-1
N_2O	0.0001 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-2
Total HAPs	4.68 lb/MMscf VOC Multiple HAP factors	VOC: vendor specified emission rate HAPs: Table 1.4-3 of AP-42 scaled using vendor data and AP-42 emission rates for VOC.

In order to calculate hourly emissions, the emission factors provided in Tables 4-4 through 4-6 are converted to factors in lb/MMscf. These converted factors are multiplied by the respective heater's hourly fuel consumption in scf/hr to obtain hourly emissions. Fuel consumption is calculated from the heat output of the heater assuming a thermal efficiency of 83 percent, 64 percent, and 85 percent for the Lambertville space heaters, Lambertville fuel gas heaters, and PennEast step down heaters, respectively as well as a natural gas heating value of 1,020 Btu/scf. Annual potential emissions are calculated based on average hourly fuel consumption. Maximum hourly potential emissions are calculated based on maximum hourly fuel consumption, assuming an overload capability of 105 percent. The following sections summarize the general methods used to obtain lb/MMscf emission factors for each pollutant emitted from the new heaters. Specific calculation methodologies will depend on the source of the information as outlined in the above tables.

4.2.1. Heater Emission Factors – NO_X, CO, and TOC

NO_X, CO, and TOC emitted by the heater are calculated based on vendor specified emission or AP-42 Chapter 1.4 emission rates as shown in Tables 4-4 through 4-6 above.

4.2.2. Heater Emission Factors – VOC, CH_4, and HAPs

For the Lambertville space heaters and the Lambertville fuel gas heaters, VOC, CH_4, and HAP emissions are calculated using the vendor specified TOC emission rate and AP-42 emission factors. For the PennEast step down heaters, TOC, CH_4, and HAP emissions are calculated using the vendor specified VOC emission rate and AP-42 emission factors. Standard emission factors for TOC, VOC, CH_4, and HAP from natural gas-fired heaters are provided in Chapter 1.4 of AP-42. Table 1.4-2 (version dated July 1998) provides a CH_4 emission factor for natural gas-fired external combustion sources. The TOC and VOC factors used in the calculations differ slightly from the factors provided in Table 1.4-2. TOC and VOC factors are calculated as the sum of the factors for all speciated organic compounds listed in Table 1.4-3 which are TOCs and VOCs, respectively. Table 1.4-3 of AP-42 (version dated July 1998) provides emission factors for the HAPs emitted from natural gas-fired external combustion units.

VOC, CH_4, and HAP emissions from the heaters are calculated using the same ratio method used to calculate VOC, CH_4, and HAP emitted from the turbines (detailed in Section 4.1.1.2) based on the vendor-specified TOC emission rate, where applicable.

4.2.3. Heater Emission Factors - PM_{10}, $PM_{2.5}$, and SO_2

PM_{10} and $PM_{2.5}$ emitted by the heaters are calculated based on the emission factors listed in Table 1.4-2 of AP-42 (version dated July 1998) for natural gas-fired external combustion sources. The total PM emission factor of 7.6 lb/MMscf, which includes filterable and condensable particulate, is used. It is assumed that all particulate emitted from natural gas combustion is less than 2.5 microns in diameters, so that PM equals PM_{10} and $PM_{2.5}$. The SO_2 emission factor of 0.6 lb/MMscf from Table 1.4-2 of AP-42 is scaled from a fuel sulfur content of 2,000 grains per MMscf to a fuel sulfur content of 5 grains per 100 scf.

4.2.4. Heater Emission Factors - CO_2, N_2O, and CO_2e

CO_2 and N_2O emitted by the heaters are calculated based on the emission factors listed in 40 CFR 98, Subpart C, Tables C-1 and C-2. Equation 4-6 and Equation 4-7 show how factors in lb/MMscf are derived for these pollutants. GHGs emitted from the heaters include CO_2, CH_4, and N_2O. CO_2e emissions are calculated using the GWPs provided in Table 4-2.

4.3. EMERGENCY GENERATOR ENGINE EMISSIONS

The project is proposing to install one new Waukesha four stroke lean burn natural gas-fired emergency generator (or equivalent) at the Lambertville Compressor Station and one new 755 bhp Caterpillar G3412C (or equivalent) natural gas fired emergency generator at the PennEast Station, which is located adjacent to the Lambertville Compressor Station. The operation of the emergency engines for maintenance checks and readiness testing will be limited to no more than 100 hr/yr per the requirements in 40 CFR 60.4243(d)(2). The following table provides information on the emission factors used to calculate emissions from each emergency generator.

Table 4-7. Emergency Generator Emission Factors

Pollutant	Lambertville Waukesha Emergency Generator	PennEast Caterpillar Emergency Generator	Source
NO_X	2.0 g/bhp-hr	2.0 g/bhp-hr	NSPS Subpart JJJJ
CO	4.0 g/bhp-hr	4.0 g/bhp-hr	NSPS Subpart JJJJ
VOC	1.0 g/bhp-hr	1.0 g/bhp-hr	VOC (without formaldehyde): NSPS Subpart JJJJ Table 3.2-2 of AP-42
CH_4	1.0 g VOC/bhp-hr 5.23 lb/MMBtu (HHV)	1.0 g VOC/bhp-hr 5.10 lb/MMBtu (HHV)	VOC: NSPS Subpart JJJJ Table 3.2-2 of AP-42 ratioed based on calculated VOC emission rate
$PM_{10}/PM_{2.5}$	0.00999 lb/MMBtu (HHV)	0.00999 lb/MMBtu (HHV)	Table 3.2-2 of AP-42
SO_2	0.0140 lb/MMBtu (HHV)	0.0140 lb/MMBtu (HHV)	Table 3.2-2 of AP-42 42 scaled using 5 gr/100 scf fuel sulfur content
CO_2	53.02 kg/MMBtu (HHV)	53.02 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-1
N_2O	0.0001 kg/MMBtu (HHV)	0.0001 kg/MMBtu (HHV)	40 CFR 98, Subpart C, Table C-2
Total HAPs	1.0 g VOC/bhp-hr Multiple HAP factors	1.0 g VOC/bhp-hr Multiple HAP factors	VOC: NSPS Subpart JJJJ Table 3.2-2 of AP-42 ratioed based on calculated VOC emission rate

In order to calculate hourly emissions, the emission factors provided in the table above are converted to factors in lb/MMscf. These converted factors are multiplied by the respective generator's hourly fuel consumption in scf/hr to obtain hourly emissions. Fuel consumption is calculated based on vendor provided data. The following sections summarize the methods used to obtain lb/MMscf emission factors for each pollutant emitted from the new emergency generator.

Annual potential emissions are calculated based on average hourly fuel consumption and maximum hours of operation per year. Maximum hourly potential emissions are calculated based on maximum hourly fuel consumption, assuming an overload capability of 105 percent.

4.3.1. Emergency Generator Emission Factors – NO_X, CO, and VOC

NO_X, CO, and VOC emitted by the emergency generators are calculated based on the emission limits established under NSPS Subpart JJJJ in grams per brake horsepower-hour (g/bhp-hr) for emergency engines greater than 130 hp installed on and after January 1, 2009.[8]

The VOC emission limit of 1.0 g/bhp-hr in NSPS Subpart JJJJ excludes formaldehyde.[9] A VOC factor inclusive of formaldehyde is calculated using the relative emissions of formaldehyde and VOC provided in Table 3.2-2 of AP-42 (version dated July 2000). A VOC factor is calculated as the sum of the factors for all trace organic compounds listed in Table 3.2-2 which are VOCs. Formaldehyde emissions are proportional to VOC emissions, because formaldehyde is a constituent of VOC. The VOC factor is adjusted to account for formaldehyde as follows:

Equation 4-15:

[8] Per Table 1 to Subpart JJJJ of Part 60.
[9] Per footnote "d" of Table 1 to Subpart JJJJ of Part 60.

$$VOC\ EF = \frac{1.0\ g\ VOC\ (without\ formaldehyde)}{bhp - hr} \times \frac{\left(\frac{0.118\ lb\ VOC}{MMBtu}\right)}{\left(\frac{0.118\ lb\ VOC}{MMBtu} - \frac{0.0528\ lb\ formaldehyde}{MMBtu}\right)} = 1.79\frac{g}{bhp - hr}$$

Vendor-specified power output and fuel consumption for the engine are used to convert the g/bhp-hr factors.

NO_X, CO, and VOC factors are derived as follows:

Equation 4-16:

$$NO_x, CO, VOC\ EF = \frac{g}{bhp - hr} \times \frac{lb}{453.6\ g} \times hp \times \frac{hr}{scf\ fuel} \times \frac{1{,}000{,}000\ scf}{MMscf} = \frac{lb}{MMscf}$$

4.3.2. Emergency Generator Emission Factors - CH_4 and HAP

CH_4 and HAP emissions are calculated using the VOC emission rate and AP-42 emission factors. Standard emission factors for VOC, CH_4, and HAP from natural gas fired engines are provided in Chapter 3.2 of AP-42. Table 3.2-2 (version dated July 2000) provides emission factors for VOC, CH_4, and HAPs from four stroke lean burn natural gas-fired engines.

Using the same ratio method used to calculate CH_4 and HAP emitted from turbines (detailed in Section 4.1.1.2), CH_4 and HAP emitted from engines are ratioed based on the VOC emission rate from NSPS Subpart JJJJ.

4.3.3. Emergency Generator Emission Factors - PM_{10}, $PM_{2.5}$, and SO_2

PM_{10} and $PM_{2.5}$ emitted by the emergency generators are calculated based on the emission factors listed in Table 3.2-2 of AP-42 (version dated July 2000) for natural gas fired engines. PM_{10} and $PM_{2.5}$ emission factors are calculated as the sum of the filterable and condensable PM emission factors. The SO_2 emission factor of 5.88 E-4 lb/MMBtu from Table 3.2-2 of AP-42 is scaled from a fuel sulfur content of 2,000 grains per MMscf to a fuel sulfur content of 5 grains per 100 scf.

4.3.4. Emergency Generator Emission Factors - CO_2, N_2O, and CO_2e

CO_2 and N_2O emitted by the emergency generator are calculated based on the emission factors listed in 40 CFR 98, Subpart C, Tables C-1 and C-2. Equation 4-6 and Equation 4-8 show how factors in lb/MMscf are derived for these pollutants. GHGs emitted from the engine include CO_2, CH_4, and N_2O. CO_2e emissions are calculated using the GWPs provided in Table 4-2.

4.4. TANKS

Two 44-gallon pipeline liquids storage tanks (SV-V1-C4 and SV-V1-C5) will be installed to replace two existing storage tanks being removed along with the DC 990 turbines under the Lambertville East Expansion project. Additionally, one new 1,000 gallon pipeline liquids storage tank (TK-V5-PE) and two new 560 gallon coolant storage tanks (TK-V11-PE1 and TK-V11-PE2) are proposed for the PennEast Interconnect project. Working and breathing losses will occur at the tanks. Working and breathing losses include VOCs and HAPs and are calculated with EPA's TANKS 4.0.9d program using maximum potential throughputs for each tank.

The storage of pipeline liquids has the potential for flash emissions in addition to working and breathing losses. Flashing losses occur when the pressure of a liquid is decreased or the temperature is increased. Total flashing losses are calculated based on a flash gas rate and a representative flash gas density. The flash gas rate is calculated based on a liquids input rate and a flash factor.[10] Emissions of individual VOCs and HAPs are calculated from total flashing losses using a representative pipeline liquids composition.

Tanks TK-V11-PE1 and TK-V11-PE2 store coolant which are not pressurized and have no potential for flash emissions. Therefore, emissions from these tanks include working and breathing losses only.

4.5. TRUCK LOADING

The PennEast Interconnect project will include a pipeline liquids truck loading area (TL-PL-PE) and a coolant truck loading area (TL-EC-PE). At the loading areas, emissions will occur during the loading of volatile organic liquids into tanker trucks. Therefore, the emissions calculations include VOC and HAP emissions from truck loading of pipeline liquids and coolant. Total loading losses are calculated based on calculation methods for submerged filling provided in AP-42 Section 5.2 (version dated July 2008). Emissions of individual VOCs and HAPs are calculated from total loading losses using representative pipeline liquids and coolant compositions.

4.6. FUGITIVE EMISSIONS

Component counts are estimated based on design drawings and construction surveys for similar facilities. Potential emissions are calculated from the piping components using emission factors from EPA's Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017), Table 2-4 (November 1995) which provides leak emission factors for oil and gas production operations. Gas service factors are used for components in natural gas service, light oil service factors are used for components in pipeline liquids service, and heavy oil service factors are used for components in oil service. Because an emission factor is not provided for leaks from pump seals in heavy oil service in Table 2-4 of the guidance, the average "SOCMI without ethylene" emission factor for pumps in heavy oil service from Table 2-1 is used to estimate emissions. Maximum hourly emissions are based on 120% of the hourly emissions estimated in an effort to be conservative. Annual emissions are conservatively calculated assuming that the components are in continuous gas/liquid/oil service as follows:

Equation 4-17:

$$Total\ Gas\ Emissions = \#\ of\ components \times \frac{\frac{kg}{hr}}{component} \times \frac{8{,}760\ hrs}{yr} \times \frac{1{,}000\ g}{kg} \times \frac{lb}{453.6\ g} \times \frac{ton}{2{,}000\ lb} = \frac{tons}{yr}$$

The equation above is used to calculate the total increase in fugitive gas emitted from the piping components. Emissions of individual VOCs, GHGs, and HAPs are calculated by multiplying the total fugitive gas emissions from piping components in gas, pipeline liquid, and oil service by the weight percent of each pollutant in gas, pipeline liquids, and oil. Natural gas, pipeline liquid, and oil compositions are engineering estimates based on available sampling data from Enbridge-owned pipelines.[11]

[10] The liquids input rate is determined based on operator experience with the incorporation of a safety factor. The flash factor in standard cubic foot per barrel (scf/bbl) was determined in a laboratory analysis of a gas sample taken from Atlanta, Texas.

[11] Natural gas composition is conservatively estimated based on an extended gas analysis of 421 samples of pipeline quality natural gas collected at various locations along Enbridge pipelines in the US from 2011 through 2016. The maximum hourly emission rates are calculated based on the 98th percentile value obtained from the analysis of all 421 samples. The average hourly emission rate is calculated based on the 60th percentile value obtained from the analysis of the 421 sample dataset. The PTE in tons per year is calculated based on the average hourly emission rate and 8,760 hours per year. Pipeline liquids composition is estimated from a liquid sample taken from a flash analysis from Atlanta, Texas.

4.7. EMISSIONS DUE TO GAS RELEASES

Gas releases refer to the blowdown or purging of natural gas from process equipment and pipelines for maintenance and repair, valve leakage, emergency releases, etc. as described in the existing Title V permit under insignificant source IDs IS2 through IS15. While no increases to potential emissions from gas releases at the Lambertville Compressor Station are proposed as part of the Lambertville East Expansion project, the proposed PennEast Interconnect project will result in additional gas releases from the new equipment to be installed. The potential volume of gas emitted is estimated in standard cubic feet per year based on design data for other stations. Emissions of individual VOC, GHG and HAPs are calculated by multiplying the total fugitive gas emissions from gas releases by the estimated weight percent of each pollutant in the natural gas. Natural gas composition is estimated based on available sampling data from Enbridge-owned pipelines.

4.8. TOTAL PROJECT EMISSIONS

Tables 4-8 and 4-9 present potential to emit increases from the new units to be installed for the Lambertville East Expansion Project and the PennEast Interconnect Project, respectively. Table 4-10 summarizes total PTE increases due to the proposed projects at the Lambertville Compressor Station. Detailed emission calculations can be found in Appendix A of this application report.

Table 4-8: PTE Increases – Lambertville East Expansion Project (tpy per unit)

Pollutant	Two Taurus 70 Turbines	One Waukesha EGen	Two Fuel Gas Heaters	Four Space Heaters	Two Pipeline Liquids Tanks	Non-Source Fugitives[1]	Gas Releases
NO_X (tpy)	12.5	0.19	0.16	0.024	0	0	0
CO (tpy)	13.3	0.39	0.25	0.010	0	0	0
$PM_{2.5/10}$ (tpy)	2.51	0.003	0.013	0.0020	0	0	0
SO_2 (tpy)	5.33	0.005	0.024	0.0037	0	0	0
VOC (tpy)	4.07	0.17	0.060	0.0021	0.02	0	3.62
CO_2e (tpy)	45,244	86	200	31	0.95	0	6,739
HAPs (tpy)	1.42	0.11	0.014	0.0005	0.0011	0	0.09

[1] Piping components (FG1) – There will be no increase in PTE due to the Lambertville East Expansion Project.

Table 4-9: PTE Increases – PennEast Interconnect Project (tpy per unit)

Pollutant	Eight Step-Down Heaters	One Caterpillar EGen	Non-Source Fugitives[1]	Station Gas Releases[2]
NO_X (tpy)	0.48	0.17	0	0
CO (tpy)	1.61	0.33	0	0
$PM_{2.5/10}$ (tpy)	0.33	0.003	0	0
SO_2 (tpy)	0.61	0.004	0	0
VOC (tpy)	0.20	0.15	3.13	3.05
CO_2e (tpy)	5,158	75	650	5,689
HAPs (tpy)	0.046	0.090	0.36	0.07

[1] Piping components, storage vessels, and truck loading/unloading

[2] Equipment blowdowns for maintenance/repair, pigging, separator vessels

Table 4-10: PTE Increases – Project (tpy)

Pollutant	Lambertville East Exp. Project	PennEast Interconnect Project	Total
NO_X (tpy)	25.61	3.97	29.58
CO (tpy)	27.53	13.22	40.75
$PM_{2.5/10}$ (tpy)	5.06	2.61	7.68
SO_2 (tpy)	10.73	4.91	15.65
VOC (tpy)	14.54	7.94	22.48
CO_2e (tpy)	98,142	47,678	145,820
HAPs (tpy)	3.06	0.89	3.95

This section contains an analysis of the applicability of federal and state air quality regulations to the proposed Projects at the Lambertville Compressor Station. The specific regulations included in this applicability review are the Prevention of Significant Deterioration (PSD) and Non-Attainment New Source Review (NNSR), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and NJDEP Air Quality Regulations.

5.1. ATTAINMENT STATUS

The EPA has established National Ambient Air Quality Standards (NAAQS) for each of the following criteria air pollutants: particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$), sulfur dioxide (SO_2), ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb). Areas in which the NAAQS are being met are referred to as attainment areas. Areas in which the NAAQS are not being met are referred to as nonattainment areas. Areas that were formerly nonattainment areas but are now in attainment and covered by a maintenance plan are referred to as maintenance areas. Areas for which sufficient data are not available to determine a classification are referred to as unclassifiable. The federal attainment status designations of areas in New Jersey with respect to NAAQS are listed at 40 CFR 81.331.

The Lambertville Compressor Station is an existing compressor station located in Hunterdon County, New Jersey. Hunterdon County is currently designated as attainment or unclassifiable for SO_2, NO_2, CO, PM_{10}, $PM_{2.5}$ and lead (Pb). Hunterdon County is also currently designated as moderate non-attainment for the 8-hour ozone standard (2008), however it was also designated as severe nonattainment for the 1-hour ozone standard which was revoked by EPA effective December 17, 2006 and as moderate nonattainment for the 1997 8-hour ozone standard. New Jersey regulations retain the 1-hour standard for previously designated nonattainment areas, therefore, new or modified sources in Hunterdon County, New Jersey with potential emissions of NO_x exceeding 25 tons per year and/or potential emissions of VOC exceeding 25 tons per year are subject to non-attainment new source review (NNSR).

5.2. PSD APPLICABILITY ANALYSIS

The requirements of 40 CFR 51.166, which apply to a new or modified major facility located in an attainment area, is administered through NJDEP's permitting process. The NJDEP accepted delegation of the administration of the PSD program from USEPA on February 22, 1983. The following sections assess PSD applicability to the proposed projects at the Lambertville Compressor Station.

5.2.1. Major Source Status

The first step in completing a PSD applicability analysis is to determine if a facility is currently considered a major stationary source. Under PSD permitting rules, the major source threshold is 250 tpy unless the facility falls under one of the specifically delineated source categories ("List of 28") in 40 CFR 51.165(a)(4) as having a lower 100 tpy threshold. Natural gas compressor stations are not on the "List of 28" therefore the PSD major source threshold for the Lambertville Compressor Station is 250 tpy of any PSD pollutant.

Based on the facility's current permit, the Lambertville Compressor Station is considered a major stationary source under the PSD program because NO_2 emissions exceed the 250 tpy major source threshold. The replacement of the DC 990 Turbines under the Lambertville East Expansion Project with lower NO_2-emitting turbines will result in the facility being reclassified as a minor source with respect to PSD post Project, with potential emissions of all regulated pollutants below the 250 tpy major source threshold. EPA guidance indicates that if an existing source that is considered to be major under PSD for one pollutant undergoes a modification that will bring the source below the major source threshold for that pollutant, it will not be required to undergo PSD review.[12] Pre- and Post-Project[13] facility-wide potential to emit (PTE) is summarized in Table 5-1 below.

Table 5-1: Potential-to-Emit

Pollutant	Pre-Project(s) Facility-wide PTE [1] (tpy)	Post-Project(s) Facility-wide PTE (tpy)
NO_X	308.22	50.13
CO	29.93	49.72
$PM_{2.5/10}$	23.45	13.57
SO_2 [2]	1.713	17.40
VOC[3]	38.03	51.59
HAPs[4]	1.91	7.27
CO_2e	72,584	182,265

[1] Pre-project PTE is based on current Title V permit, except for VOC which reflects the reconciliation of non-source fugitives per Section 2 of the application report.

[2] Post-project SO_2 PTE increase is due to the use of the gas tariff sulfur content.

[3] Pre-project VOC PTE calculated as follows:
17.89 tpy (significant source operations) + 10.39 tpy (reconciled IS2 - IS15) + 8.41 tpy (reconciled FG1) + 0.023 tpy (IS1) + 0.152 tpy (IS16 - IS20) + Proposed IS21 - Existing Pipeline Liquids Storage Tank (0.76 tpy) + Proposed IS22 - Existing Parts Washer (0.41 tpy)

[4] Pre-project HAPs PTE values from current Title V permit do not include pollutants below the reporting threshold. Post-project HAPs PTE includes summation of PTE for all HAPs emitted (both above and below the reporting thresholds).

However, since the Lambertville Compressor Station is an existing major source prior to the project, Texas Eastern is also providing a PSD applicability analysis in the following sections.

5.2.2. Project Emissions Increase Methodology

While the proposed projects are separate and independent, in order to ensure a conservative and complete regulatory and permitting applicability evaluation, this application takes into consideration the sum of the total emissions changes as a result of both projects. Under the PSD program, the major NSR requirements are triggered at an existing major source when a major modification occurs. A major modification is defined as a change that results in a significant emissions increase and a significant net emissions increase as the result of a

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[12] "PSD Questions" Memorandum from Mr. Edward Reich, Director, Division of Stationary Source Enforcement, Office of Enforcement, US EPA, to Mr. Merrill Hohman, Director, Air & Hazardous Materials Division, Region I, US EPA, April 1, 1981.

[13] Includes both Lambertville East Expansion and PennEast Interconnect Projects.

project. A net emissions increase is the sum of emissions increases from a particular physical change or change in the method of operation at a stationary source and any other increases and decreases in actual emissions at the major stationary source that are contemporaneous with the particular change and are otherwise creditable. An increase or decrease in actual emissions is contemporaneous if it occurs between the date five years before construction of the project commences and the date the increase associated with the project occurs. A significant net emissions increase occurs if the net emissions increase are above the significant emission rate (SER) thresholds identified in Table 5-2 below.

Table 5-2: Significant Emission Rates – For PSD Applicability

Pollutant	SER (tpy)
NO_X	40
CO	100
VOC[14]	40
SO_2	40
PM	25
PM_{10}	15
$PM_{2.5}$	10
H_2SO_4	7
CO_2e	75,000[15]

The first step (1) in a PSD applicability analysis is commonly referred to as the "project emission increases" as it accounts only for emissions related to the proposed project itself. According to 40 CFR 51.166(a)(7)(iv)(c) through (f), an actual-to-projected-actual calculation is used to assess the project emissions increase for existing emissions units and an actual-to potential calculation is used to assess the project emissions increase for new emission units.

If the emission increases estimated per step (1) exceed the major modification thresholds, then the applicant may move to step (2), commonly referred to as netting. As previously stated, if the resulting net emission increases exceed the major modification thresholds, then PSD permitting is required.

5.2.2.1. Baseline Actual Emissions

The first calculation under the step (1) analysis is to determine the baseline actual emissions for the modified units. The baseline actual emissions are defined in for a non-electric utility steam generating unit (EUSGU) as the average rate, in tons per year, at which the emission unit actually emitted the pollutant during any consecutive 24-month period selected by the applicant within the 10-year period immediately preceding either the anticipated date of the owner or operator begins actual construction of the project.

Under the Lambertville East Expansion Project, the removal and replacement of the two existing DC 990 turbines will result in certain existing piping components that are currently associated with the DC990 turbines to be removed and replaced as well. To conservatively calculate the project emission increase in CO_2e for PSD applicability purposes, the estimated PTE associated with the replacement piping components (302 tpy CO_2e)

[14] Because the project is located in an area designated as non-attainment for ozone, VOC will not be evaluated for PSD applicability. An assessment of VOC with respect to Non-attainment NSR is included in Section 5.3 of this application.
[15] The value listed for CO_2e listed functions similar to an SER when the source is already an existing major PSD source and the project triggers PSD for another pollutant (i.e., PSD "anyway" source).

are included without taking into account the baseline actual emissions associated with the components being replaced.

5.2.2.2. Projected Actual Emissions/Potential to Emit

After determining the baseline actual emissions, the next calculation of the step (1) applicability analysis is to estimate the projected actual emissions from the proposed project. As provided in the definition of projected actual emissions in 40 CFR 51.166(40), Texas Eastern elected to use the PTE of each of the affected sources instead of developing a projection of the maximum annual rate of emissions at which the units will emit after the project. Therefore, in the actual-to-projected actual applicability analysis performed, the projected actual emissions are equal to the potential emissions. The calculation methodology for potential emissions from the affected combustion units after the proposed project were described earlier in this application. In addition to the new proposed units, emissions from the two existing above ground pipeline liquids storage tanks (currently permitted as Emission Unit U6) may increase due to proposed project, making them affected sources. Note that there will be no change in U6 permitted PTE as a result of the project. U6 increases are included in this analysis at permitted PTE rather than projected actuals. The sum of the potential emissions from the Lambertville East Expansion and the PennEast Interconnect projects, combined, are shown in the table below.

Table 5-3. Project PTE

Pollutant	PTE (tpy)
NO_X	29.58
CO	40.75
SO_2	15.65
PM	7.68
PM_{10}	7.68
$PM_{2.5}$	7.68
CO_2e	145,869

5.2.2.3. Project Emissions Increase

The final calculation of step (1) using the actual-to-projected actual applicability test is to subtract the baseline actual emissions from the potential emissions of each pollutant to determine if a significant emissions increase will occur. The difference between the actual emissions and the potential emissions after the project are shown in the table below. Since baseline actual emissions are zero, the project emissions increase is equal to the project PTE shown in Table 5-4 above. While projected emissions increase of CO_2e exceeds 75,000 tpy, since no other PSD pollutants exceed their respective SERs the project is not subject to PSD "anyway." Therefore PSD is not triggered solely based on CO_2e emissions increases.

5.3. SUBCHAPTER 18 NETTING ANALYSIS

In New Jersey, NNSR is administered through N.J.A.C. 7:27-18: Control and Prohibition of Air Pollution from New or Altered Sources Affecting Ambient Air Quality (Emissions Offset Rules), which establishes preconstruction requirements for new and modified major facilities located in non-attainment areas. A netting analysis has been prepared in accordance with N.J.A.C. 7:27-18.7 for the proposed projects at Lambertville Compressor Station and the completed eNAT Tool in provided in Appendix B to this application. The following discussion summarizes the analysis.

In accordance with N.J.A.C. 7:27-18.7(a), to determine whether the maximum allowable emissions proposed in an application for a permit will result in a net emission increase or significant net emission increase an analysis is conducted in accordance with the following equation:

$$NI = IP + INP + IF + IA - DO - DC$$

Where:

NI = The net emission increase at a facility;
IP = Any increase(s) in the allowable emissions of the air contaminant which occurred during the contemporaneous period and which were authorized by permits issued by NJDEP;
INP = Any increase(s) in the allowable emissions of the air contaminant which occurred during the contemporaneous period and which came from any equipment or control apparatus for which no permit was in effect at the time of the increase;
IF = Any increase in fugitive emissions of the air contaminant from the facility during the contemporaneous period;
IA = Any proposed increase in allowable emissions of the air contaminant from the newly constructed, reconstructed, or modified equipment or control apparatus which is the subject of the permit application;
DO = Any increase(s) in the allowable emissions of the air contaminant which occurred during the contemporaneous period, if emission offsets were secured for these increases from the facility or from another facility; and
DC = The sum of all creditable emission reductions at the facility during the contemporaneous period, not including any creditable emissions reductions previously used as emission offsets at the facility or any other facility.

The contemporaneous period is defined as starting five (5) years prior to commencement of construction date and ending with the initiation of operation of the newly constructed or modified equipment. Texas Eastern plans to commence construction on both the Lambertville East Expansion project and the PennEast Interconnect project by Spring 2019. The change in emissions due to both projects, in aggregate, is evaluated in accordance with the Subchapter 18 netting equation in the following sections.

5.3.1. Contemporaneous Increases in Allowable Emissions (IP)

There have been no projects at the Lambertville Compressor Station since the existing reciprocating engines were installed in 2012. The IP term for both projects is equal to zero.

5.3.2. Contemporaneous Increases from Non-Permitted Sources (INP)

There have been no off-permit increases in allowable emissions at the Lambertville Compressor Station during the contemporaneous period. The INP term for both projects is equal to zero.

5.3.3. Contemporaneous Increases in Fugitive Emissions (IF)

There have been no increases in fugitive emissions at the Lambertville Compressor Station during the contemporaneous period. The IF term for both projects is equal to zero.

5.3.4. Proposed Increases in Allowable Emissions from the Proposed Project (IA)

The proposed Lambertville East Expansion Project involves the construction of the following new emission sources:

- Two new 10,915 HP (ISO) Solar Taurus 70 natural gas-fired turbines, which will replace the two existing 5,800 HP (ISO) Dresser Clark DC 990 natural gas-fired compressor turbines (Emission Unit U1);
- A new 880 bhp Waukesha VGF36GL natural gas-fired emergency generator which will replace the existing Caterpillar G-398 emergency generator (Emission Unit U3);
- Two new natural gas-fired gas heaters associated with the new turbine compressors (rated at < 1 MMBtu/hr heat input);
- Four new natural gas-fired warehouse space heaters (all rated at < 1 MMBtu/hr heat input);
- Two new 44-gallon pipeline liquids storage tanks; and
- New gas release vents associated with the new turbines.

Due to the replacement of the two DC 990 turbines at the site, the portion of the existing piping components associated with these turbines will be replaced with new components associated with the new Taurus 70 replacement turbines. However, the estimate of PTE due to fugitive piping components at the Lambertville Station will not change as a result of the proposed Lambertville East Expansion project because the basic footprint of the station will not change. The estimated total maximum number of piping components pre-project will be the same as the estimated total maximum number of piping components post-project.

The proposed PennEast Interconnect Project involves the construction of the following new emission sources:

- Eight new Cleaver Brooks Step-Down Heaters (10 MMBtu/hr each);
- Three new storage vessels/filter separators associated with pipeline pigging;
- Truck loading; and
- Gas releases due to pipeline blowdowns for maintenance and repair.

A summary of the increase in allowable emissions due to the Lambertville East Expansion project and the PennEast Interconnect project is provided in Table 5-4 below.

Table 5-4: Proposed Increases in Allowable Emissions

Unit Description	NO_X (tpy)	VOC (tpy)	CO (tpy)	$PM/PM_{10}/PM_{2.5}$ (tpy)	SO_2 (tpy)
Lambertville East Expansion Project					
Two Solar Taurus 70 Turbines	25.0	8.15	26.6	5.03	10.7
One 880 HP Waukesha EGen	0.19	0.17	0.39	0.003	0.005
Two Fuel Gas Heaters	0.33	0.12	0.50	0.03	0.05
Four Warehouse Heaters	0.10	0.01	0.04	0.01	0.01
Two Pipeline Liquids Tanks	NA	0.04	NA	NA	NA
Portion of Piping Components Replaced	NA	2.44	NA	NA	NA
Increase in Gas Releases	NA	3.62	NA	NA	NA
PennEast Interconnect Project					
Eight Step-Down Heaters	3.80	1.61	12.9	2.61	4.91
Three Storage Vessels	NA	0.64	NA	NA	NA
Truck Loading	NA	0.02	NA	NA	NA
Piping Components	NA	2.47	NA	NA	NA
Gas Releases	NA	3.05	NA	NA	NA
Total Increase in Allowables	29.58	22.48	40.75	7.68	15.65

5.3.5. Contemporaneous Decreases for Which Emission Offsets Were Secured (DO)

The Lambertville Compressor Station has not been required to obtain emissions offsets during the contemporaneous period. The DO term for both projects is equal to zero.

5.3.6. Contemporaneous Creditable Emission Reductions (DC)

Following construction and prior to operation of the proposed Project, Texas Eastern will permanently retire the two existing Dresser Clark DC 990 turbines (U1). [16] The shutdown of these units will result in creditable emissions reductions.

The decrease associated with the shutdown of these units is calculated as the difference between the projected actual emissions (equal to zero) and baseline actual emissions. In accordance with Subchapter 18, emission reductions were determined using the actual average emissions rate during the two calendar years immediately preceding the date of the permit application (i.e. 2015-2016). On November 6, 2017, the NJDEP adopted amendments to N.J.A.C. 7:27-19 Control and Prohibition of Air Pollution from Oxides of Nitrogen (the NO_X RACT Rule). These amendments require any simple cycle combustion turbine combusting natural gas and compressing gaseous fuel at a major NO_X facility to meet an emission limit of 42 ppm_{vd} NO_X corrected to 15% O_2. As such, the NO_X emission reductions for the DC 990 turbines are adjusted in accordance with N.J.A.C. 7:27-18.8(e) by comparing the reported emissions during the baseline period to what would have been reported had the units been subject to the 42 ppm limit during that time period by taking into account the fuel usage, runtime and startup/shutdown events that were recorded. This adjustment results in baseline actual emissions for the DC 990 turbines of 33.59 tpy. Note that only a portion of the NO_X emissions decrease (5.18 tpy) has been

[16] A Caterpillar emergency generator (U3) will also be removed/replaced, but ERCs will not be sought for this unit.

included in DC from the shutdown of the DC 990 turbines. The remaining portion (28.42 tpy) will be banked as ERCs in accordance with N.J.A.C. 7:27-18.8 within 12 months of turbine shutdown.

The creditable emission reductions are summarized in Table 5-7 below.

Table 5-5: Creditable Emission Reductions (DC)

Pollutant	Period	Creditable Emission Reductions (tpy)[17]
NO_x	January 2015 – December 2016	5.18
CO	January 2015 – December 2016	1.22
VOC	January 2015 – December 2016	0.01
SO_2	January 2015 – December 2016	0.56
TSP (PM)	January 2015 – December 2016	1.09
PM_{10}	January 2015 – December 2016	1.09

5.3.7. Net Emissions Increase (NI)

The calculated net emission increase at the Lambertville Compressor Station due to the Lambertville East Expansion project and the PennEast Interconnect project is provided in Table 5-8 below. It shows that the net increase in emissions from the combined projects will not exceed the Subchapter 18 thresholds for any pollutant. Therefore, Subchapter 18 does not apply.

[17] NO_X emissions adjusted by a ratio of 42 ppm/172.5 ppm to account for the change in allowable emission rate for the DC 990 turbines with the issuance of the NO_X RACT Rule amendments on November 6, 2017.

Table 5-6: Calculated Net Increase in Emissions (NI)

Pollutant	Net Increase (tpy)	Subchapter 18 Threshold (tpy)	Subject to Subchapter 18?
NO_x	24.40	25	No
CO	39.53	100	No
VOC	22.47	25	No
SO_2	15.08	40	No
TSP (PM)	6.58	25	No
PM_{10}	6.58	15	No

5.4. NEW SOURCE PERFORMANCE STANDARDS (NSPS)

The New Source Performance Standards (NSPS) codified in 40 CFR Part 60 require that new, modified or reconstructed sources control emissions to the level achievable by the best demonstrated technology as specified by the applicable provisions. NSPS Subpart A General Provisions require affected sources to provide initial notification to the regulatory agency and to complete performance testing, recordkeeping, monitoring, and mandates general control device requirements for all other subparts as applicable.

5.4.1. 40 CFR Part 60 Subpart KKKK - Standards of Performance for Stationary Gas Turbines (After February 18, 2005)

Applicability

Pursuant to 40 CFR 60. 4305(a), the new Solar gas turbines to be installed under the Lambertville East Expansion project are subject to the requirements of 40 CFR 60 Subpart KKKK, because their heat input at peak load will be greater than or equal to 10 MMBtu/hr (HHV) and Texas Eastern will have commenced the construction of the turbines after February 18, 2005.

Emission Limits

Pursuant to 40 CFR 60.4320(a) and Table 1 to Subpart KKKK of Part 60 – Nitrogen Oxide Emission Limits for New Stationary Combustion Turbines, the two new gas turbines, which will have an HHV heat input of between 50 and 850 MMBtu/hr, will comply with a NO_X emission standard of 25 ppm at 15 percent O_2 t as indicated by the vendor guaranteed emission rates listed in Table 3-1. Subpart KKKK also includes a NO_X limit of 150 ppmvd at 15 percent O_2 for turbine operation at temperatures less than 0°F and turbine operation at loads less than 75 percent of peak load which the new turbines will also meet as indicated by the vendor guaranteed emission rates listed in Tables 3-3, 3-4 and 3-5.

The new Solar turbines will comply with the NSPS KKKK SO_2 emission standard pursuant to 40 CFR 60.4330(a)(2) which requires that they not burn any fuel that has the potential to emit in excess of 0.060 lb/MMBtu SO_2 heat input, .

General Compliance Requirements

Pursuant to 40 CFR 60.4333(a), the new turbines, their air pollution control equipment, and their monitoring equipment will be maintained in a manner that is consistent with good air pollution control practices for minimizing emissions. This requirement applies at all times including during startup, shutdown, and malfunction.

NO_X Compliance Demonstration

Pursuant to 40 CFR 60.4340(a), Texas Eastern will perform annual performance tests in accordance with 40 CFR 60.4400 to demonstrate continuous compliance. If the NO_X emission result from the performance test is less than or equal to 75 percent of the NO_X emission limit for a turbine ($\leq$ 18.75 ppm at 15 percent O_2 or $\leq$ 0.9 lb/MW-hr), Texas Eastern may reduce the frequency of subsequent performance tests to once every two years (no more than 26 calendar months following the previous performance test). If the results of any subsequent performance test exceed 75 percent of the NO_X emission limit, Texas Eastern will be required to resume annual performance testing.

Per 40 CFR 60.8(a), the initial NO_X performance tests for the new turbines are required to be conducted within 60 days after achieving the maximum production rate, but no later than 180 days after initial startup.

SO_2 Compliance Demonstration

Pursuant to 40 CFR 60.4365(a), in order to demonstrate continuous compliance with the applicable SO_2 emissions limit in 40 CFR 60.4330(a)(2), the Lambertville Compressor Station will utilize a current, valid purchase contract, tariff sheet, or transportation contract for natural gas that will specify that the maximum total sulfur content of the natural gas used at the facility is less than 20 grains per 100 standard cubic feet.

Reporting

Pursuant to 40 CFR 60.4375(b), a written report of the results of each performance test required under 40 CFR 60.4340(a) will be submitted to NJDEP and the USEPA before the close of business on the 60th day following the completion of the performance test.

Pursuant to 40 CFR 60.7(a)(1), Texas Eastern will provide written notification of the date of construction for each new turbine. The submittal will be postmarked by no later than 30 days after the commencement of construction. Per 40 CFR 60.7(a)(3), Texas Eastern will also provide written notification of the actual date of initial startup for the new turbines. These notifications will be postmarked by no later than 15 days after the initial startup date.

5.4.2. 40 CFR Part 60 Subpart GG – Standards of Performance for Stationary Gas Turbines

Pursuant to 40 CFR 60.4305(b), since the new turbines at the Lambertville Compressor Station are subject to 40 CFR 60 Subpart KKKK, they are exempt from 40 CFR 60 Subpart GG.

5.4.3. 40 CFR 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

NSPS Subpart JJJJ regulates criteria pollutant emissions from stationary spark ignition (SI) internal combustion engines (ICE) constructed after June 12, 2006. The term "constructed" is defined by NSPS Subpart JJJJ as the date the engine is ordered by the owner or operator, and manufactured after July 1, 2007 (for engines with a design rating greater than or equal to 500 hp). The proposed projects at the Lambertville Station include the installation of two new emergency generators which will be subject to this regulation: 1) a 880 bhp Waukesha VGF36GL natural gas-fired reciprocating ICE under the Lambertville East Expansion project, and 2) a 755 bhp Caterpillar G3412C natural gas-fired reciprocating ICE under the PennEast Interconnect project.

These emergency generators will be subject to the following emissions standards from Table 1 of NSPS Subpart JJJJ (emergency engines greater than 130 hp):

- NO_X: 2.0 g/hp-hr or 160 ppmvd @15% O_2
- CO: 4.0 g/hp-hr or 540 ppmvd @15% O_2
- VOC: 1.0 g/hp-hr or 86 ppmvd @15% O_2

Texas Eastern will comply with the requirements by installing either engines certified to meet NSPS JJJJ by the manufacturer, or if a non-certified generator is installed, it will fulfill the requirements per 40 CFR 60.4243(a)(2)(iii). If non-certified engines are installed, requirements include conducting an initial performance test within one year of startup and submitting a copy of the performance test within 60 days of its completion per 40 CFR 60.4245(d).

Since the engines will be used as emergency generators and will not meet the standards applicable to non-emergency engines, a non-resettable hour meter is required.[18] Per 40 CFR §60.4243(d), emergency engines are allowed to be operated according to the following time constraints:

- There is no time limit on use in emergency situations.
- The emergency ICE can operate for up to 100 hours per year total for maintenance checks and readiness testing, provided that the tests are recommended by federal, state, or local government, the manufacturer, the vendor, the regional transmission organization or equivalent balancing authority and transmission operator, or the insurance company associated with the engine.

Texas Eastern will track the engine's run time and the reason for use in order to demonstrate compliance with the run time requirements.[19] If a non-certified engine is chosen, initial notification is required for non-certified RICE greater than 500 hp[20]. In addition, since performance testing would be required per 40 CFR 60.4243(a)(2)(iii), advanced notification and results reporting are required.[21]

5.4.4. 40 CFR Part 60, Subpart OOOO – Crude Oil and Natural Gas Production, Transmission, and Distribution

On December 31, 2014, the USEPA finalized amendments to the Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution (NSPS OOOO). Affected sources under NSPS OOOO include storage vessels in the oil and natural gas production segment, natural gas processing segment, or natural gas transmission and storage segment with VOC emissions exceeding six (6) tpy as described in 40 CFR 60.5365(e) as well as equipment leaks at natural gas processing plants as described in 40 CFR 60.5365(f).

The existing storage vessels at the Lambertville Compressor Station have uncontrolled potential emissions of VOC that are less than 6 tpy, and therefore are not affected sources under NSPS OOOO. The proposed PennEast Interconnect project includes the installation of two new storage vessels. However, the uncontrolled potential emissions of VOC from each of these storage vessels are also well below 6 tpy as indicated in Appendix A, Tables

[18] 40 CFR 60.4237(a)
[19] 40 CFR 60.4245(b)
[20] 40 CFR 60.4245(c)
[21] 40 CFR 60.8(d) and 40 CFR 60.4245(d)

3 and 4. Therefore, the proposed project will not trigger the requirements of NSPS OOOO for these storage vessels.

Per 40 CFR 60.5365(f)(2), equipment leaks from process units located at onshore natural gas processing plants are subject to the LDAR requirements established in NSPS OOOO. Because the Lambertville Compressor Station operates under North American Industry Classification System (NAICS) Code 486210 for the Pipeline Transportation of Natural Gas, the facility is not a natural gas processing plant and equipment leaks at the Lambertville Compressor Station are not subject to the requirements of NSPS OOOO pursuant to 40 CFR 60.5365(f)(2).

5.4.5. 40 CFR Part 60, Subpart OOOOa - Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution

40 CFR Part 60, Subpart OOOOa applies to sources that are constructed/modified after September 18, 2015, including centrifugal compressors, reciprocating compressors, pneumatic controllers, pneumatic pumps, storage vessels, equipment leaks and sweetening units within the crude oil and natural gas sector. In the natural gas transmission segment, Subpart OOOOa has standards for each of these affected facilities, except for pneumatic pumps and sweetening units.

Centrifugal compressors with wet seals constructed after September 18, 2015 are subject to the control, recordkeeping, and reporting requirements of Subpart OOOOa. Texas Eastern will not be installing any centrifugal compressors with wet seals as a part of either of the proposed projects. In addition, no existing reciprocating compressors are being modified or reconstructed. Therefore, the Lambertville Compressor Station will not be subject to the rod packing replacement or control requirements for compressors.

Per 40 CFR 60.5365a(d)(1), Subpart OOOOa applies to each pneumatic controller not located at a natural gas process plant which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh. However, there will be no continuous bleed pneumatics installed, modified or reconstructed under either project.

40 CFR 60.5365a(e) defines storage vessel affected facilities as a single storage vessel with potential VOC emissions equal to or greater than 6 tpy. As indicated in Section 5.4.4 above, there are no NSPS OOOOa affected storage vessels existing at the Lambertville Compressor Station and the storage vessels to be installed under the proposed PennEast Interconnect project will have potential VOC emissions well below this threshold.

Subpart OOOOa has added Leak Detection and Repair ("LDAR") requirements for new or modified compressor stations in the transmission segment. For purposes of OOOOa applicability to fugitive emissions components, a modification to a compressor station occurs when one or more compressors at the station is replaced with one or more compressors of greater total horsepower than the compressors being replaced. As such, the proposed Lambertville East Expansion project is considered a modification and the fugitive emissions components at the Lambertville Compressor Station will be subject to the LDAR requirements of Subpart OOOOa.

It should be noted that in June 2017, USEPA published a notice of reconsideration and partial stay of certain provisions of Subpart OOOOa, including the fugitive emissions monitoring requirements. On July 3, 2017, the U.S. Court of Appeals for the D.C. Circuit vacated USEPA's 90-day stay of portions of the rule. In response to the Court's decision, USEPA filed a motion on July 7, 2017, to recall its mandate in order to provide USEPA with the standard short period of time in which to evaluate its options before the decision becomes effective. At this time, the fugitive emissions monitoring requirements are in effect.

5.4.6. CFR 60, Subpart Dc: Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

The provisions of 40 CFR Part 60; Subpart Dc apply to steam generating units with a maximum heat input capacity is greater than or equal to 10 MMBtu/hr and less than 100 MMBtu/hr. 40 CFR 60.41c defines steam generating unit as *"a device that combusts any fuel and produces steam or heats water or heats any heat transfer medium. … This term does not include process heaters as defined in this subpart."* The rule further defines process heater as *"a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst."*

As part of the proposed PennEast Interconnect project, eight (8) new natural gas-fired 10 MMBtu/hr Cleaver Brooks ClearFire®-LC full condensing hydronic boilers to be used as step down heaters will be installed. These units do not generate steam, however, they use a hot water and glycol mixture as a heat medium to heat the natural gas to above dew point. EPA has provided further clarification indicating that "devices which combust fuel and transfer heat from the combustion gases to a heat transfer medium across a physical barrier which prevents direct contact or intermixing of the combustion gases and the heat transfer medium are considered steam generating units under Subpart Dc."[22] Therefore, since the PennEast step down heaters meet the definition of steam generating unit per 40 CFR 60.41c and have a maximum heat input of 10 MMBtu/hr they are subject to Subpart Dc. All other heaters/boilers proposed as part of this project are below the 10 MMBtu/hr heat input threshold and therefore are not subject to this NSPS.

For units combusting only natural gas, Subpart Dc requires an initial notification and recordkeeping regarding the amount of fuel burned on a monthly basis in accordance with 40 CFR 60.48c(g)(2) There are no emission limitations or reporting requirements for natural gas fired units.

5.5. NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

National Emission Standards for Hazardous Air Pollutants (NESHAP) are emission standards for HAPs, regulated by 40 CFR Part 61 and 63. NESHAP regulations apply to sources in specifically regulated industrial source classifications (Clean Air Act Section 112(d)) or on a case-by-case basis (Clean Air Act Section 112(g)) for facilities not regulated as a specific industrial source type. The Lambertville Compressor Station is considered an area source of HAPs because the facility-wide HAP PTE is less than 25 tpy of total combined HAP and less than 10 tpy of any individual HAP. As indicated in Table 4-1, the facility will remain an area source of HAP post-Projects. It should be noted that the Lambertville Compressor Station was classified as a major source of HAPs until December 2011, at which time it became a minor source of HAPs due to the replacement of several reciprocating compressors. Any existing sources that were installed prior to that date would be subject to major source NESHAPs, as applicable.

The Lambertville Compressor Station is not subject to any of the 40 CFR 61 NESHAP. All sources regulated by a 40 CFR 63 NESHAP are subject to the general provisions of 40 CFR 63, Subpart A unless specifically excluded by the applicable subpart. The following section evaluates the potential applicability of the source-specific NESHAPs.

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[22] US EPA, ADI PS36.

5.5.1. 40 CFR Part 63, Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines

40 CFR Part 63, Subpart YYYY applies to new and reconstructed stationary combustion turbines at major sources of HAPs. However, per 40 CFR 63.6085, the new Solar gas turbines at the Lambertville Compressor Station are not subject to requirements of 40 CFR 63 Subpart YYYY because the Lambertville Compressor Station will continue to operate as an area source of HAPs.

5.5.2. 40 CFR Part 63, Subpart HH - National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities

Per 63.760(a) and (b), Subpart HH applies to facilities that process, upgrade, or store hydrocarbon liquids. The natural gas production facility to which the rule applies ends at the point that the natural gas enters a facility in the natural gas transmission and storage category per 63.760(a)(3). The Lambertville Compressor Station is considered a natural gas transmission facility; therefore, Subpart HH is not applicable

5.5.3. 40 CFR Part 63, Subpart HHH – National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities

As per 40 CFR 63.1270(a), major sources of HAP that engage in natural gas transmission and storage and that transport or store natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company) are subject to requirements of 40 CFR Part 63 Subpart HHH. Since the Lambertville Compressor Station is an area source of HAP, the requirements of Subpart HHH do not apply.

5.5.4. 40 CFR Part 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Engines

Subpart ZZZZ, NESHAP for Stationary Reciprocating Internal Combustion Engines, applies to reciprocating internal combustion engines (RICE) located at a major or area source of HAP emissions. At area sources, engines for which construction commenced on or after June 12, 2006, are considered new stationary RICE.[23] Texas Eastern is proposing to install two natural gas-fired emergency generators (one under the Lambertville East Expansion project and one under the PennEast Interconnect project), which will be classified as new units.

The generators will subject to 40 CFR 60 (NSPS) Subpart JJJJ. Per 40 CFR 63.6590(c), a new SI RICE at an area source must meet the requirements of 40 CFR 63 Subpart ZZZZ by meeting the requirements of 40 CFR 60 Subpart JJJJ for SI ICEs. No further requirements apply for such engines under the Subpart ZZZZ. Thus, by complying with 40 CFR 60 Subpart JJJJ, the proposed emergency generators will also be in compliance with 40 CFR 63 Subpart ZZZZ.

5.5.5. 40 CFR 63 Subpart DDDDD – Industrial, Commercial, and Institutional Boilers and Process Heaters Major Sources

40 CFR 63 Subpart DDDDD, also known as "major source Boiler MACT," regulates HAP emissions from boilers and process heaters at facilities that are a major source of HAP. The Lambertville Compressor Station is an area source of HAP; therefore, major source Boiler MACT does not apply.

[23] 40 CFR 63.6590(a)(1)(iii) and (a)(2)(iii)

5.5.6. 40 CFR 63 Subpart JJJJJJ - Industrial, Commercial, and Institutional Boilers Area Sources

Subpart JJJJJJ regulates HAP emissions from boilers at area sources of HAP. The rule defines boiler as:[24]

> *"An enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam and/or hot water."*

The proposed PennEast step-down heaters meet the definition of a boiler. However, 40 CFR 63.11195(e) specifically exempts gas-fired boilers which are defined as:[25]

> *"Any boiler that burns gaseous fuels not combined with any solid fuels and burns liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or for periodic testing, maintenance, or operator training on liquid fuel. Periodic testing, maintenance, or operator training on liquid fuel shall not exceed a combined total of 48 hours during any calendar year."*

The proposed PennEast step-down heaters will only be capable of combusting natural gas and therefore meet this definition. As a result, they are not subject to NSPS JJJJJJ.

5.6. APPLICABLE NJDEP STATE REGULATIONS

Air emissions from the Lambertville Compressor Station are subject to certain regulations from Chapter 7:27 of the New Jersey Administrative Code (N.J.A.C.). The applicability of N.J.A.C. Chapter 7:27 to the proposed Lambertville East Expansion and PennEast Interconnect projects is evaluated in the following sections.

5.6.1. Subchapter 3 "Control and Prohibition of Smoke from Combustion of Fuel"

N.J.A.C. 7:27 - 3.5 limits the opacity from internal combustion engines and stationary combustion turbines to less than 20% opacity, exclusive of condensed water vapor for a period of more than 10 consecutive seconds. Combustion turbines and emergency generators firing natural gas will normally have opacity near zero. As such, the proposed emergency generators and stationary combustion turbines at the Lambertville Compressor station are expected to be in compliance with this opacity standard.

5.6.2. Subchapter 4 "Control and Prohibition of Particles Combustion of Fuel"

N.J.A.C. 7:27 - 4.2(a) limits the mass emission of particulates from the proposed turbines, heaters and emergency generators to be installed for the Lambertville East Expansion and PennEast Interconnect projects. The applicable maximum allowable emission rates under N.J.A.C. 7:27-4.2(a) are based on the units rated heat input rate in MMBtu/hr.

Based on the maximum heat input of the proposed units, PM emissions are limited to 14.6 lb/hr for the combustion turbines and 6 lb/hr for the PennEast heaters. Maximum hourly PM emission rates proposed for the combustion turbines and PennEast heaters are 0.6055 lb/hr and 0.0782 lb/hr, respectively. These proposed emission rates are well below their respective standards.

[24] 40 CFR 63.11237
[25] 40 CFR 63.11237

Subchapter 4 does not apply to combustion sources with maximum heat input rates less than 1 MMBtu/hr.

5.6.1. Subchapter 7 "Sulfur"

N.J.A.C. 7:27-7 limits SO_2 emissions to less than 2000 ppm by volume at standard conditions. Subchapter 7 does not apply to SO_2 emissions from the combustion of commercial fuel; or sources having the sole function of relieving pressure of gas, vapor or liquid under abnormal emergency conditions. All sources of SO_2 emissions from the project are from the combustion of natural gas. Therefore, the project is not subject to Subchapter 7.

5.6.2. Subchapter 8 "Permits and Certificates for Minor Facilities (and Major Facilities without an Operating Permit)"

PennEast will pursue pre-construction approval in accordance with N.J.A.C. 7:27-8 for the proposed PennEast-owned and operated emission units once the agreement with Texas Eastern is finalized. These emission units consist of piping component and gas releases. Subchapter 8 also imposes SOTA requirement if the potential emissions of criteria pollutants and HAPS exceed the NJDEP SOTA thresholds specified in Appendix 1, Tables A and B. Potential emissions of all pollutants are below their respective NJDEP SOTA thresholds, therefore a SOTA analysis for the PennEast permitted sources is not required.

Texas Eastern is submitting a facility wide risk assessment which includes the entire Lambertville Compressor Station and PennEast Station as described in Section 7 and the proposed protocol in Appendix D. The results of the risk assessment will be provided under separate cover.

5.6.3. Subchapter 16 "Control and Prohibition of Air Pollution by Volatile Organic Compounds"

N.J.A.C. 7:27-16.9 applies to any stationary combustion turbine that is subject to the provisions of N.J.A.C. 7:27-19 (NO_X RACT Rule) except for emergency generators. As outlined below, pursuant to N.J.A.C. 7:27-19(c)(2), the proposed Taurus 70 turbines are subject to the NO_X RACT Rule. The provisions in N.J.A.C. 7:27-16.9 establish VOC and CO limits of 50 ppm and 250 ppm respectively for stationary gas turbines. These limits apply during all modes of operation. Since the turbines will not utilize CO or VOC CEMS, compliance with these limits will be determined through stack testing in accordance with N.J.A.C. 7:27-16.9(i) for CO and 16.9(g) for VOC.

N.J.A.C. 7:27-16.8(c) requires boilers and heaters less than 50 MMBtu/hr to adjust the combustion process annually. Subchapter16 does not apply to emergency generators.

N.J.A.C. 7:27-16.21 establishes record keeping, reporting and control technology requirements for natural gas pipeline blowdown events[26]. Texas Eastern is currently subject to these provisions as required by the Lambertville Station's Title V permit (BOP14001, GR1, Ref.# 1 - 3). These provisions will also apply to the potential pipeline releases from the proposed PennEast Interconnect Project equipment. Requirements include the preparation of a control measure plan for blowdown events which identifies control technologies/procedures for reducing VOC emissions. These control technologies/procedures can include pipeline pressure reductions, use of mobile compressors for recompressing and the use of control apparatus. Texas Eastern already has a plan in place for its operations in New Jersey. PennEast will develop and implement

[26] Per N.J.A.C. 7:27-16.1 "blowdown event" means the non-emergency release of natural gas from a pipeline for the purposes of inspection, maintenance, or repair and where, in the absence of control, more than 2,000 pounds of VOC could be released to the atmosphere.

a control measure plan for blowdown events under their control. In addition, PennEast will maintain and submit a record of blowdown events each year in accordance with N.J.A.C. 7:27-16.21(c).

5.6.4. Subchapter 17 "Control and Prohibition of Air Pollution by Toxic Substances"

N.J.A.C. 7:27-17 applies to any source or equipment that has the potential to emit any Group 1 or Group 2 air toxic (TXS) at a rate greater than 0.1 lb/hr. Group 1 TXS include benzene, which is a constituent of natural gas. Subchapter 17 requires sources emitting any Group 1 TXS to have a stack height of at least 40 feet above grade , no less than 20 feet higher than any area of human use or occupancy, and with a vertical discharge.

Based on the updated emissions calculation methodology for gas releases discussed in Section 2, Enbridge is increasing the stacks on the following existing gas release points at the Lambertville Compressor Station because they have the potential to emit benzene at a rate greater than 0.1 lb/hr assuming a worst case gas quality coupled with a high volume, intermittent release (e.g., associated with a unit blowdown). These stack are identified as follows in the Title V permit:

- V1-302 associated with IS2 and IS3. This vent should be identified as the Recip Case Vent Blowdown Separator.
- V1-322 associated with IS4 through IS7. This vent should be identified as the EMD Case Vent Blowdown Separator.
- V2-322 associated with IS9 and IS10. This vent should be identified as the Pig Receiver Separator.

Also, the new gas release vents that are to be installed for the new Taurus 70 turbines could potentially emit benzene at a rate higher than 0.1 lb/hr assuming a worst case gas quality coupled with a high volume, intermittent release. As such, these stacks will be constructed to meet Subchapter 17 stack height requirements.

5.6.5. Subchapter 18 "Control and Prohibition of Air Pollution from New or Altered Sources Affecting Ambient Air Quality (Emission Offset Rules)"

Establishes emission offsets and LAER requirements for defined major projects. As demonstrated in Section 5.3, the proposed projects at the Lambertville Compressor Station will not trigger the requirements of Subchapter 18.

5.6.6. Subchapter 19 "Control and Prohibition of Air Pollution by Oxides of Nitrogen"

Proposed N.J.A.C. 7:27-19.5(l) limits NO_x emissions from simple cycle combustion turbines burning natural gas and compressing gaseous fuel at major NO_X facilities to no more than 42 ppmvd of NO_X @ 15% O_2. This rule was finalized and became effective November 6, 2017. The proposed NO_X limit for the Solar Taurus 70 turbines is in compliance with the NO_X RACT rule. The compliance demonstration requirements in N.J.A.C. 7:27-19.15(a)(2) requires that NO_X testing to demonstrate compliance with this rule be conducted concurrently with CO testing to demonstrate compliance with the applicable CO emissions limits in N.J.A.C. 7:27-16.9.

In addition, the PennEast heaters are subject to an annual combustion adjustment per N.J.A.C. 7:27-19.7(g). The emergency generators are only subject to the recordkeeping requirements under N.J.A.C. 7:27-19.11.

5.6.7. Subchapter 22 "Operating Permits"

The facility is submitting this significant Title V modification application pursuant to N.J.A.C. 7:27-22. N.J.A.C. 7:27-22.8 requires new sources and modifications to perform a risk assessment for any hazardous air pollutant with potential emissions greater than or equal to the NJDEP reporting thresholds. Texas Eastern performed a facility-wide risk assessment which demonstrates the project does not have the potential to pose a health risk. See Section 7 and Appendix D for the proposed risk assessment protocol.

In addition, N.J.A.C. 7:27-22.35 requires SOTA for any equipment with greater than five (5) tons per year potential to emit (PTE) for criteria pollutants. For the proposed projects at Lambertville Compressor Station, pollutants subject to SOTA only include NO_X, CO and SO_2 from turbine operations. All other sources have potential emissions of criteria pollutants less than 5 tpy. HAP emissions from all proposed emission units are below their SOTA applicability thresholds. A detailed SOTA analysis is included in Section 6 of this application.

In accordance with N.J.A.C. 7:27-22.8 an air quality impact analysis is required if (1) the proposed project triggers PSD review, (2) The proposed project results in a significant net emissions increase pursuant to the procedures in Subchapter 18, (3) The application includes relocation of a temporary facility to a site not specifically authorized in the operating permit, and air quality simulation modeling or risk assessment was required for the location(s) authorized in the operating permit; or (4) The application includes source operations which, based on screening procedures published in technical manuals by the Department, have the potential to cause any of the adverse air quality effects.

While the proposed projects at the Lambertville Compressor Station do not trigger air dispersion modeling based on the regulatory criteria above, Texas Eastern is submitting an air quality impact assessment under separate cover as described in Section 7 and the proposed protocol in Appendix C to demonstrate that the Lambertville Compressor Station and PennEast Station, post projects, will not cause or contribute to a violation of the NAAQS for any pollutant and will not exceed the PSD Class II increment for any pollutant.

As previously mentioned, Texas Eastern is also submitting a facility wide risk assessment which includes the entire Lambertville Compressor Station and PennEast Station as described in Section 7 and the proposed protocol in Appendix D. The results of the risk assessment is being provided under separate cover.

6. STATE OF THE ART (SOTA) CONTROL TECHNOLOGY ANALYSIS

6.1. OVERVIEW

As per N.J.A.C. 7:27-22.35(c), for any equipment with greater than five (5) tons per year potential to emit (PTE), an applicant is required to document advances in the art of air pollution control (or SOTA). SOTA is defined as equipment, devices, methods or techniques as determined by the NJDEP which will prevent, reduce or control emissions of an air contaminant to the maximum degree possible and which are available or may be made available. SOTA for various sources is well defined based upon previous permitting efforts or emission levels presented in NJDEP SOTA Manuals. If no SOTA manual exists for a certain source category, a case by case SOTA analysis shall be performed using a "top-down" approach.

6.2. POLLUTANTS SUBJECT TO SOTA

As defined in Section 1.4 of the SOTA Manual (July 1997), compliance with SOTA requirements can be shown through documentation of compliance with emission levels or technology requirements defined in an applicable SOTA Manual. Criteria pollutants for which potential emissions are below 5 tpy are not subject to NJDEP SOTA requirements. For HAPs, the SOTA thresholds vary by species.

For the proposed projects at the Lambertville Compressor Station, pollutants subject to SOTA only include NO_X, CO and SO_2 from the proposed Taurus 70 turbines. All other sources have potential emissions of criteria pollutants less than 5 tpy. HAP emissions from all proposed emission units are below the SOTA applicability thresholds.

Note that throughout this section, "ppm" concentration levels for gaseous pollutants are parts per million by volume, dry basis, corrected to 15% O_2 content (ppmvd @ 15% O_2), unless otherwise noted. Likewise, all emission factors expressed as pounds of pollutant per million Btu of fuel (lb/MMBtu) are based upon the higher heating value (HHV) of the fuel.

A SOTA analysis has been performed for the proposed turbines based upon guidance presented in NJDEP's State of the Art (SOTA) Manual for Combustion Turbines" (December, 2004).

6.3. TURBINES – NO_X SOTA

The formation of NO_x in combustion units is determined by the interaction of chemical and physical processes occurring within the combustion chamber. There are two principal forms of NO_x, designated as "thermal" NO_x and "fuel" NO_x. Thermal NO_x formation is the result of oxidation of atmospheric nitrogen contained in the inlet gas in the high temperature, post flame region of the combustion zone. The major factors influencing thermal NO_x formation are temperature, concentrations of nitrogen and oxygen in the inlet air and residence time within the combustion zone. Fuel NO_x is formed by the oxidation of fuel bound nitrogen. NO_x formation can be controlled by adjusting the combustion process and/or by installing post combustion controls.

The NJDEP SOTA Manual for stationary combustion turbines with heat inputs between 10 and 100 MMBtu/hr specify a NO_X emission rate of 25 ppm for natural gas fired simple cycle combustion turbines by means of dry low NO_X combustion technology.

The proposed Solar Taurus 70 turbines will utilize SoLoNO$_X$ technology, which is a type of dry low NO$_X$ combustion technology from Solar Turbines, a turbine manufacturer. The new turbines are guaranteed by the vendor to achieve 9 ppm$_{vd}$ NO$_X$ @ 15% O$_2$ under normal operating conditions. This guarantee is possible due to improvements and refinements of several of the technologies implemented in 15 ppm NO$_X$ capable turbines such as the Augmented Backside Cooled (ABC) combustor liner, parallel fuel valves, fuels system upgrades, closed loop pilot, and injector improvements. Specifically to reach 9 ppm, the control algorithm is changed to operate directly off calculated primary zone temperature allowing for more precise burner temperature control with varying ambient conditions across the load range which results in tighter control of emissions. Primary zone temperature control requires the addition of several different new measurements in the engine which are not standard for the 15 ppm configuration. These modifications allow for a lower vendor guarantee. It should be noted that these improvements are inherent in the design of the turbine's combustion chamber itself.

6.4. TURBINES - CO SOTA

The formation of CO in the exhaust of a combustion turbine is the result of incomplete combustion of fuel. Several conditions can lead to incomplete combustion, including insufficient O$_2$ availability, poor air/fuel mixing, cold wall flame quenching, reduced combustion temperature, decreased combustion residence time and load reduction. By controlling the combustion process carefully, CO emissions can be minimized.

The NJDEP SOTA Manual for stationary combustion turbines with heat inputs between 10 and 150 MMBtu/hr specify an CO emission rate of 50 ppm[27] (natural gas firing, simple cycle mode) by means of good combustion practices.

The proposed Solar Taurus 70 turbines will utilize an oxidation catalyst to control CO emissions by 95 wt.%. (or 1.25 ppm$_{vd}$ @ 15% O$_2$ under normal operating conditions).

6.5. TURBINES - SO$_2$ SOTA

Emissions of SO$_2$ from natural gas-fired combustion sources are inherently low due to small amounts of sulfur containing compounds in the fuel. The NJDEP SOTA Manual does not present performance levels or control technologies for SO$_2$ emissions, but does mention that permit limits for SO$_2$ emissions would be based on fuel type. The proposed turbines will exclusively burn natural gas (maximum sulfur content of 5.0 grains/100 scf per tariff requirements), which results in very low emission levels of SO$_2$. The SO$_2$ emission rate proposed for the Solar Taurus 70 turbines is 14.29 lb/MMscf based on AP-42,Table 3.1-2a and the tariff limit.

[27] During low load operating scenario (<30% of base load capacity), CO emissions shall not exceed 250 ppmvd at 15% O$_2$.

7. DISPERSION MODELING ANALYSIS

In accordance with N.J.A.C. 7:27-22.8 an air quality impact analysis is required if (1) the proposed project triggers PSD review, (2) The proposed project results in a significant net emissions increase pursuant to the procedures in Subchapter 18, (3) The application includes relocation of a temporary facility to a site not specifically authorized in the operating permit, and air quality simulation modeling or risk assessment was required for the location(s) authorized in the operating permit; or (4) The application includes source operations which, based on screening procedures published in technical manuals by the Department, have the potential to cause any of the adverse air quality effects.

While the proposed projects do not trigger the air dispersion modeling requirements outlined above, Texas Eastern will provide a facility-wide air quality impact assessment for the Lambertville Compressor Station under separate cover to demonstrate that the station configuration, post-projects, will not cause or contribute to a violation of the NAAQS for any pollutant and not exceed the PSD Class II increment for any pollutant. This assessment will take into consideration the sources associated with the PennEast Interconnect Project that will be owned and operated by PennEast, in addition to all sources to be permitted under the Lambertville Compressor Station's modified Title V permit.

In addition to the NAAQS analysis, the facility will perform a facility-wide risk analysis[28] to ascertain the potential health effects of the facility. The risk analysis will demonstrate that the long-term cancer risk for each individual HAP, as well as the cumulative effects of all HAPs, is less than one in a million. The same is true for the long-term and short-term hazard indices, with each individual HAP as well as the cumulative effects of all HAPs being less than one.

The refined dispersion modeling protocols for the NAAQS assessment and facility wide risk assessment are included as Appendix C and Appendix D, respectively.

[28] In order to be conservative, it should be noted Texas Eastern voluntarily prepared the risk assessment using the proposed (lower) NJDEP HAP reporting thresholds which are not yet finalized.

ATTACHMENT A: NJDEP RADIUS APPLICATION

TEXAS EASTERN TRANSMISSION LP - LAMBERTVILLE (80337) Date: 11/14/201

New Jersey Department of Environmental Protection
Reason for Application

Permit Being Modified

Permit Class: BOP **Number:** 140001

Description of Modifications: This application seeks approval from the New Jersey Department of Environmental Protection (NJDEP) for three separate and independent permitting actions as follows:

1) Reconciliation of Texas Eastern's current understanding of potential emissions from non-source fugitive emissions from station piping components and for miscellaneous gas releases associated with maintenance activities with historical estimates made in air permit applications submitted for the Lambertville Compressor Station.

Reconciled estimates for potential emissions (in tpy) from currently listed sources in the Title V permit for the facility are as below;

NJID	VOC	NOX	CO	SO2	TSP	PM10	HAPs
FG1	8.4115						0.8106
IS1	0.1616	0.8015	0.7010	0.1196	0.0636	0.0636	0.0372
IS2 - IS15	14.0041						0.4204
IS16	0.0013						
IS17	0.0001						
IS18	0.0011						0.0011
IS19	0.0001						0.0001
IS20	0.0639						0.0040

2) The Lambertville East Expansion Project involves the replacement of the two existing natural gas-fired Dresser Clark model DC 990 compressor turbines (Emission Unit U1) with two new lower NOx-emitting natural gas-fired Solar Taurus 70 compressor turbines. This project is being implemented as part of a system-wide project scheduled to begin construction in 2019. The project will also provide for compliance with the recently published amendments to Title 7, Chapter 27 of the New Jersey Administrative Code, N.J.A.C. 7:27, which pertain to Reasonably Available Control Technology (RACT) requirements for NOx (N.J.A.C. 7:27-19: Control and Prohibition of Air Pollution from Oxides of Nitrogen or "NOx RACT rule").

3) The PennEast Interconnect Project involves the construction of connecting piping and associated flow control devices (metering and regulating equipment) in order to receive natural gas via the PennEast pipeline, owned and operated by PennEast Pipeline Company, LLC (PennEast), at the Lambertville Compressor Station.

Please refer to attached project application report for more details on proposed project details, project emissions quantification, regulatory applicability review, SOTA analysis, and dispersion modeling analysis.

Texas Eastern is also requesting administrative revisions to the contact information as listed in the various Contact Types of the Facility Profile section of this application.

New Jersey Department of Environmental Protection
Facility Profile (General)

Facility Name (AIMS): TEXAS EASTERN TRANSMISSION LP - L **Facility ID (AIMS):** 80337

Street Address: TEXAS EASTERN TRANSMISSION LP
1325 HWY 179
LAMBERTVILLE, NJ 80530-3506

Mailing Address: TEXAS EASTERN TRANSMISSION LP
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LAMBERTVILLE, NJ 80530-3506

State Plane Coordinates:

X-Coordinate:

Y-Coordinate:

Units:

Datum:

Source Org.:

Source Type:

County: Hunterdon

Location Description: Natural Gas Compressor Station

Industry:

Primary SIC:

Secondary SIC:

NAICS: 486210

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: Air Permit Information Contact

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New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: General Contact

Organization: Texas Eastern Transmission, L.P. **Org. Type:** LP
Name: Aaron Landeryou **NJ EIN:** 00720790164
Title: Supervisor EHS NE
Phone: (617) 560-1339 x
Fax: (617) 560-1400 x
Other: ( ) - x
Type:
Email: Aaron.Landeryou@enbridge.com

Mailing Address: Enbridge
Texas Eastern Transmission,L.P.
890 Winter Street, Suite 300
Waltham, MA 02451

Contact Type: On-Site Manager

Organization: Texas Eastern Transmission, L.P. **Org. Type:** LP
Name: Geoffrey Towle **NJ EIN:** 00720790164
Title: Supervisor Associate
Phone: (609) 397-0070 x7001
Fax: ( ) - x
Other: ( ) - x
Type:
Email: Geoffrey.Towle@enbridge.com

Mailing Address: Texas Eastern Transmission, L.P.
1325 Highway 179
Lambertville, NJ 08530

Contact Type: Owner (Current Primary)

Organization: Texas Eastern Transmission, L.P. **Org. Type:** LP
Name: Texas Eastern Transmission, L.P. **NJ EIN:** 00720790164
Title: Owner
Phone: (713) 627-5300 x
Fax: (713) 989-8320 x
Other: ( ) - x
Type:
Email:

Mailing Address: Enbridge
Texas Eastern Transmission, L.P.
PO Box 1642
Houston, TX 77251-1642

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: Responsible Official

Organization: Texas Eastern Transmission, L.P.

Org. Type: LP

Name: Thomas V. Wooden, Jr.

NJ EIN: 00720790164

Title: VP - Gas Transmissions Operations

Phone: (713) 627-5300 x

Fax: (713) 989-8320 x

Other: ( ) - x

Type:

Email: Thomas.Wooden@enbridge.com

Mailing Address: Enbridge
Texas Eastern Transmission, L.P.
PO Box 1642
Houston, TX 77251-1642

New Jersey Department of Environmental Protection
Facility Profile (Permitting)

1. Is this facility classified as a small business by the USEPA?	No
2. Is this facility subject to N.J.A.C. 7:27-22?	Yes
3. Are you voluntarily subjecting this facility to the requirements of Subchapter 22?	No
4. Has a copy of this application been sent to the USEPA?	No
5. If not, has the EPA waived the requirement?	No
6. Are you claiming any portion of this application to be confidential?	No
7. Is the facility an existing major facility?	Yes
8. Have you submitted a netting analysis?	Yes
9. Are emissions of any pollutant above the SOTA threshold?	Yes
10. Have you submitted a SOTA analysis?	Yes

11. If you answered "Yes" to Question 9 and "No" to Question 10, explain why a SOTA analysis was not required

12. Have you provided, or are you planning to provide air contaminant modeling? Yes

Air Contaminant(s)	
Name	**CAS Number**
Acrolein	00107-02-8
Benzene	00071-43-2
Butadiene (1,3-)	00106-99-0
CO	
Ethylene dibromide	00106-06-2
Formaldehyde	00050-00-0
Nitrogen oxides (NOx)	
PM-10 (Total)	
PM-2.5 (Total)	
Polynuclear aromatic hydrocarbons (PAHs)	
SO2	

TEXAS EASTERN TRANSMISSION LP - LAMBERTVILLE (80337)

Date: 11/14/2017

New Jersey Department of Environmental Protection
Non-Source Fugitive Emissions

FG NJID	Description of Activity Causing Emission	Location Description	Reasonable Estimate of Emissions (tpy)								
			VOC (Total)	NOx	CO	SO	TSP (Total)	PM-10	Pb	HAPS (Total)	Other (Total)
FG2	PennEast Piping Components	Piping Components	2.474							0.31800000	

Total									

TEXAS EASTERN TRANSMISSION LP - LAMBERTVILLE (80337) Date:11/14/2017

New Jersey Department of Environmental Protection
Insignificant Source Emissions

IS NJID	Source/Group Description	Equipment Type	Location Description	Estimate of Emissions (tpy)								
				VOC (Total)	NOx	CO	SO	TSP	PM-10	Pb	HAPS (Total)	Other (Total)
IS21	Existing 1,880 gallon pipeline liquid storage tank (<2,000 gallons each & VOC TVP < 0.02 psia at 70F)	Storage Vessel		0.760							0.04620000	
IS22	Existing Parts Washer	Other Equipment		0.410								
IS31	PennEast Gas Releases	Other Equipment		3.054							0.06990000	
IS32	PennEast 1,000 gallon pipeline liquid storage tank (<2,000 gallons each & VOC TVP < 0.02 psia at 70F)	Storage Vessel		0.637							0.03840000	
IS33	PennEast Pipeline liquids loading (no control device required)	Other Equipment		0.016							0.00100000	
IS34	PennEast Coolant Tanks (<2,000 gallons each & VOC TVP < 0.02 psia at 70F)	Storage Vessel		0.000							0.00040000	
IS35	PennEast Coolant Tanks Loading (no control device required)	Other Equipment		0.000							0.00000000	

New Jersey Department of Environmental Protection
Insignificant Source Emissions

IS NJID	Source/Group Description	Equipment Type	Location Description	Estimate of Emissions (tpy)								
				VOC (Total)	NOx	CO	SO	TSP	PM-10	Pb	HAPS (Total)	Other (Total)
IS36	Lambertville Station Pipeline Liquids Storage Tanks (<2,000 gallons each & VOC TVP < 0.02 psia at 70F)	Storage Vessel		0.036							0.00220000	
Total				6.339	0.000	0.000	0.000	0.000	0.000	0.000	0.21390000	0.000

New Jersey Department of Environmental Protection
Equipment Inventory

Equip. NJID	Facility's Designation	Equipment Description	Equipment Type	Certificate Number	Install Date	Grand-Fathered	Last Mod. (Since 1968)	Equip. Set ID
E14	32301	Gas Turbine- Solar Taurus 70, T3	Combustion Turbine		3/1/2019	No		
E15	32302	Gas Turbine- Solar Taurus 70, T4	Combustion Turbine		3/1/2019	No		
E16	32401	Emergency Generator- Waukesha	Emergency Generator		3/1/2019	No		
E17	33101	Penn East CB Heater 1	Process Heater		3/1/2019	No		
E18	33102	Penn East CB Heater 2	Process Heater		3/1/2019	No		
E19	33103	Penn East CB Heater 3	Process Heater		3/1/2019	No		
E20	33104	Penn East CB Heater 4	Process Heater		3/1/2019	No		
E21	33105	Penn East CB Heater 5	Process Heater		3/1/2019	No		
E22	33106	Penn East CB Heater 6	Process Heater		3/1/2019	No		
E23	33107	Penn East CB Heater 7	Process Heater		3/1/2019	No		
E24	33108	Penn East CB Heater 8	Process Heater		3/1/2019	No		
E25	33109	Penn East Emergency Generator- Caterpillar	Emergency Generator		3/1/2019	No		

000000 E14 (Combustion Turbine)
Print Date: 11/14/2017

Make:	Solar Turbines		
Manufacturer:			
Model:	Taurus 70		
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	93.97		
Type of Turbine:	Industrial		
Type of Cycle:	Simple-Cycle	Description:	
Industrial Application:	Compressor	Description:	
Power Output:	10,915.00	Units:	BHP

Is the combustion turbine using (check all that apply):

A Dry Low NOx Combustor:	☑		
Steam Injection:	☐	Steam to Fuel Ratio:	
Water Injection:	☐	Water to Fuel Ratio:	
Other:	☐	Description:	

Is the turbine Equipped with a Duct Burner? ○ Yes ● No

Have you attached a diagram showing the location and/or the configuration of this equipment? ● Yes ○ No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application? ● Yes ○ No

Comments: SoLoNOx

000000 E15 (Combustion Turbine)
Print Date: 11/14/2017

Make:	Solar Turbines		
Manufacturer:			
Model:	Taurus 70		
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	93.97		
Type of Turbine:	Industrial		
Type of Cycle:	Simple-Cycle	Description:	
Industrial Application:	Compressor	Description:	
Power Output:	10,915.00	Units:	BHP

Is the combustion turbine using (check all that apply):

A Dry Low NOx Combustor:	☑		
Steam Injection:	☐	Steam to Fuel Ratio:	
Water Injection:	☐	Water to Fuel Ratio:	
Other:	☐	Description:	

Is the turbine Equipped with a Duct Burner? ○ Yes ● No

Have you attached a diagram showing the location and/or the configuration of this equipment? ● Yes ○ No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application? ● Yes ○ No

Comments: SoLoNOx

000000 E16 (Emergency Generator)
Print Date: 11/14/2017

Make:	Waukesha
Manufacturer:	
Model:	VGF36GL
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	6.96
Will the equipment be used in excess of 500 hours per year?	○ Yes ● No

Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No

Comments:

000000 E17 (Process Heater)
Print Date: 11/14/2017

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

000000 E18 (Process Heater)
Print Date: 11/14/2017

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment? ○ Yes ● No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application? ○ Yes ● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

000000 E20 (Process Heater)
Print Date: 11/14/2017

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

000000 E21 (Process Heater)
Print Date: 11/14/2017

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

000000 E22 (Process Heater)
Print Date: 11/14/2017

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment? ○ Yes ● No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application? ○ Yes ● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

000000 E23 (Process Heater)
Print Date: 11/14/2017

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment?
○ Yes
● No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?
○ Yes
● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

000000 E24 (Process Heater)
Print Date: 11/14/2017

Make:	Cleaver Brooks
Manufacturer:	
Model:	CFLC-10000
Equipment Type Description:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	10.00
Draft Type:	Forced
Firing Method:	Direct

Is the Process Heater using (check all that apply):

Low NOx Burner	☑
Type of Low NOx Burner:	
Flue Gas Recirculation (FGR):	☐

Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No

Comments:

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

000000 E25 (Emergency Generator)
Print Date: 11/14/2017

Make:	Caterpillar
Manufacturer:	
Model:	G3412C
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	6.12
Will the equipment be used in excess of 500 hours per year?	○ Yes ● No

Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No

Comments:

New Jersey Department of Environmental Protection
Control Device Inventory

CD NJID	Facility's Designation	Description	CD Type	Install Date	Grand-Fathered	Last Mod. (Since 1968)	CD Set ID
CD3	OXY CAT - T3	Oxidation Catalyst T3	Oxidizer (Catalytic)	3/1/2019	No		
CD4	OXY CAT - T4	Oxidation Catalyst T4	Oxidizer (Catalytic)	3/1/2019	No		

000000 CD3 (Oxidizer (Catalytic))
Print Date: 11/14/2017

Make:	BASF or Equivalent
Manufacturer:	
Model:	BASF Corp. Camet CO Catalyst
Minimum Inlet Temperature (°F):	800.0
Maximum Inlet Temperature (°F)	1250.0
Minimum Outlet Temperature (°F)	
Maximum Outlet Temperature (°F):	
Minimum Residence Time (sec)	
Fuel Type:	
Description:	
Maximum Rated Gross Heat Input (MMBtu/hr):	
Minimum Pressure Drop Across Catalyst (psi):	
Maximum Pressure Drop Across Catalyst (psi):	
Catalyst Material:	
Form of Catalyst:	Other
Description:	Cat. Coated Metal Foil
Minimum Expected Life of Catalyst:	20000.00
Units:	hours
Volume of Catalyst (ft^3):	0.64
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	○ Yes ● No
Comments:	

000000 CD4 (Oxidizer (Catalytic))
Print Date: 11/14/2017

Make:	BASF or Equivalent
Manufacturer:	
Model:	BASF Corp. Camet CO Catalyst
Minimum Inlet Temperature (°F):	800.0
Maximum Inlet Temperature (°F)	1250.0
Minimum Outlet Temperature (°F)	
Maximum Outlet Temperature (°F):	
Minimum Residence Time (sec)	
Fuel Type:	
Description:	
Maximum Rated Gross Heat Input (MMBtu/hr):	
Minimum Pressure Drop Across Catalyst (psi):	
Maximum Pressure Drop Across Catalyst (psi):	
Catalyst Material:	
Form of Catalyst:	Other
Description:	Cat. Coated Metal Foil
Minimum Expected Life of Catalyst:	20000.00
Units:	hours
Volume of Catalyst (ft^3):	0.64
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	Yes ○ No ●
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	Yes ○ No ●
Have you attached a diagram showing the location and/or configuration of this control apparatus?	Yes ○ No ●
Comments:	

TEXAS EASTERN TRANSMISSION LP - LAMBERTVILLE (80337)

Date: 11/14/2017

New Jersey Department of Environmental Protection
Emission Points Inventory

PT NJID	Facility's Designation	Description	Config.	Equiv. Diam. (in.)	Height (ft.)	Dist. to Prop. Line (ft)	Exhaust Temp. (deg. F)			Exhaust Vol. (acfm)			Discharge Direction	PT Set ID
							Avg.	Min.	Max.	Avg.	Min.	Max.		
PT14	32301	Gas Turbine- Solar Taurus 70, T3	Round	51	60	136	933.0	880.0	1,043.0	128,001.0	91,803.0	136,400.0	Up	
PT15	32302	Gas Turbine- Solar Taurus 70, T4	Round	51	60	206	933.0	880.0	1,043.0	128,001.0	91,803.0	136,400.0	Up	
PT16	32401	Emergency Generator- Waukesha	Round	7	22	143	843.0			4,760.0			Up	
PT17	33101	Penn East CB Heater 1	Round	20	26	101	200.0			2,500.0			Up	
PT18	33102	Penn East CB Heater 2	Round	20	26	101	200.0			2,500.0			Up	
PT19	33103	Penn East CB Heater 3	Round	20	26	101	200.0			2,500.0			Up	
PT20	33104	Penn East CB Heater 4	Round	20	26	101	200.0			2,500.0			Up	
PT21	33105	Penn East CB Heater 5	Round	20	26	66	200.0			2,500.0			Up	
PT22	33106	Penn East CB Heater 6	Round	20	26	66	200.0			2,500.0			Up	
PT23	33107	Penn East CB Heater 7	Round	20	26	66	200.0			2,500.0			Up	
PT24	33108	Penn East CB Heater 8	Round	20	26	66	200.0			2,500.0			Up	
PT25	33201	Penn East Emergency Generator- Caterpillar	Round	3	10	53	990.0			2,422.0			Up	

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 8 GT (2) Two (2)- Gas Turbines- Solar Taurus 70 (32301 & 32302)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	32301-N	T3 - Normal Operation	Normal - Steady State	E14	CD3 (P)	PT14	2-02-002-01	0.0	8,760.0		91,803.0	133,544.0	888.0	1,043.0
OS2	32301-LT	T3 - Low Temperature Operation (Amb. Temp - 0F >T> -20F)	Normal - Steady State	E14	CD3 (P)	PT14	2-02-002-01	0.0	2.0		112,401.0	136,400.0	880.0	908.0
OS3	32301-SU	T3 - Startup	Startup	E14		PT14	2-02-002-01	0.0	39.0		37,728.0	65,522.0	633.0	912.0
OS4	32301-SD	T3 - Stutdown	Shutdown	E14	CD3 (P)	PT14	2-02-002-01	0.0	37.0		59,676.0	65,522.0	634.0	844.0
OS5	32302-N	T4 - Normal Operation	Normal - Steady State	E15	CD4 (P)	PT15	2-02-002-01	0.0	8,760.0		91,803.0	133,544.0	888.0	1,043.0
OS6	32302-LT	T4 - Low Temperature Operation (Amb. Temp - 0F >T> -20F)	Normal - Steady State	E15	CD4 (P)	PT15	2-02-002-01	0.0	2.0		112,401.0	136,400.0	880.0	908.0
OS7	32302-SU	T4 - Startup	Startup	E15		PT15	2-02-002-01	0.0	39.0		37,728.0	65,522.0	633.0	912.0
OS8	32302-SD	T4 - Stutdown	Shutdown	E15	CD4 (P)	PT15	2-02-002-01	0.0	37.0		59,676.0	65,522.0	634.0	844.0
OS9	32301-COMM	T3 - Commissioning	Normal - Steady State	E14		PT14	2-02-002-01							
OS10	32302-COMM	T4 - Commissioning	Normal - Steady State	E15		PT15	2-02-002-01							

TEXAS EASTERN TRANSMISSION LP - LAMBERTVILLE (80337)

Date: 11/14/2017

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 9 EG WAU 2 Emergency Generator- Waukesha

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	32401	Emergency Generator - Waukesha	Standby	E16		PT16	2-01-002-02	0.0	100.0		4,760.0		843.0	

U 10 PENN HTR (8) Penn East Heaters- CFLC (10.5 MMBtu/hr) (33101 to 33108)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	33101	Penn East Heaters 1	Normal - Steady State	E17		PT17	1-02-006-02	0.0	8,760.0			2,500.0		200.0
OS2	33102	Penn East Heaters 2	Normal - Steady State	E18		PT18	1-02-006-02	0.0	8,760.0			2,500.0		200.0
OS3	33103	Penn East Heaters 3	Normal - Steady State	E19		PT19	1-02-006-02	0.0	8,760.0			2,500.0		200.0
OS4	33104	Penn East Heaters 4	Normal - Steady State	E20		PT20	1-02-006-02	0.0	8,760.0			2,500.0		200.0
OS5	33105	Penn East Heaters 5	Normal - Steady State	E21		PT21	1-02-006-02	0.0	8,760.0			2,500.0		200.0
OS6	33106	Penn East Heaters 6	Normal - Steady State	E22		PT22	1-02-006-02	0.0	8,760.0			2,500.0		200.0
OS7	33107	Penn East Heaters 7	Normal - Steady State	E23		PT23	1-02-006-02	0.0	8,760.0			2,500.0		200.0
OS8	33108	Penn East Heaters 8	Normal - Steady State	E24		PT24	1-02-006-02	0.0	8,760.0			2,500.0		200.0

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 11 PENN EG CAT Penn East Emergency Generator- Caterpillar

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	33201	Penn East Emergency Generator - Caterpillar	Standby	E25		PT25	2-01-002-02	0.0	100.0		2,422.0		990.0	

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS0 Summary**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Butadiene (1,3-)		0.00242000	0.00166800	0.00166800	tons/yr	No
Acetaldehyde		0.22400000	0.11360000	0.11360000	tons/yr	No
Acrolein		0.03600000	0.02480000	0.02480000	tons/yr	No
Benzene		0.06740000	0.04660000	0.04660000	tons/yr	No
CO		90.09100000	26.60560000	26.60560000	tons/yr	No
Ethylbenzene		0.17960000	0.12420000	0.12420000	tons/yr	No
Formaldehyde		3.98000000	1.64800000	1.64800000	tons/yr	No
HAPs (Total)		4.67188000	2.08504800	2.08504800	tons/yr	No
Naphthalene		0.00730000	0.00504000	0.00504000	tons/yr	No
NOx (Total)		24.98800000	24.98800000	24.98800000	tons/yr	No
PM-10 (Total)		5.02700000	5.02700000	5.02700000	tons/yr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.01236000	0.00854000	0.00854000	tons/yr	No
Propylene oxide		0.16280000	0.11260000	0.11260000	tons/yr	No
SO2		10.66780000	10.66780000	10.66780000	tons/yr	No
TSP		5.02700000	5.02700000	5.02700000	tons/yr	No
VOC (Total)		11.79060000	8.14980000	8.14980000	tons/yr	No

Subject Item: **U8 GT (2)**

Operating Scenario: **OS1**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Butadiene (1,3-)		0.00012900	0.00006460	0.00006460	lb/hr	No
Acetaldehyde		0.01200000	0.00240000	0.00240000	lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS1**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Acrolein		0.00192000	0.00096100	0.00096100	lb/hr	No
Benzene		0.00361000	0.00180000	0.00180000	lb/hr	No
CO		5.03880000	0.25190000	0.25190000	lb/hr	No
Ethylbenzene		0.00961000	0.00481000	0.00481000	lb/hr	No
Formaldehyde		0.21300000	0.01070000	0.01070000	lb/hr	No
HAPs (Total)		0.25000000	0.02560000	0.02560000	lb/hr	No
Naphthalene		0.00039100	0.00019500	0.00019500	lb/hr	No
NOx (Total)		2.97970000	2.97970000	2.97970000	lb/hr	No
PM-10 (Total)		0.60550000	0.60550000	0.60550000	lb/hr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00066100	0.00033000	0.00033000	lb/hr	No
Propylene oxide		0.00871000	0.00436000	0.00436000	lb/hr	No
SO2		1.28490000	1.28490000	1.28490000	lb/hr	No
TSP		0.60550000	0.60550000	0.60550000	lb/hr	No
VOC (Total)		0.63090000	0.31550000	0.31550000	lb/hr	No

Subject Item: **U8 GT (2)**

Operating Scenario: **OS2**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Butadiene (1,3-)		0.00039700	0.00019900	0.00019900	lb/hr	No
Acetaldehyde		0.03700000	0.00739000	0.00739000	lb/hr	No
Acrolein		0.00591000	0.00296000	0.00296000	lb/hr	No
Benzene		0.01110000	0.00554000	0.00554000	lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS2**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		30.98870000	1.54940000	1.54940000	lb/hr	No
Ethylbenzene		0.02960000	0.01480000	0.01480000	lb/hr	No
Formaldehyde		0.65600000	0.03280000	0.03280000	lb/hr	No
HAPs (Total)		0.77000000	0.07870000	0.07870000	lb/hr	No
Naphthalene		0.00120000	0.00060100	0.00060100	lb/hr	No
NOx (Total)		40.72230000	40.72230000	40.72230000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.62020000	0.62020000	0.62020000	lb/hr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00203000	0.00102000	0.00102000	lb/hr	No
Propylene oxide		0.02680000	0.01340000	0.01340000	lb/hr	No
SO2		1.31610000	1.31610000	1.31610000	lb/hr	No
TSP		0.62020000	0.62020000	0.62020000	lb/hr	No
VOC (Total)		1.94020000	0.97010000	0.97010000	lb/hr	No

Subject Item: **U8 GT (2)**

Operating Scenario: **OS3**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO					lb/hr	No
CO		89.47810000	89.47810000	89.47810000	lb/step	No
HAPs (Total)					lb/hr	No
NOx (Total)					lb/hr	No
NOx (Total)		0.92410000	0.92410000	0.92410000	lb/step	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS3**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Pb					lb/hr	No
PM-10 (Total)					lb/hr	No
SO2					lb/hr	No
TSP					lb/hr	No
VOC (Total)					lb/hr	No
VOC (Total)		17.34220000	17.34220000	17.34220000	lb/step	No

Subject Item: **U8 GT (2)**

Operating Scenario: **OS4**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO					lb/hr	No
CO		97.90380000	4.89520000	4.89520000	lb/step	No
HAPs (Total)					lb/hr	No
NOx (Total)					lb/hr	No
NOx (Total)		1.07210000	1.07210000	1.07210000	lb/step	No
Pb					lb/hr	No
PM-10 (Total)					lb/hr	No
SO2					lb/hr	No
TSP					lb/hr	No
VOC (Total)					lb/hr	No
VOC (Total)		8.09110000	4.04560000	4.04560000	lb/step	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS5**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Butadiene (1,3-)		0.00012900	0.00006460	0.00006460	lb/hr	No
Acetaldehyde		0.01200000	0.00240000	0.00240000	lb/hr	No
Acrolein		0.00192000	0.00096100	0.00096100	lb/hr	No
Benzene		0.00361000	0.00180000	0.00180000	lb/hr	No
CO		5.03880000	0.25190000	0.25190000	lb/hr	No
Ethylbenzene		0.00961000	0.00481000	0.00481000	lb/hr	No
Formaldehyde		0.21300000	0.01070000	0.01070000	lb/hr	No
HAPs (Total)		0.25000000	0.02560000	0.02560000	lb/hr	No
Naphthalene		0.00039100	0.00019500	0.00019500	lb/hr	No
NOx (Total)		2.97970000	2.97970000	2.97970000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.60550000	0.60550000	0.60550000	lb/hr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00066100	0.00033000	0.00033000	lb/hr	No
Propylene oxide		0.00871000	0.00436000	0.00436000	lb/hr	No
SO2		1.28490000	1.28490000	1.28490000	lb/hr	No
TSP		0.60550000	0.60550000	0.60550000	lb/hr	No
VOC (Total)		0.63090000	0.31550000	0.31550000	lb/hr	No

Subject Item: **U8 GT (2)**

Operating Scenario: **OS6**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Butadiene (1,3-)		0.00039700	0.00019900	0.00019900	lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS6**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Acetaldehyde		0.03700000	0.00739000	0.00739000	lb/hr	No
Acrolein		0.00591000	0.00296000	0.00296000	lb/hr	No
Benzene		0.01110000	0.00554000	0.00554000	lb/hr	No
CO		30.98870000	1.54940000	1.54940000	lb/hr	No
Ethylbenzene		0.02960000	0.01480000	0.01480000	lb/hr	No
Formaldehyde		0.65600000	0.03280000	0.03280000	lb/hr	No
HAPs (Total)		0.77000000	0.07870000	0.07870000	lb/hr	No
Naphthalene		0.00120000	0.00060100	0.00060100	lb/hr	No
NOx (Total)		40.72230000	40.72230000	40.72230000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.62020000	0.62020000	0.62020000	lb/hr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00203000	0.00102000	0.00102000	lb/hr	No
Propylene oxide		0.02680000	0.01340000	0.01340000	lb/hr	No
SO2		1.31610000	1.31610000	1.31610000	lb/hr	No
TSP		0.62020000	0.62020000	0.62020000	lb/hr	No
VOC (Total)		1.94020000	0.97010000	0.97010000	lb/hr	No

Subject Item: **U8 GT (2)**

Operating Scenario: **OS7**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO					lb/hr	No
CO		89.47810000	89.47810000	89.47810000	lb/step	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS7**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
HAPs (Total)					lb/hr	No
NOx (Total)					lb/hr	No
NOx (Total)		0.92410000	0.92410000	0.92410000	lb/step	No
Pb					lb/hr	No
PM-10 (Total)					lb/hr	No
SO2					lb/hr	No
TSP					lb/hr	No
VOC (Total)					lb/hr	No
VOC (Total)		17.34220000	17.34220000	17.34220000	lb/step	No

Subject Item: **U8 GT (2)**

Operating Scenario: **OS8**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO					lb/hr	No
CO		97.90380000	4.89520000	4.89520000	lb/step	No
HAPs (Total)					lb/hr	No
NOx (Total)					lb/hr	No
NOx (Total)		1.07210000	1.07210000	1.07210000	lb/step	No
Pb					lb/hr	No
PM-10 (Total)					lb/hr	No
SO2					lb/hr	No
TSP					lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U8 GT (2)**

Operating Scenario: **OS8**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
VOC (Total)					lb/hr	No
VOC (Total)		8.09110000	4.04560000	4.04560000	lb/step	No

Subject Item: **U9 EG WAU 2**

Operating Scenario: **OS0 Summary**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Acetaldehyde		0.01220000	0.01220000	0.01220000	tons/yr	No
Acrolein		0.00749000	0.00749000	0.00749000	tons/yr	No
Benzene		0.00064100	0.00064100	0.00064100	tons/yr	No
CO		0.38800000	0.38800000	0.38800000	tons/yr	No
Ethylene dibromide		0.00006450	0.00006450	0.00006450	tons/yr	No
Formaldehyde		0.07690000	0.07690000	0.07690000	tons/yr	No
HAPs (Total)		0.09730000	0.09730000	0.09730000	tons/yr	No
NOx (Total)		0.19400000	0.19400000	0.19400000	tons/yr	No
PM-10 (Total)		0.00350000	0.00350000	0.00350000	tons/yr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00003920	0.00003920	0.00003920	tons/yr	No
SO2		0.00490000	0.00490000	0.00490000	tons/yr	No
TSP		0.00350000	0.00350000	0.00350000	tons/yr	No
VOC (Total)		0.17390000	0.17390000	0.17390000	tons/yr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U9 EG WAU 2**

Operating Scenario: **OS1**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Acetaldehyde		0.24400000	0.24400000	0.24400000	lb/hr	No
Acrolein		0.15000000	0.15000000	0.15000000	lb/hr	No
Benzene		0.01280000	0.01280000	0.01280000	lb/hr	No
CO		7.76010000	7.76010000	7.76010000	lb/hr	No
Ethylene dibromide		0.00129000	0.00129000	0.00129000	lb/hr	No
Formaldehyde		1.54000000	1.54000000	1.54000000	lb/hr	No
HAPs (Total)		1.95000000	1.95000000	1.95000000	lb/hr	No
NOx (Total)		3.88010000	3.88010000	3.88010000	lb/hr	No
PM-10 (Total)		0.06950000	0.06950000	0.06950000	lb/hr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00078400	0.00078400	0.00078400	lb/hr	No
SO2		0.09740000	0.09740000	0.09740000	lb/hr	No
TSP		0.06950000	0.06950000	0.06950000	lb/hr	No
VOC (Total)		3.47800000	3.47800000	3.47800000	lb/hr	No

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS0 Summary**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		12.88240000	12.88240000	12.88240000	tons/yr	No
Formaldehyde		0.01472000	0.01472000	0.01472000	tons/yr	No
HAPs (Total)		0.01472000	0.01472000	0.01472000	tons/yr	No
NOx (Total)		3.80400000	3.80400000	3.80400000	tons/yr	No
PM-10 (Total)		2.61120000	2.61120000	2.61120000	tons/yr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS0 Summary**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
SO2		4.90720000	4.90720000	4.90720000	tons/yr	No
TSP		2.61120000	2.61120000	2.61120000	tons/yr	No

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS1**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS2**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS2**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS3**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS4**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS5**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS6**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS7**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U10 PENN HTR (8)**

Operating Scenario: **OS8**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
CO		0.38600000	0.38600000	0.38600000	lb/hr	No
Formaldehyde		0.00044100	0.00044100	0.00044100	lb/hr	No
HAPs (Total)		0.00044100	0.00044100	0.00044100	lb/hr	No
NOx (Total)		0.11400000	0.11400000	0.11400000	lb/hr	No
Pb					lb/hr	No
PM-10 (Total)		0.07820000	0.07820000	0.07820000	lb/hr	No
SO2		0.14710000	0.14710000	0.14710000	lb/hr	No
TSP		0.07820000	0.07820000	0.07820000	lb/hr	No
VOC (Total)		D	D	D	lb/hr	No

Subject Item: **U11 PENN EG CAT**

Operating Scenario: **OS0 Summary**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Acrolein		0.00642000	0.00642000	0.00642000	tons/yr	No
Benzene		0.00055000	0.00055000	0.00055000	tons/yr	No
CO		0.33290000	0.33290000	0.33290000	tons/yr	No
Ethylene dibromide		0.00005500	0.00005500	0.00005500	tons/yr	No
Formaldehyde		0.06600000	0.06600000	0.06600000	tons/yr	No
HAPs (Total)		0.07310000	0.07310000	0.07310000	tons/yr	No
NOx (Total)		0.16640000	0.16640000	0.16640000	tons/yr	No
PM-10 (Total)		0.00306000	0.00306000	0.00306000	tons/yr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00003400	0.00003400	0.00003400	tons/yr	No

New Jersey Department of Environmental Protection
Potential to Emit

Subject Item: **U11 PENN EG CAT**

Operating Scenario: **OS0 Summary**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
SO2		0.00428000	0.00428000	0.00428000	tons/yr	No
TSP		0.00306000	0.00306000	0.00306000	tons/yr	No
VOC (Total)		0.14920000	0.14920000	0.14920000	tons/yr	No

Subject Item: **U11 PENN EG CAT**

Operating Scenario: **OS1**

Step:

Air Contaminant Category (HAPS)	Fugitive Emissions	Emissions Before Controls	Emissions After Controls	Total Emissions	Units	Alt. Em. Limit
Acrolein		0.12800000	0.12800000	0.12800000	lb/hr	No
Benzene		0.01100000	0.01100000	0.01100000	lb/hr	No
CO		6.65780000	6.65780000	6.65780000	lb/hr	No
Ethylene dibromide		0.00111000	0.00111000	0.00111000	lb/hr	No
Formaldehyde		1.32000000	1.32000000	1.32000000	lb/hr	No
HAPs (Total)		1.46000000	1.46000000	1.46000000	lb/hr	No
NOx (Total)		3.32890000	3.32890000	3.32890000	lb/hr	No
PM-10 (Total)		0.06120000	0.06120000	0.06120000	lb/hr	No
Polynuclear aromatic hydrocarbons (PAHs)		0.00067200	0.00067200	0.00067200	lb/hr	No
SO2		0.08580000	0.08580000	0.08580000	lb/hr	No
TSP		0.06120000	0.06120000	0.06120000	lb/hr	No
VOC (Total)		2.98400000	2.98400000	2.98400000	lb/hr	No

APPENDIX A: DETAILED EMISSIONS CALCULATIONS AND MANUFACTURER SPECIFICATIONS

Table 1. Lambertville Compressor Station VOC PTE Reconciliation

Unit Description		VOC (tpy) PTE	CO_2e (tpy) PTE	HAP (tpy) PTE
Station-wide PC and GR Estimates in BOP140001- PTE Pre-Project, Pre-Reconciliation				
LAMT GR	Stationwide Gas Releases[1] (IS02-IS15)	4.144	--	0.2825
Fugitive LAMT-PC	Stationwide Piping Components (FG1)	4.19	--	1.01
Station-wide PC and GR - PTE Pre-Project, Post-Reconciliation				
LAMT GR	Stationwide Gas Releases[1] (IS02-IS15)	10.39	14,109	0.33
Fugitive LAMT-PC	Stationwide Piping Components (FG1)	8.41	1,305	0.81

[1]VOC PTE includes 8.40 tpy due to the VOCs in the natural gas released plus 1.98 tpy VOC due to potential flashing emissions associated with blowdown separators collecting pipeline liquids. HAP PTE includes 0.21 tpy due to HAPs in the natural gas released plus 0.12 tpy HAP due to potential flashing emissions associated with blowdown spearators collecting pipeline liquids.

Table 2. Lambertville Compressor Station Change in Potential to Emit (PTE)

Pollutant	Pre-Project(s) Facility-wide PTE [1] (tpy)	Post-Project(s) Facility-wide PTE (tpy)
NO_X	308.22	50.13
CO	29.93	49.72
$PM_{2.5/10}$	23.45	13.57
SO_2 [2]	1.713	17.40
VOC[3]	38.03	51.59
HAPs[4]	1.91	7.27
CO_2e	72,584	182,265

[1] Pre-project PTE is based on current Title V permit, except for VOC which reflects the reconciliation of non-source fugitives per Section 2 of the application report.

[2] Post-project SO_2 PTE increase is due to the use of the gas tariff sulfur content.

[3] Pre-project VOC PTE calculated as follows:
17.89 tpy (significant source operations) + 10.39 tpy (reconciled IS2 - IS15) + 8.41 tpy (reconciled FG1) + 0.023 tpy (IS1) + 0.152 tpy (IS16 - IS20) + Proposed IS21 - Existing Pipeline Liquids Storage Tank (0.76 tpy) + Proposed IS22 - Existing Parts Washer (0.41 tpy)

[4] Pre-project HAPs PTE values from current Title V permit do not include pollutants below the reporting threshold. Post-project HAPs PTE includes summation of PTE for all HAPs emitted (both above and below the reporting thresholds).

Table 3. Lambertville East Expansion Project Emission Increase (PEI)

Unit Description		VOC (tpy) PTE	NO_2 (tpy) PTE	CO (tpy) PTE	$PM/PM_{10}/PM_{2.5}$ (tpy) PTE	SO_2 (tpy) PTE	CO_2e (tpy) PTE
New Units:							
LAMT-TBC-03	New Solar Taurus 70 turbine (9 ppm)	4.07	12.5	13.3	2.51	5.33	45,244
LAMT-TBC-04	New Solar Taurus 70 turbine (9 ppm)	4.07	12.5	13.3	2.51	5.33	45,244
LAMT-ENGEN 03	New Waukesha VGF36GL EGen	0.17	0.19	0.39	0.003	0.005	86
LAMT-FHTR 01	New Cameron Fuel Gas Heater	0.06	0.16	0.25	0.01	0.02	200
LAMT-FHTR 02	New Cameron Fuel Gas Heater	0.06	0.16	0.25	0.01	0.02	200
LAMT SHTR 05-08	Four New Reznor Space Heaters - Warehouse	0.01	0.10	0.04	0.01	0.01	124
LAMT-SV-V1-C4	44- gallon Pipeline Liquids Storage Tank	0.02	--	--	--	--	0.95
LAMT-SV-V1-C5	44- gallon Pipeline Liquids Storage Tank	0.02	--	--	--	--	0.95
LAMT-GR Prj_Inc	Gas Releases - T03 and T04	3.62	--	--	--	--	6,739
LAMT-GR Prj_Inc	Fugitive Piping Components - T03 and T04	2.44	--	--	--	--	302
Potentially Affected Units[1]:							
LAMT-TK-V5-307	U6: 2,940-gallon Pipeline Liquids Storage Tank	0.46	--	--	--	--	25
LAMT-TK-V5-322	U6: 2,940-gallon Pipeline Liquids Storage Tank	0.46	--	--	--	--	25

[1]Throughput to existing U6 - Two above ground pipeline liquids storage tanks may increase due to proposed project. Increases included at permitted PTE rather than projected actual. There will be no change in U6 permitted PTE as a result of the project.

Table 4. PennEast Interconnect Project Emission Increase (PEI)

Unit Description		VOC (tpy) PTE	NO_2 (tpy) PTE	CO (tpy) PTE	$PM/PM_{10}/PM_{2.5}$ (tpy) PTE	SO_2 (tpy) PTE	CO_2e (tpy) PTE
New Units :							
LAMT GHTR 01-08	8 New Cleaver Brooks Step Down Heaters (10 MMBtu/hr each)	1.61	3.80	12.88	2.61	4.91	41,264
LAMT ENGEN 04	New Caterpillar G3412C EGen	0.15	0.17	0.33	0.003	0.004	75
LAMT GR - PE	New PennEast Gas Releases	3.05	--	--	--	--	5,689
LAMT PC - PE	Fugitive - New PennEast Piping Components	2.47	--	--	--	--	629
LAMT-TK-V5-PE	1000-gallon Pipeline Liquids Storage Tank	0.64	--	--	--	--	19.85
LAMT-TK-V11-PE1	560-gallon Coolant Storage Tank	0.0002	--	--	--	--	--
LAMT-TK-V11-PE2	560-gallon Coolant Storage Tank	0.0002	--	--	--	--	--
LAMT-TL-PL-PE	Pipeline Liquids Truck Loading Area	0.02	--	--	--	--	0.89
LAMT-TL-EC-PE	Coolant Truck Loading Area	0.00	--	--	--	--	--

Prevention of Significant Deterioration (PSD) Calculation Summary:

Table 5. Project Emission Increase (Step 1)

Lambertville East Expansion Project								
Unit Description		**CO_2e Emissions (tpy)**	**NO_2 Emissions (tpy)**	**CO Emissions (tpy)**	**$PM_{2.5}$ Emissions (tpy)**	**PM_{10} Emissions (tpy)**	**SO_2 Emissions (tpy)**
		PEI [2]	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**
New Units:							
LAMT-TBC-03	New Solar Taurus 70 turbine (9 ppm)	45,244	12.5	13.3	2.51	2.51	5.33
LAMT-TBC-04	New Solar Taurus 70 turbine (9 ppm)	45,244	12.5	13.3	2.51	2.51	5.33
LAMT-ENGEN 03	New Waukesha VGF36GL EGen	86	0.19	0.39	0.00	0.00	0.00
LAMT-FHTR 01	New Cameron Fuel Gas Heater	200	0.16	0.25	0.01	0.01	0.02
LAMT-FHTR 02	New Cameron Fuel Gas Heater	200	0.16	0.25	0.01	0.01	0.02
LAMT SHTR 05-08	Four New Reznor Space Heaters - Warehouse	124	0.10	0.04	0.01	0.01	0.01
LAMT-SV-V1-C4, C5	Two New 44- gal Pipeline Liquids Storage Tank	1.9	--	--	--	--	--
LAMT-GR Prj_Inc	Gas Releases - T03 and T04	6,739	--	--	--	--	--
LAMT-GR Prj_Inc	Fugitive Piping Components - T03 and T04	302	--	--	--	--	--
Lambertville East Expansion Project PEI		98,142	25.61	27.53	5.06	5.06	10.73

PennEast Interconnect Project							
Unit Description		**CO_2e Emissions (tpy)**	**NO_2 Emissions (tpy)**	**CO Emissions (tpy)**	**$PM_{2.5}$ Emissions (tpy)**	**PM_{10} Emissions (tpy)**	**SO_2 Emissions (tpy)**
		PEI [2]	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**	**PTE/PEI [1,2]**
New Units:							
LAMT GHTR 01-08	8 New Cleaver Brooks Step Down Heaters (10 MMBtu/hr each)	41,264	3.80	12.9	2.61	2.61	4.91
LAMT ENGEN 04	New Caterpillar G3412C EGen	75	0.17	0.3	0.00	0.00	0.00
LAMT GR - PE	New PennEast Gas Releases	5,689	--	--	--	--	--
LAMT PC - PE	Fugitive - New Penn East Piping Components	629	--	--	--	--	--
LAMT-TK-V5-PE	1000-gallon Pipeline Liquids Storage Tank	20	--	--	--	--	--
LAMT-TK-V11-PE1	560-gallon Coolant Storage Tank	--	--	--	--	--	--
LAMT-TK-V11-PE2	560-gallon Coolant Storage Tank	--	--	--	--	--	--
LAMT-TL-PL-PE	Pipeline Liquids Truck Loading Area	1	--	--	--	--	--
LAMT-TL-EC-PE	Coolant Truck Loading Area	--	--	--	--	--	--
Potentially Affected Units[3]:							
LAMT-TK-V5-307	U6: 2,940-gallon Pipeline Liquids Storage Tank	25	--	--	--	--	--
LAMT-TK-V5-322	U6: 2,940-gallon Pipeline Liquids Storage Tank	25	--	--	--	--	--
PennEast Interconnect PEI		47,728	4.0	13.2	2.6	2.6	4.9

Overall Project PEI	145,869	29.58	40.75	7.68	7.68	15.65

1. PTE - Potential to Emit
2. PEI - Project Emissions Increase. For new and modified units: PEI = PTE

[3]Throughput to existing U6 - Two above ground pipeline liquids storage tanks may increase due to proposed project. Increases included at permitted PTE rather than projected actual. There will be no change in U6 permitted PTE as a result of the project.

Prevention of Significant Deterioration (PSD) Calculation Summary:

Table 6. Project Emission Potential (Step 1)

Pollutant	Project Emission Potential (PEP) (tpy)	Significant Project Threshold (SPT) (tpy) [1]	Significant Project (Yes/No)?
CO_2e	145,869	75,000	Yes
NO_2	29.6	40	No
CO	40.7	100	No
PM_{10}	7.7	15	No
$PM_{2.5}$	7.7	10	No
SO_2	15.6	40	No

1. Significant project thresholds per 40 CFR 51.166(b)(23)

Prevention of Significant Deterioration (PSD) Calculation Summary:

Step 2: Contemporaneous Changes and ERCs

Table 7. Contemporaneous Period

Estimated Start of Construction Date [1]	Mar-19
Start of Contemporaneous Period [2]	Mar-14

1. Per 40 CFR 51.166(b)(9), "commence" as applied to construction of a major stationary source or major modification means that the owner or operator has all necessary preconstruction approvals or permits and either has:
(i) begun, or caused to begin, a continuous program of actual on-site construction of the source, to be completed within a reasonable time; or
(ii) entered into binding agreements or contractual obligations, which cannot be canceled or modified without substantial loss to the owner or operator, to undertake a program of actual constructionof the source to be completed within a reasonable time.
2. Per 40 CFR 51.166(b)(3)(ii) and 52.21(b)(3)(ii), "contemporaneous" is defined as the period beginning five years prior to the scheduled commence construction date of the new or modified emission source, and ending with the date that the increase from the particular change occurs.

Table 8. Contemporaneous Increases & Decreases (Step 2)

Unit Description		CO_2e ERCs (tpy)
Shutdown Units (decreases):		
LAMT_TBC 32201	DC 990 Turbine	(9,577)
LAMT_TBC 32202	DC 990 Turbine	(9,940)
Total ERCs:		(19,517)

Table 9. Net Emission Increases (Step 2)

Pollutant	Net Emission Increase (NEI) (tpy)	Significant Net Emission Increase Threshold (tpy)	Significant Project (Yes/No)?
CO_2e [1]	126,352	75,000	Yes
NO_2	-	40	No
CO	-	100	No
PM_{10}	-	15	No
$PM_{2.5}$	-	10	No
SO_2	-	40	No

1. Following EPA's guidance, 75,000 tpy CO_2e is treated as a significant emission rate threshold for an existing major source. However, PSD for CO_2e is only triggered if the project is subject to PSD "anyway" for another PSD pollutant.

Table 10. Subchapter 18 Netting Analysis

Pollutant	IP[1] (tons/yr)	INP[2] (tons/yr)	IF[3] (tons/yr)	IA[4] (tons/yr)	DO[5] (tons/yr)	DC[6,7] (tons/yr)	NI (tons/yr)	Sub 18 Thresholds [8] (tons/yr)	Subject to Sub 18 (Yes/No)
NO_X	0.00	0.00	0.00	29.58	0.00	5.18	24.40	25	No
CO	0.00	0.00	0.00	40.75	0.00	1.22	39.53	100	No
VOC	0.00	0.00	0.00	22.48	0.00	0.01	22.47	25	No
TSP (PM) [9]	0.00	0.00	0.00	7.68	0.00	1.09	6.58	25	No
$PM_{10/2.5}$	0.00	0.00	0.00	7.68	0.00	1.09	6.58	15	No
SO_2	0.00	0.00	0.00	15.65	0.00	0.56	15.08	40	No

1. There were no projects during the contemporaneous period which resulted in an increase in the allowable emissions of air contaminants and which were authorized by permits issued by the Department.

2. There were no projects during the contemporaneous period which resulted in an increase in the allowable emissions of air contaminants and which came from any equipment or control apparatus for which no permit was in effect at the time of the increase.

3. There were no increases in fugitive emissions from the facility during the contemporaneous period.

4. Proposed increase in allowable emissions of air contaminants from the newly constructed equipment which is the subject of this permit application. This includes the Lambertville East Expansion project and the PennEast Interconnect project. While the estimated VOC PTE due to piping components at the Lambertville Compressor Station will not change as a result of the Lambertville East Expansion project, the estimated project increase due to piping components associated with the new Solar Taurus 70 turbines, (2.44 tpy VOC) is accounted for in the IA term.

5. There were no increases in the allowable emissions of air contaminants which occurred during the contemporaneous period, of which emission offsets were secured for these increases from the facility or from another facility.

6. The sum of all creditable emission reductions at the facility during the contemporaneous period includes actual emissions as reported to the NJDEP for 2015 and 2016 for the DC 990 Turbines (U1) at Lambertville Compressor Station.

7. Following construction and prior to operation of the proposed Lambertville East Expansion Project, Texas Eastern will permanently retire the two existing Dresser Clark DC 990 turbines (U1), the Caterpillar emergency generator (U3), and gas releases due to the two DC990 turbines will also be eliminated (IS9, IS10, IS11). The shutdown of these units will result in creditable emissions reductions. Creditable emissions reductions of NO_X emissions have been adjusted downward to reflect a NO_X RACT limit of 42 ppm per the finalization of N.J.A.C. 7:27-19 on 11/6/2017. Total creditable NO_X reductions from the two DC990 turbines is 33.60 tons. Note that only a portion of the NO_X emissions decrease (5.18 tons) has been included in DC from the shutdown of the DC 990 turbines. The remaining portion (28.42 tons) will be banked as ERCs in accordance with N.J.A.C. 7:27-18.8 within 12 months of turbine shutdown.

Total NO_X Emissions Reductions, tpy:	33.59
NO_X ERCs Needed to Net Out, :	5.18
NO_X ERCs to be Banked:	28.42

8. The Subchapter 18 Thresholds provided in NJAC 7:27-18.7 Table 3. Significant Net Emissions Increases.

9. Proposed increase of TSP is conservatively estimated based on PM_{10}. TSP is filterable only PM.

Table 11. Emission Reduction Credits (ERCs) due to U1 Shutdown

	DC 990 Turbine (U1, E1)				DC 990 Turbine (U1, E2)			
	2015 Actual Emissions (tpy)	2016 Actual Emissions (tpy)	Average 2015-2016 Emissions (tpy)	Adjusted NO_X Emissions[1] (tpy)	2015 Actual Emissions (tpy)	2016 Actual Emissions (tpy)	Average 2015-2016 Emissions (tpy)	Adjusted NO_X Emissions[1] (tpy)
NOx	34.01	41.19	37.60	15.97	33.25	46.12	39.68	17.63
CO	0.59	0.72	0.66	--	0.47	0.65	0.56	--
VOC	0.01	0.01	0.01	--	0.00	0.00	0.00	--
SO_2	0.25	0.30	0.28	--	0.24	0.33	0.29	--
PM_{10}	0.49	0.59	0.54	--	0.47	0.65	0.56	--
$PM_{2.5}$	0.49	0.59	0.54	--	0.47	0.65	0.56	--
CO_2e	8,662	10,492	9,577	--	8,329	11,551	9,940	--

1. Actual NO_X emissions are adjusted downward to reflect a NO_X RACT limit of 42 ppm per the finalization of N.J.A.C. 7:27-19 on 11/6/2017. This adjustment was based on comparing the reported emissions for 2015 and 2016 to what would have been reported using 42 ppm and the fuel usage, runtime, and SU/SD events that were reported during this baseline period.

TABLE B-1Ba
Ambient Temperature, Start Model, and Utilization Data
PTE - 100% Fuel Utilization at 100% Power Output

Month	#Days	Daily Average	Weighted Daily Average
JAN	31.00	26.55	2.25
FEB	28.50	29.30	2.28
MAR	31.00	39.35	3.34
APR	30.00	49.60	4.07
MAY	31.00	60.30	5.11
JUN	30.00	69.40	5.70
JUL	31.00	74.05	6.28
AUG	31.00	72.15	6.12
SEP	30.00	64.65	5.31
OCT	31.00	53.15	4.51
NOV	30.00	43.00	3.53
DEC	31.00	31.80	2.70
Annual	365.50	51.11	**51.20**

Low Temperature Data	
Below 0˚F Hours	2 hrs/yr
Below -20˚F Hours	0 hrs/yr

NOTES

1. Please refer to TABLE B-0.

Start Model and Utilization	
Utilization	100.00%
Start Model	TET - High
Starts	260.00 starts/yr

TABLE B-1Bb
Manufacturer's Operating and Emissions Data
Normal Operations
PTE - 100% Fuel Utilization at 100% Power Output

Parameters			Curve Fitting			Vendor Data						
Ambient	Temperature	°F	-20.00	-20.00	51.11	-0.01	0.01	20.00	40.00	60.00	80.00	100.00
	Altitude	ft	0	0	0	0	0	0	0	0	0	0
	Pressure	psia	14.702	14.702	14.702	14.702	14.702	14.702	14.702	14.702	14.702	14.702
	Relative Humidity	%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
	Specific Humidity	$lb_{H2O}/lb_{Dry\ Air}$	0.0003	0.0003	0.0042	0.0006	0.0006	0.0013	0.0028	0.0058	0.0124	0.0262
Fuel	Lower Heating Value (LHV)	BTU/scf	939.2	939.2	939.2	939.2	939.2	939.2	939.2	939.2	939.2	939.2
	Higher Heating Value (HHV)	BTU/scf	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6
Turbine	Net Output Power	hp	10,970	10,970	10,755	10,977	10,977	10,984	10,894	10,563	9,484	8,474
	Fuel Consumption	scf/hr	90,047	90,047	83,319	87,915	87,915	85,786	84,125	82,443	76,586	71,188
	Heat Input at LHV	MMBTU/hr	84.57	84.57	78.25	82.57	82.57	80.57	79.01	77.43	71.93	66.86
	Heat Input at HHV	MMBTU/hr	93.97	93.97	86.95	91.74	91.74	89.52	87.79	86.03	79.92	74.29
	Heat Rate at LHV	BTU/hp-hr	7,709	7,709	7,276	7,522	7,522	7,335	7,253	7,330	7,584	7,890
	Heat Rate at HHV	BTU/hp-hr	8,566	8,566	8,084	8,358	8,358	8,150	8,058	8,145	8,427	8,767
Exhaust	Temperature	°F	880	880	933	888	888	896	916	948	975	1,004
	Water Fraction	%, by vol	5.70%	5.70%	6.59%	5.84%	5.84%	5.98%	6.30%	6.89%	7.84%	9.51%
	Non-Water Fraction	%, by vol	94.30%	94.30%	93.41%	94.16%	94.16%	94.02%	93.70%	93.11%	92.16%	90.49%
	O_2 Content	%, by vol (dry)	15.38%	15.38%	15.22%	15.36%	15.36%	15.34%	15.28%	15.19%	15.18%	15.18%
	Molecular Weight	lb/lb-mol	28.62	28.62	28.52	28.60	28.60	28.58	28.55	28.49	28.38	28.19
	Flow Rate	lb/hr	239,260	239,260	215,688	232,765	232,765	226,276	219,534	211,887	196,615	182,664
		scfm (1 atm, 68°F)	53,766	53,766	48,524	52,328	52,328	50,908	49,340	47,814	44,550	41,640
		acfm	136,400	136,400	128,001	133,544	133,544	130,691	128,534	127,455	121,031	115,413
NO_X Emissions		lb/lb-mol	46.01	46.01	46.01	46.01	46.01	46.01	46.01	46.01	46.01	46.01
		ppmvd, 15% O_2	120	42	9	42	9	9	9	9	9	9
		ppmvw	105.87	37.06	8.09	37.13	7.96	7.97	8.03	8.11	8.04	7.90
		lb/hr	40.72	14.25	2.82	13.91	2.98	2.90	2.84	2.78	2.56	2.35
CO Emissions		lb/lb-mol	28.01	28.01	28.01	28.01	28.01	28.01	28.01	28.01	28.01	28.01
		ppmvd, 15% O_2	150	100	25	100	25	25	25	25	25	25
		ppmvw	132.34	88.23	22.47	88.41	22.10	22.15	22.31	22.53	22.34	21.93
		lb/hr	30.99	20.66	4.76	20.16	5.04	4.91	4.81	4.69	4.33	3.98
UHC Emissions		lb/lb-mol	18.37	18.37	18.37	18.37	18.37	18.37	18.37	18.37	18.37	18.37
		ppmvd, 15% O_2	75	50	25	50	25	25	25	25	25	25
		ppmvw	66.17	44.11	22.47	44.21	22.10	22.15	22.31	22.53	22.34	21.93
		lb/hr	10.16	6.78	3.12	6.61	3.30	3.22	3.15	3.08	2.84	2.61

NOTES

1. Operating and emissions data was provided by the manufacturer for the following ambient temperatures: 0°F, 20°F, 40°F, 60°F, 80°F, and 100°F.
   Specific Humidity is estimate using curve fitting equation: $6.15E\text{-}04e^{3.75E\text{-}02T}$
   All other parameter values estimated using cubic spline.
2. Pollutant concentrations (ppmvd at 15% O2) for 0°F and -20°F based on information provided in a document published by the manufacturer.
3. Ambient pressure and humidity will vary. However, it is believed that any variation would not affect compliance with the proposed emission representations.
4. The heating value of the natural gas used to fuel the turbine will vary. However, it is believed that any variation would not affect compliance with the proposed emission representations.

TABLE B-1Bb
Manufacturer's Operating and Emissions Data
Normal Operations
PTE - 100% Fuel Utilization at 100% Power Output

Vendor Data

Make:	Solar
Model:	070-10802S4
Rate	10,915 hp (ISO)
Capacity:	9,400 hp (NEMA)
Load:	100%

Ambient	Temperature	°F			-0.01	0.01	20.00	40.00	60.00	80.00	100.00
	Specific Humidity	$lb_{H2O}/lb_{Dry\ Air}$			0.0006	0.0006	0.0014	0.0031	0.0066	0.0133	0.0253
Fuel	Lower Heating Value (LHV)	BTU/scf			939.2	939.2	939.2	939.2	939.2	939.2	939.2
Turbine	Net Output Power	hp			10,977	10,977	10,984	10,894	10,563	9,484	8,474
	Heat Input at LHV	MMBTU/hr			82.57	82.57	80.57	79.01	77.43	71.93	66.86
Exhaust	Temperature	°F			888	888	896	916	948	975	1,004
	Water Fraction	%			5.84%	5.84%	5.98%	6.30%	6.89%	7.84%	9.51%
	O_2 Content	% (dry)			15.36%	15.36%	15.34%	15.28%	15.19%	15.18%	15.18%
	Molecular Weight	lb/lb-mol			28.60	28.60	28.58	28.55	28.49	28.38	28.19
	Flow Rate	lb/hr			232,765	232,765	226,276	219,534	211,887	196,615	182,664
		acfm			133,544	133,544	130,691	128,534	127,455	121,031	115,413
Guaranteed	NO_X	ppmvd, 15% O_2	120	42	42	9	9	9	9	9	9
Emissions	CO	ppmvd, 15% O_2	150	100	100	25	25	25	25	25	25
	UHC	ppmvd, 15% O_2	75	50	50	25	25	25	25	25	25

TABLE B-1Bc
Gas-Fired Turbines
Emission Estimates
Normal Operations
PTE - 100% Fuel Utilization at 100% Power Output

Make	Solar				
Model	070-10802S4				
Normal Operating Load	100%				
Fuel	Natural Gas				
Fuel Higher Heating Value (HHV)	1,020 BTU/scf			1,020 BTU/scf	
Ambient Temperature	51.11 °F			0.01 °F	
Power Output	10,755 bhp (mech.)			10,977 bhp (mech.)	
	8,020 kW (elec.)			8,186 kW (elec.)	
Heat Rate at HHV	8,084 BTU/hp-hr			8,358 BTU/hp-hr	
Operating Hours	8,760 hrs/yr				
Fuel Consumption	85,243 scfh			89,946 scfh	
	746.733 MMscf/yr				
Heat Input at HHV	86.95 MMBTU/hr			91.74 MMBTU/hr	
	761,668 MMBTU/yr	Average	Maximum		Maximum
NO_X	33.02 lb/MMscf	2.8150 lb/hr	12.3298 tpy	33.13 lb/MMscf	2.9797 lb/hr
CO	55.84 lb/MMscf	4.7604 lb/hr	20.8504 tpy	56.02 lb/MMscf	5.0388 lb/hr
SO_2	14.29 lb/MMscf	1.2178 lb/hr	5.3338 tpy	14.29 lb/MMscf	1.2849 lb/hr
$PM_{10/2.5}$	6.73 lb/MMscf	0.5739 lb/hr	2.5135 tpy	6.73 lb/MMscf	0.6055 lb/hr
$CO_{2\text{-}e}$	120,801 lb/MMscf	10,297 lb/hr	45,103 tpy	120,803 lb/MMscf	10,866 lb/hr
CO_2	120,017 lb/MMscf	10,231 lb/hr	44,810 tpy	120,017 lb/MMscf	10,795 lb/hr
N_2O	0.23 lb/MMscf	0.0193 lb/hr	0.0845 tpy	0.23 lb/MMscf	0.0203 lb/hr
TOC (Total)	36.63 lb/MMscf	3.1223 lb/hr	13.6758 tpy	36.74 lb/MMscf	3.3050 lb/hr
Methane	28.64 lb/MMscf	2.4411 lb/hr	10.6920 tpy	28.73 lb/MMscf	2.5839 lb/hr
Ethane	1.00 lb/MMscf	0.0852 lb/hr	0.3730 tpy	1.00 lb/MMscf	0.0901 lb/hr
VOC (Total)	6.99 lb/MMscf	0.5961 lb/hr	2.6108 tpy	7.01 lb/MMscf	0.6309 lb/hr
VOC (non-HAP)	3.57 lb/MMscf	0.3045 lb/hr	1.3336 tpy	3.58 lb/MMscf	0.3223 lb/hr
HAP (Total)	3.42 lb/MMscf	0.2916 lb/hr	1.2772 tpy	3.43 lb/MMscf	0.3087 lb/hr
Acetaldehyde	1.33E-01 lb/MMscf	0.0114 lb/hr	0.0497 tpy	1.34E-01 lb/MMscf	0.0120 lb/hr
Acrolein	2.13E-02 lb/MMscf	0.0018 lb/hr	0.0080 tpy	2.14E-02 lb/MMscf	0.0019 lb/hr
Benzene	4.00E-02 lb/MMscf	0.0034 lb/hr	0.0149 tpy	4.01E-02 lb/MMscf	0.0036 lb/hr
Biphenyl					
Butadiene (1,3-)	1.43E-03 lb/MMscf	0.0001 lb/hr	0.0005 tpy	1.44E-03 lb/MMscf	0.0001 lb/hr
Carbon Tetrachloride					
Chlorobenzene					
Chloroform					
Dichloropropene (1,3-)					
Ethylbenzene	1.07E-01 lb/MMscf	0.0091 lb/hr	0.0398 tpy	1.07E-01 lb/MMscf	0.0096 lb/hr
Ethylene Dibromide					
Formaldehyde	2.36E+00 lb/MMscf	0.2015 lb/hr	0.8827 tpy	2.37E+00 lb/MMscf	0.2133 lb/hr
Hexane (n-)					
Methanol					
Methylene Chloride					
Methylnaphthalene (2-)					
Naphthalene	4.33E-03 lb/MMscf	0.0004 lb/hr	0.0016 tpy	4.34E-03 lb/MMscf	0.0004 lb/hr
PAH	7.33E-03 lb/MMscf	0.0006 lb/hr	0.0027 tpy	7.35E-03 lb/MMscf	0.0007 lb/hr
Phenol					
Propylene Oxide	9.66E-02 lb/MMscf	0.0082 lb/hr	0.0361 tpy	9.69E-02 lb/MMscf	0.0087 lb/hr
Styrene					
Tetrachloroethane (1,1,2,2-)					
Toluene	4.33E-01 lb/MMscf	0.0369 lb/hr	0.1616 tpy	4.34E-01 lb/MMscf	0.0391 lb/hr
Trichloroethane (1,1,2-)					
Trimethylpentane (2,2,4-)					
Vinyl Chloride					
Xylenes	2.13E-01 lb/MMscf	0.0182 lb/hr	0.0796 tpy	2.14E-01 lb/MMscf	0.0192 lb/hr

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Manufacturer provided operating and emissions data (TABLE B-1Bb).
3. The annual emissions are based on a representative annual average ambient temperature (TABLE B-1Ba).
   Maximum hourly emissions are based on an ambient temperature of 0°F.
4. NOX, CO, and TOC (Total) emission factor based on Vendor Guarantee.
5. CO2 and N2O emission factors based on 40 CFR 98, Subpart C, Table C-1 and 40 CFR 98, Subpart C, Table C-2, respectively.
6. SO2 emission factor based on AP-42, Section 3.1 (Revised 4/00), Table 3.1-2a using Tariff (5 gr/100 scf).
7. PM10/2.5 emission factor based on AP-42, Section 3.1 (Revised 4/00), Table 3.1-2a, not Solar's PIL 171 dated 5/6/2015 (which is 127% greater).
8. Methane, Ethane, and VOC (Total) emissions based on scaling of AP-42, Section 3.1 (Revised 4/00), Table 3.1-2a using Vendor Guarantee.
   Speciated VOC (non-HAP) emissions based on scaling of AP-42, Section 3.1 (Revised 4/00), Table 3.1-2a using Vendor Guarantee.
   $EF_{Scaled} = (EF_{AP42})(EF_{TOC}/EF_{TOC\text{-}AP42})$

TABLE B-1Bd
Manufacturer's Operating and Emissions Data
Startup/Shutdown Step 2: Iginition-Idle
PTE - 100% Fuel Utilization at 100% Power Output

Parameters			Interpolated	Vendor Data					
Ambient	Temperature	°F	51.11	0.01	20.00	40.00	60.00	80.00	100.00
	Altitude	ft	0	0	0	0	0	0	0
	Pressure	psia	14.702	14.702	14.702	14.702	14.702	14.702	14.702
	Relative Humidity	%	60%	60%	60%	60%	60%	60%	60%
	Specific Humidity	$lb_{H2O}/lb_{Dry\ Air}$	0.0042	0.0006	0.0013	0.0028	0.0058	0.0124	0.0262
Fuel	Lower Heating Value (LHV)	BTU/scf	939.2	939.2	939.2	939.2	939.2	939.2	939.2
	Higher Heating Value (HHV)	BTU/scf	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6
Turbine	Net Output Power	hp	1,076	1,098	1,098	1,090	1,056	948	847
	Fuel Consumption	scf/hr	19,243	18,697	18,995	19,218	19,250	18,665	18,175
	Heat Input at LHV	MMBTU/hr	18.07	17.56	17.84	18.05	18.08	17.53	17.07
	Heat Input at HHV	MMBTU/hr	20.08	19.51	19.82	20.06	20.09	19.48	18.97
	Heat Rate at LHV	BTU/hp-hr	16,799	15,993	16,248	16,560	17,121	18,492	20,153
	Heat Rate at HHV	BTU/hp-hr	18,665	17,770	18,053	18,400	19,024	20,546	22,393
Exhaust	Temperature	°F	768	633	685	738	792	852	912
	Water Fraction	%, by vol	4.29%	3.22%	3.51%	3.94%	4.64%	5.81%	7.73%
	Non-Water Fraction	%, by vol	95.71%	96.78%	96.49%	96.06%	95.36%	94.19%	92.27%
	O_2 Content	%, by vol (dry)	17.57%	17.99%	17.83%	17.66%	17.49%	17.30%	17.09%
	Molecular Weight	lb/lb-mol	28.66	28.76	28.73	28.69	28.63	28.51	28.30
	Flow Rate	lb/hr	77,092	85,086	82,121	79,013	75,277	69,333	63,969
		scfm (1 atm, 68°F)	17,260	19,024	18,374	17,696	16,903	15,631	14,525
		acfm	40,113	39,367	39,829	40,135	40,066	38,826	37,728
NO_X Emissions		lb/lb-mol	46.01	46.01	46.01	46.01	46.01	46.01	46.01
		ppmvd, 15% O_2	50	50	50	50	50	50	50
		ppmvw	27.04	23.87	25.10	26.38	27.56	28.74	29.79
		lb/hr	3.35	3.25	3.30	3.34	3.33	3.22	3.10
CO Emissions		lb/lb-mol	28.01	28.01	28.01	28.01	28.01	28.01	28.01
		ppmvd, 15% O_2	10,000	10,000	10,000	10,000	10,000	10,000	10,000
		ppmvw	5,407.22	4,773.39	5,020.75	5,275.16	5,511.48	5,747.19	5,958.45
		lb/hr	407.39	395.56	401.98	406.93	405.90	391.48	377.25
UHC Emissions		lb/lb-mol	18.37	18.37	18.37	18.37	18.37	18.37	18.37
		ppmvd, 15% O_2	45,600	45,600	45,600	45,600	45,600	45,600	45,600
		ppmvw	24,656.91	21,766.64	22,894.62	24,054.73	25,132.37	26,207.17	27,170.54
		lb/hr	1,218.47	1,183.07	1,202.27	1,217.08	1,214.02	1,170.88	1,128.32

NOTES

1. Footnotes 1 thru 4 of TABLE B-1Bb.

TABLE B-1Bd
Manufacturer's Operating and Emissions Data
Startup/Shutdown Step 2: Iginition-Idle
PTE - 100% Fuel Utilization at 100% Power Output

Vendor Data

Make:	Solar								
Model:	070-10802S4								
Rate	10,915 hp (ISO)								
Capacity:	9,400 hp (NEMA)								
Load:	10%								
Ambient	Temperature	°F		0.01	20.00	40.00	60.00	80.00	100.00
	Specific Humidity	$lb_{H2O}/lb_{Dry\ Air}$		0.0006	0.0014	0.0031	0.0066	0.0133	0.0253
Fuel	Lower Heating Value (LHV)	BTU/scf		939.2	939.2	939.2	939.2	939.2	939.2
Turbine	Net Output Power	hp		1,098	1,098	1,090	1,056	948	847
	Heat Input at LHV	MMBTU/hr		17.56	17.84	18.05	18.08	17.53	17.07
Exhaust	Temperature	°F		633	685	738	792	852	912
	Water Fraction	%		3.22%	3.51%	3.94%	4.64%	5.81%	7.73%
	O_2 Content	% (dry)		17.99%	17.83%	17.66%	17.49%	17.30%	17.09%
	Molecular Weight	lb/lb-mol		28.76	28.73	28.69	28.63	28.51	28.30
	Flow Rate	lb/hr		85,086	82,121	79,013	75,277	69,333	63,969
		acfm		39,367	39,829	40,135	40,066	38,826	37,728
Estimated	NO_X	ppmvd, 15% O_2		50	50	50	50	50	50
Emissions	CO	ppmvd, 15% O_2		10,000	10,000	10,000	10,000	10,000	10,000
	UHC	ppmvd, 15% O_2		45,600	45,600	45,600	45,600	45,600	45,600

TABLE B-1Be
Manufacturer's Operating and Emissions Data
Startup/Shutdown Step 3: Loading/Thermal Stabilization
PTE - 100% Fuel Utilization at 100% Power Output

Parameters			Interpolated	Vendor Data					
Ambient	Temperature	°F	51.11	0.01	20.00	40.00	60.00	80.00	100.00
	Altitude	ft	0	0	0	0	0	0	0
	Pressure	psia	14.702	14.702	14.702	14.702	14.702	14.702	14.702
	Relative Humidity	%	60%	60%	60%	60%	60%	60%	60%
	Specific Humidity	$lb_{H2O}/lb_{Dry\ Air}$	0.0042	0.0006	0.0013	0.0028	0.0058	0.0124	0.0262
Fuel	Lower Heating Value (LHV)	BTU/scf	939.2	939.2	939.2	939.2	939.2	939.2	939.2
	Higher Heating Value (HHV)	BTU/scf	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6
Turbine	Net Output Power	hp	3,227	3,293	3,295	3,269	3,168	2,845	2,522
	Fuel Consumption	scf/hr	33,692	33,316	33,678	33,827	33,443	31,378	29,312
	Heat Input at LHV	MMBTU/hr	31.64	31.29	31.63	31.77	31.41	29.47	27.53
	Heat Input at HHV	MMBTU/hr	35.16	34.77	35.14	35.30	34.90	32.74	30.59
	Heat Rate at LHV	BTU/hp-hr	9,807	9,502	9,599	9,719	9,915	10,359	10,916
	Heat Rate at HHV	BTU/hp-hr	10,896	10,558	10,666	10,798	11,016	11,509	12,129
Exhaust	Temperature	°F	753	634	682	728	772	808	844
	Water Fraction	%, by vol	4.79%	3.75%	4.04%	4.46%	5.11%	6.13%	7.15%
	Non-Water Fraction	%, by vol	95.21%	96.25%	95.96%	95.54%	94.89%	93.87%	92.85%
	O_2 Content	%, by vol (dry)	17.07%	17.47%	17.31%	17.15%	17.02%	16.97%	16.92%
	Molecular Weight	lb/lb-mol	28.63	28.73	28.70	28.66	28.60	28.49	28.38
	Flow Rate	lb/hr	126,933	139,149	134,608	129,868	124,164	115,169	106,174
		scfm (1 atm, 68°F)	28,465	31,151	30,144	29,132	27,912	25,989	24,173
		acfm	65,378	64,519	65,172	65,522	65,104	62,390	59,676
NO_X Emissions		lb/lb-mol	46.01	46.01	46.01	46.01	46.01	46.01	46.01
		ppmvd, 15% O_2	60	60	60	60	60	60	60
		ppmvw	37.10	33.57	35.03	36.43	37.44	37.52	37.58
		lb/hr	7.57	7.48	7.56	7.60	7.48	6.98	6.47
CO Emissions		lb/lb-mol	28.01	28.01	28.01	28.01	28.01	28.01	28.01
		ppmvd, 15% O_2	9,000	9,000	9,000	9,000	9,000	9,000	9,000
		ppmvw	5,565.09	5,036.00	5,255.03	5,465.21	5,616.20	5,627.43	5,637.10
		lb/hr	691.09	683.19	690.36	693.66	682.94	637.19	590.71
UHC Emissions		lb/lb-mol	18.37	18.37	18.37	18.37	18.37	18.37	18.37
		ppmvd, 15% O_2	5,940	5,940	5,940	5,940	5,940	5,940	5,940
		ppmvw	3,672.96	3,323.76	3,468.32	3,607.04	3,706.69	3,714.10	3,720.48
		lb/hr	299.17	295.75	298.85	300.28	295.64	275.83	255.72

NOTES

1. Footnotes 1 thru 4 of TABLE B-1Bb.

TABLE B-1Be
Manufacturer's Operating and Emissions Data
Startup/Shutdown Step 3: Loading/Thermal Stabilization
PTE - 100% Fuel Utilization at 100% Power Output

Vendor Data

Make:	Solar								
Model:	070-10802S4								
Rate Capacity:	10,915 hp (ISO)								
	9,400 hp (NEMA)								
Load:	30%								
Ambient	Temperature	°F		0.01	20.00	40.00	60.00	80.00	100.00
	Specific Humidity	$lb_{H2O}/lb_{Dry\ Air}$		0.0006	0.0014	0.0031	0.0066	0.0133	0.0253
Fuel	Lower Heating Value (LHV)	BTU/scf		939.2	939.2	939.2	939.2	939.2	939.2
Turbine	Net Output Power	hp		3,293	3,295	3,269	3,168	2,845	2,522
	Heat Input at LHV	MMBTU/hr		31.29	31.63	31.77	31.41	29.47	27.53
Exhaust	Temperature	°F		634	682	728	772	808	844
	Water Fraction	%		3.75%	4.04%	4.46%	5.11%	6.13%	7.15%
	O_2 Content	% (dry)		17.47%	17.31%	17.15%	17.02%	16.97%	16.92%
	Molecular Weight	lb/lb-mol		28.73	28.70	28.66	28.60	28.49	28.38
	Flow Rate	lb/hr		139,149	134,608	129,868	124,164	115,169	106,174
		acfm		64,519	65,172	65,522	65,104	62,390	59,676
Estimated Emissions	NO_X	ppmvd, 15% O_2		60	60	60	60	60	60
	CO	ppmvd, 15% O_2		9,000	9,000	9,000	9,000	9,000	9,000
	UHC	ppmvd, 15% O_2		5,940	5,940	5,940	5,940	5,940	5,940

TABLE B-1Bf
Gas-Fired Turbines
Emission Estimates
Startup
PTE - 100% Fuel Utilization at 100% Power Output

Make	Solar				
Model	070-10802S4				
Fuel	Natural Gas				
Ambient Temperature	51.11 °F			0.01 °F	
Maximum Event Frequency		1 events/hr	260 events/yr		1 events/hr
Maximum Startup Time		9.00 min/hr	39.00 hrs/yr		9.00 min/hr
Fuel Consumption		4,331 scf/hr	1.13 MMscf/yr		4,266 scf/hr
		Average	Maximum		Maximum
NO_X	0.9241 lbs/event	0.9241 lb/hr	0.1201 tpy	0.9106 lbs/event	0.9106 lb/hr
CO	89.4781 lbs/event	89.4781 lb/hr	11.6322 tpy	88.0971 lbs/event	88.0971 lb/hr
SO_2	0.0619 lbs/event	0.0619 lb/hr	0.0080 tpy	0.0609 lbs/event	0.0609 lb/hr
$PM_{10/2.5}$	0.0292 lbs/event	0.0292 lb/hr	0.0038 tpy	0.0287 lbs/event	0.0287 lb/hr
$CO_{2\text{-}e}$	2,296 lbs/event	2,296 lb/hr	298 tpy	2,247 lbs/event	2,247 lb/hr
CO_2	520 lbs/event	520 lb/hr	68 tpy	512 lbs/event	512 lb/hr
N_2O	0.0010 lbs/event	0.0010 lb/hr	0.0001 tpy	0.0010 lbs/event	0.0010 lb/hr
TOC (Total)	90.8402 lbs/event	90.8402 lb/hr	11.8092 tpy	88.7287 lbs/event	88.7287 lb/hr
Methane	71.0205 lbs/event	71.0205 lb/hr	9.2327 tpy	69.3697 lbs/event	69.3697 lb/hr
Ethane	2.4775 lbs/event	2.4775 lb/hr	0.3221 tpy	2.4199 lbs/event	2.4199 lb/hr
VOC (Total)	17.3422 lbs/event	17.3422 lb/hr	2.2545 tpy	16.9391 lbs/event	16.9391 lb/hr
VOC (non-HAP)	8.8583 lbs/event	8.8583 lb/hr	1.1516 tpy	8.6524 lbs/event	8.6524 lb/hr
HAP (Total)	8.4839 lbs/event	8.4839 lb/hr	1.1029 tpy	8.2867 lbs/event	8.2867 lb/hr
Acetaldehyde	3.30E-01 lbs/event	0.3303 lb/hr	0.0429 tpy	3.23E-01 lbs/event	0.3226 lb/hr
Acrolein	5.29E-02 lbs/event	0.0529 lb/hr	0.0069 tpy	5.16E-02 lbs/event	0.0516 lb/hr
Benzene	9.91E-02 lbs/event	0.0991 lb/hr	0.0129 tpy	9.68E-02 lbs/event	0.0968 lb/hr
Biphenyl					
Butadiene (1,3-)	3.55E-03 lbs/event	0.0036 lb/hr	0.0005 tpy	3.47E-03 lbs/event	0.0035 lb/hr
Carbon Tetrachloride					
Chlorobenzene					
Chloroform					
Dichloropropene (1,3-)					
Ethylbenzene	2.64E-01 lbs/event	0.2643 lb/hr	0.0344 tpy	2.58E-01 lbs/event	0.2581 lb/hr
Ethylene Dibromide					
Formaldehyde	5.86E+00 lbs/event	5.8633 lb/hr	0.7622 tpy	5.73E+00 lbs/event	5.7270 lb/hr
Hexane (n-)					
Methanol					
Methylene Chloride					
Methylnaphthalene (2-)					
Naphthalene	1.07E-02 lbs/event	0.0107 lb/hr	0.0014 tpy	1.05E-02 lbs/event	0.0105 lb/hr
PAH	1.82E-02 lbs/event	0.0182 lb/hr	0.0024 tpy	1.77E-02 lbs/event	0.0177 lb/hr
Phenol					
Propylene Oxide	2.39E-01 lbs/event	0.2395 lb/hr	0.0311 tpy	2.34E-01 lbs/event	0.2339 lb/hr
Styrene					
Tetrachloroethane (1,1,2,2-)					
Toluene	1.07E+00 lbs/event	1.0736 lb/hr	0.1396 tpy	1.05E+00 lbs/event	1.0486 lb/hr
Trichloroethane (1,1,2-)					
Trimethylpentane (2,2,4-)					
Vinyl Chloride					
Xylenes	5.29E-01 lbs/event	0.5285 lb/hr	0.0687 tpy	5.16E-01 lbs/event	0.5162 lb/hr

NOTES

1. Emissions of NOx, CO, and UHC are estimated using information provided in TABLE B-1Bd and TABLE B-1Be.

	51.11 °F		0.01 °F	
	Step 2	Step 3	Step 2	Step 3
Duration	3.00 min/event	6.00 min/event	3.00 min/event	6.00 min/event
NO_X	0.1673 lb/event	0.7568 lb/event	0.1624 lb/event	0.7482 lb/event
CO	20.3696 lb/event	69.1086 lb/event	19.7778 lb/event	68.3192 lb/event
UHC	60.9234 lb/event	29.9167 lb/event	59.1537 lb/event	29.5750 lb/event
Fuel	962 scf/event	3,369 scf/event	935 scf/event	3,332 scf/event

2. Footnotes 4 thru 8 of TABLE B-1Bc.
3. The frequency of startup events was provided by Technical Services.

TABLE B-1Bg
Gas-Fired Turbines
Emission Estimates
Shutdown
PTE - 100% Fuel Utilization at 100% Power Output

Make	Solar				
Model	070-10802S4				
Fuel	Natural Gas				
Ambient Temperature	51.11 °F			0.01 °F	
Maximum Event Frequency		1 events/hr	260 events/yr		1 events/hr
Maximum Startup Time		8.50 min/hr	36.83 hrs/yr		8.50 min/hr
Fuel Consumption		4,773 scf/hr	1.24 MMscf/yr		4,720 scf/hr
		Average	Maximum		Maximum
NO_X	1.0721 lbs/event	1.0721 lb/hr	0.1394 tpy	1.0599 lbs/event	1.0599 lb/hr
CO	97.9038 lbs/event	97.9038 lb/hr	12.7275 tpy	96.7856 lbs/event	96.7856 lb/hr
SO_2	0.0682 lbs/event	0.0682 lb/hr	0.0089 tpy	0.0674 lbs/event	0.0674 lb/hr
$PM_{10/2.5}$	0.0321 lbs/event	0.0321 lb/hr	0.0042 tpy	0.0318 lbs/event	0.0318 lb/hr
CO_{2-e}	1,402 lbs/event	1,402 lb/hr	182 tpy	1,386 lbs/event	1,386 lb/hr
CO_2	573 lbs/event	573 lb/hr	74 tpy	566 lbs/event	566 lb/hr
N_2O	0.0011 lbs/event	0.0011 lb/hr	0.0001 tpy	0.0011 lbs/event	0.0011 lb/hr
TOC (Total)	42.3820 lbs/event	42.3820 lb/hr	5.5097 tpy	41.8979 lbs/event	41.8979 lb/hr
Methane	33.1350 lbs/event	33.1350 lb/hr	4.3076 tpy	32.7566 lbs/event	32.7566 lb/hr
Ethane	1.1559 lbs/event	1.1559 lb/hr	0.1503 tpy	1.1427 lbs/event	1.1427 lb/hr
VOC (Total)	8.0911 lbs/event	8.0911 lb/hr	1.0518 tpy	7.9987 lbs/event	7.9987 lb/hr
VOC (non-HAP)	4.1329 lbs/event	4.1329 lb/hr	0.5373 tpy	4.0857 lbs/event	4.0857 lb/hr
HAP (Total)	3.9582 lbs/event	3.9582 lb/hr	0.5146 tpy	3.9130 lbs/event	3.9130 lb/hr
Acetaldehyde	1.54E-01 lbs/event	0.1541 lb/hr	0.0200 tpy	1.52E-01 lbs/event	0.1524 lb/hr
Acrolein	2.47E-02 lbs/event	0.0247 lb/hr	0.0032 tpy	2.44E-02 lbs/event	0.0244 lb/hr
Benzene	4.62E-02 lbs/event	0.0462 lb/hr	0.0060 tpy	4.57E-02 lbs/event	0.0457 lb/hr
Biphenyl					
Butadiene (1,3-)	1.66E-03 lbs/event	0.0017 lb/hr	0.0002 tpy	1.64E-03 lbs/event	0.0016 lb/hr
Carbon Tetrachloride					
Chlorobenzene					
Chloroform					
Dichloropropene (1,3-)					
Ethylbenzene	1.23E-01 lbs/event	0.1233 lb/hr	0.0160 tpy	1.22E-01 lbs/event	0.1219 lb/hr
Ethylene Dibromide					
Formaldehyde	2.74E+00 lbs/event	2.7356 lb/hr	0.3556 tpy	2.70E+00 lbs/event	2.7043 lb/hr
Hexane (n-)					
Methanol					
Methylene Chloride					
Methylnaphthalene (2-)					
Naphthalene	5.01E-03 lbs/event	0.0050 lb/hr	0.0007 tpy	4.95E-03 lbs/event	0.0050 lb/hr
PAH	8.48E-03 lbs/event	0.0085 lb/hr	0.0011 tpy	8.38E-03 lbs/event	0.0084 lb/hr
Phenol					
Propylene Oxide	1.12E-01 lbs/event	0.1117 lb/hr	0.0145 tpy	1.10E-01 lbs/event	0.1105 lb/hr
Styrene					
Tetrachloroethane (1,1,2,2-)					
Toluene	5.01E-01 lbs/event	0.5009 lb/hr	0.0651 tpy	4.95E-01 lbs/event	0.4952 lb/hr
Trichloroethane (1,1,2-)					
Trimethylpentane (2,2,4-)					
Vinyl Chloride					
Xylenes	2.47E-01 lbs/event	0.2466 lb/hr	0.0321 tpy	2.44E-01 lbs/event	0.2438 lb/hr

NOTES

1. Emissions of NOx, CO, and UHC are estimated using information provided in TABLE B-1Bd and TABLE B-1Be.

	51.11 °F		0.01 °F	
	Step 2	Step 3	Step 2	Step 3
Duration	0.00 min/event	8.50 min/event	0.00 min/event	8.50 min/event
NO_X	0.0000 lb/event	1.0721 lb/event	0.0000 lb/event	1.0599 lb/event
CO	0.0000 lb/event	97.9038 lb/event	0.0000 lb/event	96.7856 lb/event
UHC	0.0000 lb/event	42.3820 lb/event	0.0000 lb/event	41.8979 lb/event
Fuel	0 scf/event	4,773 scf/event	0 scf/event	4,720 scf/event

2. Footnotes 4 thru 8 of TABLE B-1Bc.
3. The frequency of startup events was provided by Technical Services.

TABLE B-1Bh
Gas-Fired Turbines
Emission Estimates
Low Temperatures
PTE - 100% Fuel Utilization at 100% Power Output

Make	Solar					
Model	070-10802S4					
Normal Operating Load	100%					
Fuel	Natural Gas					
Fuel Higher Heating Value (HHV)	1,020 BTU/scf			1,020 BTU/scf		
Ambient Temperature	-20.00 °F			-20.00 °F		
Power Output	10,970 bhp (mech.)			10,970 bhp (mech.)		
	8,180 kW (elec.)			8,180 kW (elec.)		
Heat Rate at HHV	8,566 BTU/hp-hr			8,566 BTU/hp-hr		
Operating Hours	2 hrs/yr			0 hrs/yr		
Fuel Consumption	92,126 scfh			92,126 scfh		
	0.184 MMscf/yr			0.000 MMscf/yr		
Heat Input at HHV	93.97 MMBTU/hr	0°F ≥ T > -20°F		93.97 MMBTU/hr	T ≤ -20°F	
	188 MMBTU/yr	Hourly	Annual	0 MMBTU/yr	Hourly	Annual
NO_X	154.71 lb/MMscf	14.2528 lb/hr	0.0143 tpy	442.03 lb/MMscf	40.7223 lb/hr	0.0000 tpy
CO	224.25 lb/MMscf	20.6591 lb/hr	0.0207 tpy	336.37 lb/MMscf	30.9887 lb/hr	0.0000 tpy
SO_2	14.29 lb/MMscf	1.3161 lb/hr	0.0013 tpy	14.29 lb/MMscf	1.3161 lb/hr	0.0000 tpy
$PM_{10/2.5}$	6.73 lb/MMscf	0.6202 lb/hr	0.0006 tpy	6.73 lb/MMscf	0.6202 lb/hr	0.0000 tpy
CO_{2-e}	121,522 lb/MMscf	11,195 lb/hr	11 tpy	122,241 lb/MMscf	11,262 lb/hr	0 tpy
CO_2	120,017 lb/MMscf	11,057 lb/hr	11 tpy	120,017 lb/MMscf	11,057 lb/hr	0 tpy
N_2O	0.23 lb/MMscf	0.0208 lb/hr	0.0000 tpy	0.23 lb/MMscf	0.0208 lb/hr	0.0000 tpy
TOC (Total)	73.54 lb/MMscf	6.7752 lb/hr	0.0068 tpy	110.31 lb/MMscf	10.1628 lb/hr	0.0000 tpy
Methane	57.50 lb/MMscf	5.2969 lb/hr	0.0053 tpy	86.24 lb/MMscf	7.9454 lb/hr	0.0000 tpy
Ethane	2.01 lb/MMscf	0.1848 lb/hr	0.0002 tpy	3.01 lb/MMscf	0.2772 lb/hr	0.0000 tpy
VOC (Total)	14.04 lb/MMscf	1.2934 lb/hr	0.0013 tpy	21.06 lb/MMscf	1.9402 lb/hr	0.0000 tpy
VOC (non-HAP)	7.17 lb/MMscf	0.6607 lb/hr	0.0007 tpy	10.76 lb/MMscf	0.9910 lb/hr	0.0000 tpy
HAP (Total)	6.87 lb/MMscf	0.6328 lb/hr	0.0006 tpy	10.30 lb/MMscf	0.9491 lb/hr	0.0000 tpy
Acetaldehyde	2.67E-01 lb/MMscf	0.0246 lb/hr	0.0000 tpy	4.01E-01 lb/MMscf	0.0370 lb/hr	0.0000 tpy
Acrolein	4.28E-02 lb/MMscf	0.0039 lb/hr	0.0000 tpy	6.42E-02 lb/MMscf	0.0059 lb/hr	0.0000 tpy
Benzene	8.02E-02 lb/MMscf	0.0074 lb/hr	0.0000 tpy	1.20E-01 lb/MMscf	0.0111 lb/hr	0.0000 tpy
Biphenyl						
Butadiene (1,3-)	2.87E-03 lb/MMscf	0.0003 lb/hr	0.0000 tpy	4.31E-03 lb/MMscf	0.0004 lb/hr	0.0000 tpy
Carbon Tetrachloride						
Chlorobenzene						
Chloroform						
Dichloropropene (1,3-)						
Ethylbenzene	2.14E-01 lb/MMscf	0.0197 lb/hr	0.0000 tpy	3.21E-01 lb/MMscf	0.0296 lb/hr	0.0000 tpy
Ethylene Dibromide						
Formaldehyde	4.75E+00 lb/MMscf	0.4373 lb/hr	0.0004 tpy	7.12E+00 lb/MMscf	0.6560 lb/hr	0.0000 tpy
Hexane (n-)						
Methanol						
Methylene Chloride						
Methylnaphthalene (2-)						
Naphthalene	8.69E-03 lb/MMscf	0.0008 lb/hr	0.0000 tpy	1.30E-02 lb/MMscf	0.0012 lb/hr	0.0000 tpy
PAH	1.47E-02 lb/MMscf	0.0014 lb/hr	0.0000 tpy	2.21E-02 lb/MMscf	0.0020 lb/hr	0.0000 tpy
Phenol						
Propylene Oxide	1.94E-01 lb/MMscf	0.0179 lb/hr	0.0000 tpy	2.91E-01 lb/MMscf	0.0268 lb/hr	0.0000 tpy
Styrene						
Tetrachloroethane (1,1,2,2-)						
Toluene	8.69E-01 lb/MMscf	0.0801 lb/hr	0.0001 tpy	1.30E+00 lb/MMscf	0.1201 lb/hr	0.0000 tpy
Trichloroethane (1,1,2-)						
Trimethylpentane (2,2,4-)						
Vinyl Chloride						
Xylenes	4.28E-01 lb/MMscf	0.0394 lb/hr	0.0000 tpy	6.42E-01 lb/MMscf	0.0591 lb/hr	0.0000 tpy

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Operating hours for low ambient temperatures best on best fit of available data (see TABLE B-1Ba).
3. Manufacturer provided data on: power output, heat rate, along with NOx, CO, and UHC (or TOC) emissions.
4. Footnotes 4 thru 8 of TABLE B-1Bc.

TABLE B-1Bi
Gas-Fired Turbines
Maximum Emission Estimates
Normal Operations, Startup, Shutdown, and Low Temperature Operations
PTE - 100% Fuel Utilization at 100% Power Output

Make	Solar																	
Model	070-10802S4																	
Normal Operating Load	100%																	
Operations	Normal			Startup			Shutdown			Startup/Shutdown w/ Normal			Low Temperatures			Combined Operations		
Maximum Annual Combined Event Frequency	8,760 hrs/yr			39 hrs/yr			37 hrs/yr			8,760 hrs/yr			2 hrs/yr			8,760 hrs/yr		
	Hourly		Maximum	Hourly		Maximum	Hourly		Maximum	Hourly			Hourly		Maximum	Hourly		Maximum
Pollutant	Average	Maximum	Annual	Average	Maximum	Annual	Average	Maximum	Annual	Average	Maximum	Maximum Annual	Average	Maximum	Annual	Average	Maximum	Annual
NO_X	2.8150 lb/hr	2.9797 lb/hr	12.3298 tpy	0.9241 lb/hr	0.9241 lb/hr	0.1201 tpy	1.0721 lb/hr	1.0721 lb/hr	0.1394 tpy	2.8499 lb/hr	4.1068 lb/hr	12.4826 tpy	14.2528 lb/hr	40.7223 lb/hr	0.0143 tpy	2.8525 lb/hr	40.7223 lb/hr	12.4940 tpy
CO	4.7604 lb/hr	5.0388 lb/hr	20.8504 tpy	89.4781 lb/hr	89.4781 lb/hr	11.6322 tpy	97.9038 lb/hr	97.9038 lb/hr	12.7275 tpy	10.2807 lb/hr	190.9511 lb/hr	45.0296 tpy	20.6591 lb/hr	30.9887 lb/hr	0.0207 tpy	10.2844 lb/hr	190.9511 lb/hr	45.0455 tpy
SO_2	1.2178 lb/hr	1.2849 lb/hr	5.3338 tpy	0.0619 lb/hr	0.0619 lb/hr	0.0080 tpy	0.0682 lb/hr	0.0682 lb/hr	0.0089 tpy	1.2178 lb/hr	1.2849 lb/hr	5.3338 tpy	1.3161 lb/hr	1.3161 lb/hr	0.0013 tpy	1.2178 lb/hr	1.3161 lb/hr	5.3339 tpy
$PM_{10/2.5}$	0.5739 lb/hr	0.6055 lb/hr	2.5135 tpy	0.0292 lb/hr	0.0292 lb/hr	0.0038 tpy	0.0321 lb/hr	0.0321 lb/hr	0.0042 tpy	0.5739 lb/hr	0.6055 lb/hr	2.5135 tpy	0.6202 lb/hr	0.6202 lb/hr	0.0006 tpy	0.5739 lb/hr	0.6202 lb/hr	2.5135 tpy
CO_{2-e}	10,297 lb/hr	10,866 lb/hr	45,103 tpy	2,296 lb/hr	2,296 lb/hr	298 tpy	1,402 lb/hr	1,402 lb/hr	182 tpy	10,318 lb/hr	11,394 lb/hr	45,193 tpy	11,195 lb/hr	11,262 lb/hr	11 tpy	10,318 lb/hr	11,394 lb/hr	45,194 tpy
CO_2	10,231 lb/hr	10,795 lb/hr	44,810 tpy	520 lb/hr	520 lb/hr	68 tpy	573 lb/hr	573 lb/hr	74 tpy	10,231 lb/hr	10,795 lb/hr	44,810 tpy	11,057 lb/hr	11,057 lb/hr	11 tpy	10,231 lb/hr	11,057 lb/hr	44,811 tpy
N_2O	0.0193 lb/hr	0.0203 lb/hr	0.0845 tpy	0.0010 lb/hr	0.0010 lb/hr	0.0001 tpy	0.0011 lb/hr	0.0011 lb/hr	0.0001 tpy	0.0193 lb/hr	0.0203 lb/hr	0.0845 tpy	0.0208 lb/hr	0.0208 lb/hr	0.0000 tpy	0.0193 lb/hr	0.0208 lb/hr	0.0845 tpy
TOC (Total)	3.1223 lb/hr	3.3050 lb/hr	13.6758 tpy	90.8402 lb/hr	90.8402 lb/hr	11.8092 tpy	42.3820 lb/hr	42.3820 lb/hr	5.5097 tpy	7.0494 lb/hr	135.5632 lb/hr	30.8763 tpy	6.7752 lb/hr	10.1628 lb/hr	0.0068 tpy	7.0502 lb/hr	135.5632 lb/hr	30.8800 tpy
Methane	2.4411 lb/hr	2.5839 lb/hr	10.6920 tpy	71.0205 lb/hr	71.0205 lb/hr	9.2327 tpy	33.1350 lb/hr	33.1350 lb/hr	4.3076 tpy	5.5113 lb/hr	105.9858 lb/hr	24.1397 tpy	5.2969 lb/hr	7.9454 lb/hr	0.0053 tpy	5.5120 lb/hr	105.9858 lb/hr	24.1425 tpy
Ethane	0.0852 lb/hr	0.0901 lb/hr	0.3730 tpy	2.4775 lb/hr	2.4775 lb/hr	0.3221 tpy	1.1559 lb/hr	1.1559 lb/hr	0.1503 tpy	0.1923 lb/hr	3.6972 lb/hr	0.8421 tpy	0.1848 lb/hr	0.2772 lb/hr	0.0002 tpy	0.1923 lb/hr	3.6972 lb/hr	0.8422 tpy
VOC (Total)	0.5961 lb/hr	0.6309 lb/hr	2.6108 tpy	17.3422 lb/hr	17.3422 lb/hr	2.2545 tpy	8.0911 lb/hr	8.0911 lb/hr	1.0518 tpy	1.3458 lb/hr	25.8802 lb/hr	5.8946 tpy	1.2934 lb/hr	1.9402 lb/hr	0.0013 tpy	1.3460 lb/hr	25.8802 lb/hr	5.8953 tpy
VOC (non-HAP)	0.3045 lb/hr	0.3223 lb/hr	1.3336 tpy	8.8583 lb/hr	8.8583 lb/hr	1.1516 tpy	4.1329 lb/hr	4.1329 lb/hr	0.5373 tpy	0.6874 lb/hr	13.2195 lb/hr	3.0109 tpy	0.6607 lb/hr	0.9910 lb/hr	0.0007 tpy	0.6875 lb/hr	13.2195 lb/hr	3.0113 tpy
HAP (Total)	0.2916 lb/hr	0.3087 lb/hr	1.2772 tpy	8.4839 lb/hr	8.4839 lb/hr	1.1029 tpy	3.9582 lb/hr	3.9582 lb/hr	0.5146 tpy	0.6584 lb/hr	12.6607 lb/hr	2.8837 tpy	0.6328 lb/hr	0.9491 lb/hr	0.0006 tpy	0.6584 lb/hr	12.6607 lb/hr	2.8840 tpy
Acetaldehyde	1.14E-02 lb/hr	1.20E-02 lb/hr	4.97E-02 tpy	3.30E-01 lb/hr	3.30E-01 lb/hr	4.29E-02 tpy	1.54E-01 lb/hr	1.54E-01 lb/hr	2.00E-02 tpy	2.56E-02 lb/hr	4.93E-01 lb/hr	1.12E-01 tpy	2.46E-02 lb/hr	3.70E-02 lb/hr	2.46E-05 tpy	2.56E-02 lb/hr	4.93E-01 lb/hr	1.12E-01 tpy
Acrolein	1.82E-03 lb/hr	1.92E-03 lb/hr	7.96E-03 tpy	5.29E-02 lb/hr	5.29E-02 lb/hr	6.87E-03 tpy	2.47E-02 lb/hr	2.47E-02 lb/hr	3.21E-03 tpy	4.10E-03 lb/hr	7.89E-02 lb/hr	1.80E-02 tpy	3.94E-03 lb/hr	5.91E-03 lb/hr	3.94E-06 tpy	4.10E-03 lb/hr	7.89E-02 lb/hr	1.80E-02 tpy
Benzene	3.41E-03 lb/hr	3.61E-03 lb/hr	1.49E-02 tpy	9.91E-02 lb/hr	9.91E-02 lb/hr	1.29E-02 tpy	4.62E-02 lb/hr	4.62E-02 lb/hr	6.01E-03 tpy	7.69E-03 lb/hr	1.48E-01 lb/hr	3.37E-02 tpy	7.39E-03 lb/hr	1.11E-02 lb/hr	7.39E-06 tpy	7.69E-03 lb/hr	1.48E-01 lb/hr	3.37E-02 tpy
Biphenyl																		
Butadiene (1,3-)	1.22E-04 lb/hr	1.29E-04 lb/hr	5.35E-04 tpy	3.55E-03 lb/hr	3.55E-03 lb/hr	4.62E-04 tpy	1.66E-03 lb/hr	1.66E-03 lb/hr	2.15E-04 tpy	2.76E-04 lb/hr	5.30E-03 lb/hr	1.21E-03 tpy	2.65E-04 lb/hr	3.97E-04 lb/hr	2.65E-07 tpy	2.76E-04 lb/hr	5.30E-03 lb/hr	1.21E-03 tpy
Carbon Tetrachloride																		
Chlorobenzene																		
Chloroform																		
Dichloropropene (1,3-)																		
Ethylbenzene	9.08E-03 lb/hr	9.61E-03 lb/hr	3.98E-02 tpy	2.64E-01 lb/hr	2.64E-01 lb/hr	3.44E-02 tpy	1.23E-01 lb/hr	1.23E-01 lb/hr	1.60E-02 tpy	2.05E-02 lb/hr	3.94E-01 lb/hr	8.98E-02 tpy	1.97E-02 lb/hr	2.96E-02 lb/hr	1.97E-05 tpy	2.05E-02 lb/hr	3.94E-01 lb/hr	8.98E-02 tpy
Ethylene Dibromide																		
Formaldehyde	2.02E-01 lb/hr	2.13E-01 lb/hr	8.83E-01 tpy	5.86E+00 lb/hr	5.86E+00 lb/hr	7.62E-01 tpy	2.74E+00 lb/hr	2.74E+00 lb/hr	3.56E-01 tpy	4.55E-01 lb/hr	8.75E+00 lb/hr	1.99E+00 tpy	4.37E-01 lb/hr	6.56E-01 lb/hr	4.37E-04 tpy	4.55E-01 lb/hr	8.75E+00 lb/hr	1.99E+00 tpy
Hexane (n-)																		
Methanol																		
Methylene Chloride																		
Methylnaphthalene (2-)																		
Naphthalene	3.69E-04 lb/hr	3.91E-04 lb/hr	1.62E-03 tpy	1.07E-02 lb/hr	1.07E-02 lb/hr	1.40E-03 tpy	5.01E-03 lb/hr	5.01E-03 lb/hr	6.51E-04 tpy	8.33E-04 lb/hr	1.60E-02 lb/hr	3.65E-03 tpy	8.01E-04 lb/hr	1.20E-03 lb/hr	8.01E-07 tpy	8.33E-04 lb/hr	1.60E-02 lb/hr	3.65E-03 tpy
PAH	6.24E-04 lb/hr	6.61E-04 lb/hr	2.74E-03 tpy	1.82E-02 lb/hr	1.82E-02 lb/hr	2.36E-03 tpy	8.48E-03 lb/hr	8.48E-03 lb/hr	1.10E-03 tpy	1.41E-03 lb/hr	2.71E-02 lb/hr	6.18E-03 tpy	1.36E-03 lb/hr	2.03E-03 lb/hr	1.36E-06 tpy	1.41E-03 lb/hr	2.71E-02 lb/hr	6.18E-03 tpy
Phenol																		
Propylene Oxide	8.23E-03 lb/hr	8.71E-03 lb/hr	3.61E-02 tpy	2.39E-01 lb/hr	2.39E-01 lb/hr	3.11E-02 tpy	1.12E-01 lb/hr	1.12E-01 lb/hr	1.45E-02 tpy	1.86E-02 lb/hr	3.57E-01 lb/hr	8.14E-02 tpy	1.79E-02 lb/hr	2.68E-02 lb/hr	1.79E-05 tpy	1.86E-02 lb/hr	3.57E-01 lb/hr	8.14E-02 tpy
Styrene																		
Tetrachloroethane (1,1,2,2-)																		
Toluene	3.69E-02 lb/hr	3.91E-02 lb/hr	1.62E-01 tpy	1.07E+00 lb/hr	1.07E+00 lb/hr	1.40E-01 tpy	5.01E-01 lb/hr	5.01E-01 lb/hr	6.51E-02 tpy	8.33E-02 lb/hr	1.60E+00 lb/hr	3.65E-01 tpy	8.01E-02 lb/hr	1.20E-01 lb/hr	8.01E-05 tpy	8.33E-02 lb/hr	1.60E+00 lb/hr	3.65E-01 tpy
Trichloroethane (1,1,2-)																		
Trimethylpentane (2,2,4-)																		
Vinyl Chloride																		
Xylenes	1.82E-02 lb/hr	1.92E-02 lb/hr	7.96E-02 tpy	5.29E-01 lb/hr	5.29E-01 lb/hr	6.87E-02 tpy	2.47E-01 lb/hr	2.47E-01 lb/hr	3.21E-02 tpy	4.10E-02 lb/hr	7.89E-01 lb/hr	1.80E-01 tpy	3.94E-02 lb/hr	5.91E-02 lb/hr	3.94E-05 tpy	4.10E-02 lb/hr	7.89E-01 lb/hr	1.80E-01 tpy

NOTES

1. See TABLE B-1Bc, TABLE B-1Bf, TABLE B-1Bg, and TABLE B-1Bh.
2. If $E(t)_{normal} > E(t)_{transient}$, then $E(8{,}760\ hrs/yr)_{all} = E(8{,}760\ hrs/yr)_{normal}$
   Otherwise, $E(8{,}760\ hrs/yr)_{all} = E(8{,}760\ hrs/yr)_{normal} - E(t)_{normal} + E(t)_{transient}$,
   where t = the duration of transient operation.

TABLE B-1Bj
Gas-Fired Turbines
Maximum Emission Estimates
Normal Operations, Startup, Shutdown, and Low Temperature Operations
PTE - 100% Fuel Utilization at 100% Power Output

Make		Solar																	
Model		070-10802S4																	
Normal Operating Load		100%																	
Operations		Normal			Startup			Shutdown			Startup/Shutdown w/ Normal			Low Temperatures			Combined Operations		
Maximum Annual Combined Event Frequency		8,760 hrs/yr			39 hrs/yr			37 hrs/yr			8,760 hrs/yr			2 hrs/yr			8,760 hrs/yr		
Pollutant	Control Efficiency	Hourly		Maximum	Hourly		Maximum	Hourly		Maximum	Hourly		Maximum	Hourly		Maximum	Hourly		Maximum
		Average	Maximum	Annual	Average	Maximum	Annual	Average	Maximum	Annual	Average	Maximum	Annual	Average	Maximum	Annual	Average	Maximum	Annual
NO_X		2.8150 lb/hr	2.9797 lb/hr	12.3298 tpy	0.9241 lb/hr	0.9241 lb/hr	0.1201 tpy	1.0721 lb/hr	1.0721 lb/hr	0.1394 tpy	2.8499 lb/hr	4.1068 lb/hr	12.4826 tpy	14.2528 lb/hr	40.7223 lb/hr	0.0143 tpy	2.8525 lb/hr	40.7223 lb/hr	12.4940 tpy
CO	95.00% by weight	0.2380 lb/hr	0.2519 lb/hr	1.0425 tpy	89.4781 lb/hr	89.4781 lb/hr	11.6322 tpy	4.8952 lb/hr	4.8952 lb/hr	0.6364 tpy	3.0370 lb/hr	94.5518 lb/hr	13.3020 tpy	1.0330 lb/hr	1.5494 lb/hr	0.0010 tpy	3.0372 lb/hr	94.5518 lb/hr	13.3028 tpy
SO_2		1.2178 lb/hr	1.2849 lb/hr	5.3338 tpy	0.0619 lb/hr	0.0619 lb/hr	0.0080 tpy	0.0682 lb/hr	0.0682 lb/hr	0.0089 tpy	1.2178 lb/hr	1.2849 lb/hr	5.3338 tpy	1.3161 lb/hr	1.3161 lb/hr	0.0013 tpy	1.2178 lb/hr	1.3161 lb/hr	5.3339 tpy
$PM_{10/2.5}$		0.5739 lb/hr	0.6055 lb/hr	2.5135 tpy	0.0292 lb/hr	0.0292 lb/hr	0.0038 tpy	0.0321 lb/hr	0.0321 lb/hr	0.0042 tpy	0.5739 lb/hr	0.6055 lb/hr	2.5135 tpy	0.6202 lb/hr	0.6202 lb/hr	0.0006 tpy	0.5739 lb/hr	0.6202 lb/hr	2.5135 tpy
CO_{2-e}		10,305 lb/hr	10,873 lb/hr	45,134 tpy	2,296 lb/hr	2,296 lb/hr	298 tpy	1,548 lb/hr	1,548 lb/hr	201 tpy	10,329 lb/hr	11,545 lb/hr	45,243 tpy	11,226 lb/hr	11,308 lb/hr	11 tpy	10,330 lb/hr	13,759 lb/hr	45,244 tpy
CO_2		10,238 lb/hr	10,803 lb/hr	44,842 tpy	520 lb/hr	520 lb/hr	68 tpy	719 lb/hr	719 lb/hr	93 tpy	10,238 lb/hr	10,803 lb/hr	44,842 tpy	11,088 lb/hr	11,103 lb/hr	11 tpy	10,238 lb/hr	11,103 lb/hr	44,842 tpy
N_2O		0.0193 lb/hr	0.0203 lb/hr	0.0845 tpy	0.0010 lb/hr	0.0010 lb/hr	0.0001 tpy	0.0011 lb/hr	0.0011 lb/hr	0.0001 tpy	0.0193 lb/hr	0.0203 lb/hr	0.0845 tpy	0.0208 lb/hr	0.0208 lb/hr	0.0000 tpy	0.0193 lb/hr	0.0208 lb/hr	0.0845 tpy
TOC (Total)	10.91% by weight	2.7817 lb/hr	2.9444 lb/hr	12.1839 tpy	90.8402 lb/hr	90.8402 lb/hr	11.8092 tpy	37.7585 lb/hr	37.7585 lb/hr	4.9086 tpy	6.5745 lb/hr	130.6843 lb/hr	28.7963 tpy	6.0361 lb/hr	9.0541 lb/hr	0.0060 tpy	6.5752 lb/hr	130.6843 lb/hr	28.7995 tpy
Methane	0.00% by weight	2.4411 lb/hr	2.5839 lb/hr	10.6920 tpy	71.0205 lb/hr	71.0205 lb/hr	9.2327 tpy	33.1350 lb/hr	33.1350 lb/hr	4.3076 tpy	5.5113 lb/hr	105.9858 lb/hr	24.1397 tpy	5.2969 lb/hr	7.9454 lb/hr	0.0053 tpy	5.5120 lb/hr	105.9858 lb/hr	24.1425 tpy
Ethane	50.00% by weight	0.0426 lb/hr	0.0451 lb/hr	0.1865 tpy	2.4775 lb/hr	2.4775 lb/hr	0.3221 tpy	0.5779 lb/hr	0.5779 lb/hr	0.0751 tpy	0.1329 lb/hr	3.0873 lb/hr	0.5821 tpy	0.0924 lb/hr	0.1386 lb/hr	0.0001 tpy	0.1329 lb/hr	3.0873 lb/hr	0.5821 tpy
VOC (Total)	50.00% by weight	0.2980 lb/hr	0.3155 lb/hr	1.3054 tpy	17.3422 lb/hr	17.3422 lb/hr	2.2545 tpy	4.0456 lb/hr	4.0456 lb/hr	0.5259 tpy	0.9303 lb/hr	21.6112 lb/hr	4.0745 tpy	0.6467 lb/hr	0.9701 lb/hr	0.0006 tpy	0.9303 lb/hr	21.6112 lb/hr	4.0749 tpy
VOC (non-HAP)	19.10% by weight	0.2463 lb/hr	0.2607 lb/hr	1.0789 tpy	8.8583 lb/hr	8.8583 lb/hr	1.1516 tpy	3.3437 lb/hr	3.3437 lb/hr	0.4347 tpy	0.6064 lb/hr	12.3867 lb/hr	2.6559 tpy	0.5345 lb/hr	0.8018 lb/hr	0.0005 tpy	0.6064 lb/hr	12.3867 lb/hr	2.6562 tpy
HAP (Total)	8.23E-01 by weight	0.0517 lb/hr	0.0547 lb/hr	0.2265 tpy	8.4839 lb/hr	8.4839 lb/hr	1.1029 tpy	0.7019 lb/hr	0.7019 lb/hr	0.0912 tpy	0.3239 lb/hr	9.2245 lb/hr	1.4187 tpy	0.1122 lb/hr	0.1683 lb/hr	0.0001 tpy	0.3239 lb/hr	9.2245 lb/hr	1.4187 tpy
Acetaldehyde	80.00% by weight	2.27E-03 lb/hr	2.40E-03 lb/hr	9.95E-03 tpy	3.30E-01 lb/hr	3.30E-01 lb/hr	4.29E-02 tpy	3.08E-02 lb/hr	3.08E-02 lb/hr	4.01E-03 tpy	1.30E-02 lb/hr	3.63E-01 lb/hr	5.68E-02 tpy	4.93E-03 lb/hr	7.39E-03 lb/hr	4.93E-06 tpy	1.30E-02 lb/hr	3.63E-01 lb/hr	5.68E-02 tpy
Acrolein	50.00% by weight	9.08E-04 lb/hr	9.61E-04 lb/hr	3.98E-03 tpy	5.29E-02 lb/hr	5.29E-02 lb/hr	6.87E-03 tpy	1.23E-02 lb/hr	1.23E-02 lb/hr	1.60E-03 tpy	2.84E-03 lb/hr	6.59E-02 lb/hr	1.24E-02 tpy	1.97E-03 lb/hr	2.96E-03 lb/hr	1.97E-06 tpy	2.84E-03 lb/hr	6.59E-02 lb/hr	1.24E-02 tpy
Benzene	50.00% by weight	1.70E-03 lb/hr	1.80E-03 lb/hr	7.46E-03 tpy	9.91E-02 lb/hr	9.91E-02 lb/hr	1.29E-02 tpy	2.31E-02 lb/hr	2.31E-02 lb/hr	3.01E-03 tpy	5.32E-03 lb/hr	1.23E-01 lb/hr	2.33E-02 tpy	3.70E-03 lb/hr	5.54E-03 lb/hr	3.70E-06 tpy	5.32E-03 lb/hr	1.23E-01 lb/hr	2.33E-02 tpy
Biphenyl	0.00% by weight																		
Butadiene (1,3-)	50.00% by weight	6.10E-05 lb/hr	6.46E-05 lb/hr	2.67E-04 tpy	3.55E-03 lb/hr	3.55E-03 lb/hr	4.62E-04 tpy	8.28E-04 lb/hr	8.28E-04 lb/hr	1.08E-04 tpy	1.90E-04 lb/hr	4.43E-03 lb/hr	8.34E-04 tpy	1.32E-04 lb/hr	1.99E-04 lb/hr	1.32E-07 tpy	1.90E-04 lb/hr	4.43E-03 lb/hr	8.34E-04 tpy
Carbon Tetrachloride	50.00% by weight																		
Chlorobenzene	50.00% by weight																		
Chloroform	50.00% by weight																		
Dichloropropene (1,3-)	50.00% by weight																		
Ethylbenzene	50.00% by weight	4.54E-03 lb/hr	4.81E-03 lb/hr	1.99E-02 tpy	2.64E-01 lb/hr	2.64E-01 lb/hr	3.44E-02 tpy	6.16E-02 lb/hr	6.16E-02 lb/hr	8.01E-03 tpy	1.42E-02 lb/hr	3.29E-01 lb/hr	6.21E-02 tpy	9.85E-03 lb/hr	1.48E-02 lb/hr	9.85E-06 tpy	1.42E-02 lb/hr	3.29E-01 lb/hr	6.21E-02 tpy
Ethylene Dibromide	50.00% by weight																		
Formaldehyde	95.00% by weight	1.01E-02 lb/hr	1.07E-02 lb/hr	4.41E-02 tpy	5.86E+00 lb/hr	5.86E+00 lb/hr	7.62E-01 tpy	1.37E-01 lb/hr	1.37E-01 lb/hr	1.78E-02 tpy	1.88E-01 lb/hr	6.01E+00 lb/hr	8.24E-01 tpy	2.19E-02 lb/hr	3.28E-02 lb/hr	2.19E-05 tpy	1.88E-01 lb/hr	6.01E+00 lb/hr	8.24E-01 tpy
Hexane (n-)	50.00% by weight																		
Methanol	95.00% by weight																		
Methylene Chloride	50.00% by weight																		
Methylnaphthalene (2-)	50.00% by weight																		
Naphthalene	50.00% by weight	1.85E-04 lb/hr	1.95E-04 lb/hr	8.08E-04 tpy	1.07E-02 lb/hr	1.07E-02 lb/hr	1.40E-03 tpy	2.50E-03 lb/hr	2.50E-03 lb/hr	3.26E-04 tpy	5.76E-04 lb/hr	1.34E-02 lb/hr	2.52E-03 tpy	4.00E-04 lb/hr	6.01E-04 lb/hr	4.00E-07 tpy	5.76E-04 lb/hr	1.34E-02 lb/hr	2.52E-03 tpy
PAH	50.00% by weight	3.12E-04 lb/hr	3.30E-04 lb/hr	1.37E-03 tpy	1.82E-02 lb/hr	1.82E-02 lb/hr	2.36E-03 tpy	4.24E-03 lb/hr	4.24E-03 lb/hr	5.51E-04 tpy	9.75E-04 lb/hr	2.26E-02 lb/hr	4.27E-03 tpy	6.78E-04 lb/hr	1.02E-03 lb/hr	6.78E-07 tpy	9.75E-04 lb/hr	2.26E-02 lb/hr	4.27E-03 tpy
Phenol	50.00% by weight																		
Propylene Oxide	50.00% by weight	4.12E-03 lb/hr	4.36E-03 lb/hr	1.80E-02 tpy	2.39E-01 lb/hr	2.39E-01 lb/hr	3.11E-02 tpy	5.59E-02 lb/hr	5.59E-02 lb/hr	7.26E-03 tpy	1.28E-02 lb/hr	2.98E-01 lb/hr	5.63E-02 tpy	8.93E-03 lb/hr	1.34E-02 lb/hr	8.93E-06 tpy	1.28E-02 lb/hr	2.98E-01 lb/hr	5.63E-02 tpy
Styrene	0.00% by weight																		
Tetrachloroethane (1,1,2,2-)	50.00% by weight																		
Toluene	50.00% by weight	1.85E-02 lb/hr	1.95E-02 lb/hr	8.08E-02 tpy	1.07E+00 lb/hr	1.07E+00 lb/hr	1.40E-01 tpy	2.50E-01 lb/hr	2.50E-01 lb/hr	3.26E-02 tpy	5.76E-02 lb/hr	1.34E+00 lb/hr	2.52E-01 tpy	4.00E-02 lb/hr	6.01E-02 lb/hr	4.00E-05 tpy	5.76E-02 lb/hr	1.34E+00 lb/hr	2.52E-01 tpy
Trichloroethane (1,1,2-)	50.00% by weight																		
Trimethylpentane (2,2,4-)	50.00% by weight																		
Vinyl Chloride	0.00% by weight																		
Xylenes	50.00% by weight	9.08E-03 lb/hr	9.61E-03 lb/hr	3.98E-02 tpy	5.29E-01 lb/hr	5.29E-01 lb/hr	6.87E-02 tpy	1.23E-01 lb/hr	1.23E-01 lb/hr	1.60E-02 tpy	2.84E-02 lb/hr	6.59E-01 lb/hr	1.24E-01 tpy	1.97E-02 lb/hr	2.96E-02 lb/hr	1.97E-05 tpy	2.84E-02 lb/hr	6.59E-01 lb/hr	1.24E-01 tpy

NOTES

1. See TABLE B-1Bi.
2. It's assumed that oxidation catalyst will be ineffective during startup events.
3. $CO2 = CO2_{uncontrolled} + CE_{CO\text{-}control\ efficiency} * CO_{uncontrolled} * (MW_{CO2}/MW_{CO}) = CO2_{uncontrolled} + CE_{CO\text{-}control\ efficiency} * CO_{uncontrolled} * (44.0095/28.0101)$.

TABLE C-1E
4-Stroke Lean-Burn Reciprocating Engines
Hourly and Annual Emission Estimates
Uncontrolled

Type		4slb				
Service		Emergency				
JJJJ Relevant Date		Manufactured: On or After 01/01/2009				
ZZZZ Status		New RICE at Major HAP Source				
Make		Waukesha				
Model		VGF36GL				
Fuel		Natural Gas				
Fuel Higher Heating Value (HHV)		1,020 BTU/scf			1,020 BTU/scf	
Ambient Temperature		80 °F			80 °F	
Power Output		880 bhp (mech.)			880 bhp (mech.)	
		625 kW (elec.)			625 kW (elec.)	
Heat Rate at HHV		7,904 BTU/hp-hr			7,904 BTU/hp-hr	
Operating Hours		100 hrs/yr				
Fuel Consumption		6,820 scfh			6,820 scfh	
		0.682 MMscf/yr				
Heat Input at HHV		6.96 MMBTU/hr			6.96 MMBTU/hr	
		696 MMBTU/yr	Uncontrolled			Uncontrolled
Pollutant	Control Efficiency	Uncontrolled	Average Hourly	Maximum Annual	Uncontrolled	Maximum Hourly
NO_X		568.97 lb/MMscf	3.8801 lb/hr	0.1940 tpy	568.97 lb/MMscf	3.8801 lb/hr
CO		1,137.93 lb/MMscf	7.7601 lb/hr	0.3880 tpy	1,137.93 lb/MMscf	7.7601 lb/hr
SO_2		14.29 lb/MMscf	0.0974 lb/hr	0.0049 tpy	14.29 lb/MMscf	0.0974 lb/hr
$PM_{10/2.5}$		10.19 lb/MMscf	0.0695 lb/hr	0.0035 tpy	10.19 lb/MMscf	0.0695 lb/hr
$CO_{2\text{-}e}$		253,565 lb/MMscf	1,729 lb/hr	86 tpy	253,565 lb/MMscf	1,729 lb/hr
CO_2		120,017 lb/MMscf	818 lb/hr	41 tpy	120,017 lb/MMscf	818 lb/hr
N_2O		0.23 lb/MMscf	0.0015 lb/hr	0.0001 tpy	0.23 lb/MMscf	0.0015 lb/hr
TOC (Total)		6,278.90 lb/MMscf	42.8191 lb/hr	2.1410 tpy	6,278.90 lb/MMscf	42.8191 lb/hr
Methane		5,339.20 lb/MMscf	36.4108 lb/hr	1.8205 tpy	5,339.20 lb/MMscf	36.4108 lb/hr
Ethane		429.69 lb/MMscf	2.9303 lb/hr	0.1465 tpy	429.69 lb/MMscf	2.9303 lb/hr
VOC (Total)		510.01 lb/MMscf	3.4780 lb/hr	0.1739 tpy	510.01 lb/MMscf	3.4780 lb/hr
VOC (non-HAP)		201.64 lb/MMscf	1.3751 lb/hr	0.0688 tpy	201.64 lb/MMscf	1.3751 lb/hr
HAP (Total)		308.37 lb/MMscf	2.1029 lb/hr	0.1051 tpy	308.37 lb/MMscf	2.1029 lb/hr
Acetaldehyde		3.57E+01 lb/MMscf	2.44E-01 lb/hr	1.22E-02 tpy	3.57E+01 lb/MMscf	2.44E-01 lb/hr
Acrolein		2.20E+01 lb/MMscf	1.50E-01 lb/hr	7.49E-03 tpy	2.20E+01 lb/MMscf	1.50E-01 lb/hr
Benzene		1.88E+00 lb/MMscf	1.28E-02 lb/hr	6.41E-04 tpy	1.88E+00 lb/MMscf	1.28E-02 lb/hr
Biphenyl		9.06E-01 lb/MMscf	6.18E-03 lb/hr	3.09E-04 tpy	9.06E-01 lb/MMscf	6.18E-03 lb/hr
Butadiene (1,3-)		1.14E+00 lb/MMscf	7.78E-03 lb/hr	3.89E-04 tpy	1.14E+00 lb/MMscf	7.78E-03 lb/hr
Carbon Tetrachloride		1.57E-01 lb/MMscf	1.07E-03 lb/hr	5.35E-05 tpy	1.57E-01 lb/MMscf	1.07E-03 lb/hr
Chlorobenzene		1.30E-01 lb/MMscf	8.86E-04 lb/hr	4.43E-05 tpy	1.30E-01 lb/MMscf	8.86E-04 lb/hr
Chloroform		1.22E-01 lb/MMscf	8.30E-04 lb/hr	4.15E-05 tpy	1.22E-01 lb/MMscf	8.30E-04 lb/hr
Dichloropropene (1,3-)		1.13E-01 lb/MMscf	7.69E-04 lb/hr	3.84E-05 tpy	1.13E-01 lb/MMscf	7.69E-04 lb/hr
Ethylbenzene		1.70E-01 lb/MMscf	1.16E-03 lb/hr	5.78E-05 tpy	1.70E-01 lb/MMscf	1.16E-03 lb/hr
Ethylene Dibromide		1.89E-01 lb/MMscf	1.29E-03 lb/hr	6.45E-05 tpy	1.89E-01 lb/MMscf	1.29E-03 lb/hr
Formaldehyde		2.26E+02 lb/MMscf	1.54E+00 lb/hr	7.69E-02 tpy	2.26E+02 lb/MMscf	1.54E+00 lb/hr
Hexane (n-)		4.74E+00 lb/MMscf	3.23E-02 lb/hr	1.62E-03 tpy	4.74E+00 lb/MMscf	3.23E-02 lb/hr
Methanol		1.07E+01 lb/MMscf	7.28E-02 lb/hr	3.64E-03 tpy	1.07E+01 lb/MMscf	7.28E-02 lb/hr
Methylene Chloride		8.54E-02 lb/MMscf	5.83E-04 lb/hr	2.91E-05 tpy	8.54E-02 lb/MMscf	5.83E-04 lb/hr
Methylnaphthalene (2-)		1.42E-01 lb/MMscf	9.67E-04 lb/hr	4.84E-05 tpy	1.42E-01 lb/MMscf	9.67E-04 lb/hr
Naphthalene		3.18E-01 lb/MMscf	2.17E-03 lb/hr	1.08E-04 tpy	3.18E-01 lb/MMscf	2.17E-03 lb/hr
PAH		1.15E-01 lb/MMscf	7.84E-04 lb/hr	3.92E-05 tpy	1.15E-01 lb/MMscf	7.84E-04 lb/hr
Phenol		1.03E-01 lb/MMscf	6.99E-04 lb/hr	3.50E-05 tpy	1.03E-01 lb/MMscf	6.99E-04 lb/hr
Propylene Oxide						
Styrene		1.01E-01 lb/MMscf	6.87E-04 lb/hr	3.44E-05 tpy	1.01E-01 lb/MMscf	6.87E-04 lb/hr
Tetrachloroethane (1,1,2,2-)		1.81E-01 lb/MMscf	1.24E-03 lb/hr	6.19E-05 tpy	1.81E-01 lb/MMscf	1.24E-03 lb/hr
Toluene		1.74E+00 lb/MMscf	1.19E-02 lb/hr	5.94E-04 tpy	1.74E+00 lb/MMscf	1.19E-02 lb/hr
Trichloroethane (1,1,2-)		1.36E-01 lb/MMscf	9.26E-04 lb/hr	4.63E-05 tpy	1.36E-01 lb/MMscf	9.26E-04 lb/hr
Trimethylpentane (2,2,4-)		1.07E+00 lb/MMscf	7.28E-03 lb/hr	3.64E-04 tpy	1.07E+00 lb/MMscf	7.28E-03 lb/hr
Vinyl Chloride		6.36E-02 lb/MMscf	4.34E-04 lb/hr	2.17E-05 tpy	6.36E-02 lb/MMscf	4.34E-04 lb/hr
Xylenes		7.86E-01 lb/MMscf	5.36E-03 lb/hr	2.68E-04 tpy	7.86E-01 lb/MMscf	5.36E-03 lb/hr

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Maximum hourly emissions based on 100% of rated capacity.
3. Vendor provided data on power output and heat rate.
4. SO2 emission factor based on AP-42, Section 3.2 (Revised 7/00), Table 3.2-1 using Tariff (5 gr/100 scf).
5. PM10/2.5 emission factor based on AP-42, Section 3.2 (Revised 7/00), Table 3.2-2.
6. CO2 and N2O emission factors based on 40 CFR 98, Subpart C, Table C-1 and 40 CFR 98, Subpart C, Table C-2, respectively.
7. NOX and CO emission factors based on 40 CFR 60, Subpart JJJJ.
8. TOC (Total) and TOC specie emissions are estimated based on scaling of AP-42 using 40 CFR 60, Subpart JJJJ (VOC - Formaldehyde) data.
   Emission factors based on: $EF_i = [EF_{(VOC\text{ - }Formaldehyde)}]/[(EF_{VOC\text{-}AP42} - EF_{Formaldehyde\text{-}AP42})]\ (EF_{i\text{-}AP42})$

TABLE C-1F
4-Stroke Lean-Burn Reciprocating Engines
Hourly and Annual Emission Estimates
Uncontrolled

Type		4slb				
Service		Emergency				
JJJJ Relevant Date		Manufactured: On or After 01/01/2009				
ZZZZ Status		New RICE at Area HAP Source				
Make		Caterpillar				
Model		G3412C				
Fuel		Natural Gas				
Fuel Higher Heating Value (HHV)		1,020 BTU/scf			1,020 BTU/scf	
Ambient Temperature		80 °F			80 °F	
Power Output		755 bhp (mech.)			755 bhp (mech.)	
		500 kW (elec.)			500 kW (elec.)	
Heat Rate at HHV		8,111 BTU/hp-hr			8,111 BTU/hp-hr	
Operating Hours		100 hrs/yr				
Fuel Consumption		6,004 scfh			6,004 scfh	
		3.002 MMscf/yr				
Heat Input at HHV		6.12 MMBTU/hr			6.12 MMBTU/hr	
		612 MMBTU/yr	Uncontrolled			Uncontrolled
Pollutant	Control Efficiency	Uncontrolled	Average Hourly	Maximum Annual	Uncontrolled	Maximum Hourly
NO_X		554.47 lb/MMscf	3.3289 lb/hr	0.1664 tpy	554.47 lb/MMscf	3.3289 lb/hr
CO		1,108.94 lb/MMscf	6.6578 lb/hr	0.3329 tpy	1,108.94 lb/MMscf	6.6578 lb/hr
SO_2		14.29 lb/MMscf	0.0858 lb/hr	0.0043 tpy	14.29 lb/MMscf	0.0858 lb/hr
$PM_{10/2.5}$		10.19 lb/MMscf	0.0612 lb/hr	0.0031 tpy	10.19 lb/MMscf	0.0612 lb/hr
CO_{2-e}		250,164 lb/MMscf	1,502 lb/hr	75 tpy	250,164 lb/MMscf	1,502 lb/hr
CO_2		120,017 lb/MMscf	721 lb/hr	36 tpy	120,017 lb/MMscf	721 lb/hr
N_2O		0.23 lb/MMscf	0.0014 lb/hr	0.0001 tpy	0.23 lb/MMscf	0.0014 lb/hr
TOC (Total)		6,118.92 lb/MMscf	36.7368 lb/hr	1.8368 tpy	6,118.92 lb/MMscf	36.7368 lb/hr
Methane		5,203.16 lb/MMscf	31.2388 lb/hr	1.5619 tpy	5,203.16 lb/MMscf	31.2388 lb/hr
Ethane		418.74 lb/MMscf	2.5140 lb/hr	0.1257 tpy	418.74 lb/MMscf	2.5140 lb/hr
VOC (Total)		497.02 lb/MMscf	2.9840 lb/hr	0.1492 tpy	497.02 lb/MMscf	2.9840 lb/hr
VOC (non-HAP)		196.50 lb/MMscf	1.1798 lb/hr	0.0590 tpy	196.50 lb/MMscf	1.1798 lb/hr
HAP (Total)		300.51 lb/MMscf	1.8042 lb/hr	0.0902 tpy	300.51 lb/MMscf	1.8042 lb/hr
Acetaldehyde		3.48E+01 lb/MMscf	2.09E-01 lb/hr	1.04E-02 tpy	3.48E+01 lb/MMscf	2.09E-01 lb/hr
Acrolein		2.14E+01 lb/MMscf	1.28E-01 lb/hr	6.42E-03 tpy	2.14E+01 lb/MMscf	1.28E-01 lb/hr
Benzene		1.83E+00 lb/MMscf	1.10E-02 lb/hr	5.50E-04 tpy	1.83E+00 lb/MMscf	1.10E-02 lb/hr
Biphenyl		8.82E-01 lb/MMscf	5.30E-03 lb/hr	2.65E-04 tpy	8.82E-01 lb/MMscf	5.30E-03 lb/hr
Butadiene (1,3-)		1.11E+00 lb/MMscf	6.67E-03 lb/hr	3.34E-04 tpy	1.11E+00 lb/MMscf	6.67E-03 lb/hr
Carbon Tetrachloride		1.53E-01 lb/MMscf	9.17E-04 lb/hr	4.59E-05 tpy	1.53E-01 lb/MMscf	9.17E-04 lb/hr
Chlorobenzene		1.27E-01 lb/MMscf	7.60E-04 lb/hr	3.80E-05 tpy	1.27E-01 lb/MMscf	7.60E-04 lb/hr
Chloroform		1.19E-01 lb/MMscf	7.12E-04 lb/hr	3.56E-05 tpy	1.19E-01 lb/MMscf	7.12E-04 lb/hr
Dichloropropene (1,3-)		1.10E-01 lb/MMscf	6.60E-04 lb/hr	3.30E-05 tpy	1.10E-01 lb/MMscf	6.60E-04 lb/hr
Ethylbenzene		1.65E-01 lb/MMscf	9.92E-04 lb/hr	4.96E-05 tpy	1.65E-01 lb/MMscf	9.92E-04 lb/hr
Ethylene Dibromide		1.84E-01 lb/MMscf	1.11E-03 lb/hr	5.54E-05 tpy	1.84E-01 lb/MMscf	1.11E-03 lb/hr
Formaldehyde		2.20E+02 lb/MMscf	1.32E+00 lb/hr	6.60E-02 tpy	2.20E+02 lb/MMscf	1.32E+00 lb/hr
Hexane (n-)		4.62E+00 lb/MMscf	2.77E-02 lb/hr	1.39E-03 tpy	4.62E+00 lb/MMscf	2.77E-02 lb/hr
Methanol		1.04E+01 lb/MMscf	6.25E-02 lb/hr	3.12E-03 tpy	1.04E+01 lb/MMscf	6.25E-02 lb/hr
Methylene Chloride		8.33E-02 lb/MMscf	5.00E-04 lb/hr	2.50E-05 tpy	8.33E-02 lb/MMscf	5.00E-04 lb/hr
Methylnaphthalene (2-)		1.38E-01 lb/MMscf	8.30E-04 lb/hr	4.15E-05 tpy	1.38E-01 lb/MMscf	8.30E-04 lb/hr
Naphthalene		3.10E-01 lb/MMscf	1.86E-03 lb/hr	9.30E-05 tpy	3.10E-01 lb/MMscf	1.86E-03 lb/hr
PAH		1.12E-01 lb/MMscf	6.72E-04 lb/hr	3.36E-05 tpy	1.12E-01 lb/MMscf	6.72E-04 lb/hr
Phenol		9.99E-02 lb/MMscf	6.00E-04 lb/hr	3.00E-05 tpy	9.99E-02 lb/MMscf	6.00E-04 lb/hr
Propylene Oxide						
Styrene		9.82E-02 lb/MMscf	5.90E-04 lb/hr	2.95E-05 tpy	9.82E-02 lb/MMscf	5.90E-04 lb/hr
Tetrachloroethane (1,1,2,2-)		1.77E-01 lb/MMscf	1.06E-03 lb/hr	5.31E-05 tpy	1.77E-01 lb/MMscf	1.06E-03 lb/hr
Toluene		1.70E+00 lb/MMscf	1.02E-02 lb/hr	5.10E-04 tpy	1.70E+00 lb/MMscf	1.02E-02 lb/hr
Trichloroethane (1,1,2-)		1.32E-01 lb/MMscf	7.95E-04 lb/hr	3.97E-05 tpy	1.32E-01 lb/MMscf	7.95E-04 lb/hr
Trimethylpentane (2,2,4-)		1.04E+00 lb/MMscf	6.25E-03 lb/hr	3.12E-04 tpy	1.04E+00 lb/MMscf	6.25E-03 lb/hr
Vinyl Chloride		6.20E-02 lb/MMscf	3.72E-04 lb/hr	1.86E-05 tpy	6.20E-02 lb/MMscf	3.72E-04 lb/hr
Xylenes		7.66E-01 lb/MMscf	4.60E-03 lb/hr	2.30E-04 tpy	7.66E-01 lb/MMscf	4.60E-03 lb/hr

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Maximum hourly emissions based on 100% of rated capacity.
3. Vendor provided data on power output and heat rate.
4. SO2 emission factor based on AP-42, Section 3.2 (Revised 7/00), Table 3.2-1 using Tariff (5 gr/100 scf).
5. PM10/2.5 emission factor based on AP-42, Section 3.2 (Revised 7/00), Table 3.2-2.
6. CO2 and N2O emission factors based on 40 CFR 98, Subpart C, Table C-1 and 40 CFR 98, Subpart C, Table C-2, respectively.
7. NOX and CO emission factors based on 40 CFR 60, Subpart JJJJ.
8. TOC (Total) and TOC specie emissions are estimated based on scaling of AP-42 using 40 CFR 60, Subpart JJJJ (VOC - Formaldehyde) data.
   Emission factors based on: $EF_i = [EF_{(VOC - Formaldehyde)}]/[(EF_{VOC-AP42} - EF_{Formaldehyde-AP42})]\ (EF_{i-AP42})$

TABLE D-1G
Natural Gas Combustion
Hourly and Annual Emission Estimates
Uncontrolled

Application		Space Heater				
Combustion Process		Conventional				
Add-on Controls		None				
Package (Make: Model)		Reznor: UDAP060				
Burner (Make: Model)		Unknown: Unknown				
Fuel		Natural Gas				
Fuel Higher Heating Value (HHV)		1,020 BTU/scf			1,020 BTU/scf	
Heat Output at HHV		0.050 MMBTU/hr			0.052 MMBTU/hr	
Thermal Efficiency		83%			83%	
Operating Hours		8,760 hrs/yr				
Fuel Consumption		59 scfh			62 scfh	
		0.515 MMscf/yr				
Heat Input at HHV		0.060 MMBTU/hr			0.063 MMBTU/hr	
		526 MMBTU/yr	Uncontrolled			Uncontrolled
Pollutant	Control Efficiency	Uncontrolled	Average Hourly	Maximum Annual	Uncontrolled	Maximum Hourly
NO_X		94.00 lb/MMscf	0.0055 lb/hr	0.0242 tpy	94.00 lb/MMscf	0.0058 lb/hr
CO		40.00 lb/MMscf	0.0024 lb/hr	0.0103 tpy	40.00 lb/MMscf	0.0025 lb/hr
SO_2		14.29 lb/MMscf	0.0008 lb/hr	0.0037 tpy	14.29 lb/MMscf	0.0009 lb/hr
$PM_{10/2.5}$		7.60 lb/MMscf	0.0004 lb/hr	0.0020 tpy	7.60 lb/MMscf	0.0005 lb/hr
CO_{2-e}		120,142.36 lb/MMscf	7.0672 lb/hr	30.9543 tpy	120,142.36 lb/MMscf	7.4206 lb/hr
CO_2		120,017.45 lb/MMscf	7.0599 lb/hr	30.9221 tpy	120,017.45 lb/MMscf	7.4128 lb/hr
N_2O		0.23 lb/MMscf	0.0000 lb/hr	0.0001 tpy	0.23 lb/MMscf	0.0000 lb/hr
TOC (Total)		13.58 lb/MMscf	0.0008 lb/hr	0.0035 tpy	13.58 lb/MMscf	0.0008 lb/hr
Methane		2.30 lb/MMscf	0.0001 lb/hr	0.0006 tpy	2.30 lb/MMscf	0.0001 lb/hr
Ethane		3.10 lb/MMscf	0.0002 lb/hr	0.0008 tpy	3.10 lb/MMscf	0.0002 lb/hr
VOC (Total)		8.18 lb/MMscf	0.0005 lb/hr	0.0021 tpy	8.18 lb/MMscf	0.0005 lb/hr
VOC (non-HAP)		6.30 lb/MMscf	0.0004 lb/hr	0.0016 tpy	6.30 lb/MMscf	0.0004 lb/hr
HAP (Total)		1.88 lb/MMscf	0.0001 lb/hr	0.0005 tpy	1.88 lb/MMscf	0.0001 lb/hr
Acetaldehyde						
Acrolein						
Benzene		2.10E-03 lb/MMscf	1.24E-07 lb/hr	5.41E-07 tpy	2.10E-03 lb/MMscf	1.30E-07 lb/hr
Biphenyl						
Butadiene (1,3-)						
Carbon Tetrachloride						
Chlorobenzene						
Chloroform						
Dichloropropene (1,3-)						
Ethylbenzene						
Ethylene Dibromide						
Formaldehyde		7.50E-02 lb/MMscf	4.41E-06 lb/hr	1.93E-05 tpy	7.50E-02 lb/MMscf	4.63E-06 lb/hr
Hexane (n-)		1.80E+00 lb/MMscf	1.06E-04 lb/hr	4.64E-04 tpy	1.80E+00 lb/MMscf	1.11E-04 lb/hr
Methanol						
Methylene Chloride						
Methylnaphthalene (2-)		2.40E-05 lb/MMscf	1.41E-09 lb/hr	6.18E-09 tpy	2.40E-05 lb/MMscf	1.48E-09 lb/hr
Naphthalene		6.10E-04 lb/MMscf	3.59E-08 lb/hr	1.57E-07 tpy	6.10E-04 lb/MMscf	3.77E-08 lb/hr
PAH						
Phenol						
Propylene Oxide						
Styrene						
Tetrachloroethane (1,1,2,2-)						
Toluene		3.40E-03 lb/MMscf	2.00E-07 lb/hr	8.76E-07 tpy	3.40E-03 lb/MMscf	2.10E-07 lb/hr
Trichloroethane (1,1,2-)						
Trimethylpentane (2,2,4-)						
Vinyl Chloride						
Xylenes						

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Maximum hourly emissions based on 105% of rated capacity.
3. Vendor provided data on: heat output and heat input.
4. CO2 and N2O emission factors based on 40 CFR 98, Subpart C, Table C-1 and 40 CFR 98, Subpart C, Table C-2, respectively.
5. NOX, CO and TOC (Total) emission factors based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-1 : Residential Furnace (< 0.3 MMBTU/hr) - Uncontrolled.
6. SO2 emission factors based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2 using Tariff (5 gr/100 scf).
7. PM10/2.5 emission factors based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2.
8. Remaining TOC specie emission factors based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-3.

TABLE D-1H
Natural Gas Combustion
Hourly and Annual Emission Estimates
Uncontrolled

Application		Process Heater				
Combustion Process		Conventional				
Add-on Controls		None				
Package (Make: Model)		Cameron: N/A				
Burner (Make: Model)		Flameco: SB12-8				
Fuel		Natural Gas				
Fuel Higher Heating Value (HHV)		1,020 BTU/scf			1,020 BTU/scf	
Heat Output at HHV		0.250 MMBTU/hr			0.263 MMBTU/hr	
Thermal Efficiency		64%			64%	
Operating Hours		8,760 hrs/yr				
Fuel Consumption		380 scfh			399 scfh	
		3.329 MMscf/yr				
Heat Input at HHV		0.388 MMBTU/hr			0.407 MMBTU/hr	
		3,395 MMBTU/yr	Uncontrolled			Uncontrolled
Pollutant	Control Efficiency	Uncontrolled	Average Hourly	Maximum Annual	Uncontrolled	Maximum Hourly
NO_X		98.43 lb/MMscf	0.0374 lb/hr	0.1638 tpy	98.43 lb/MMscf	0.0393 lb/hr
CO		150.00 lb/MMscf	0.0570 lb/hr	0.2497 tpy	150.00 lb/MMscf	0.0599 lb/hr
SO_2		14.29 lb/MMscf	0.0054 lb/hr	0.0238 tpy	14.29 lb/MMscf	0.0057 lb/hr
$PM_{10/2.5}$		7.60 lb/MMscf	0.0029 lb/hr	0.0126 tpy	7.60 lb/MMscf	0.0030 lb/hr
CO_{2-e}		120,338.86 lb/MMscf	45.7288 lb/hr	200.2920 tpy	120,338.86 lb/MMscf	48.0152 lb/hr
CO_2		120,017.45 lb/MMscf	45.6066 lb/hr	199.7571 tpy	120,017.45 lb/MMscf	47.8870 lb/hr
N_2O		0.23 lb/MMscf	0.0001 lb/hr	0.0004 tpy	0.23 lb/MMscf	0.0001 lb/hr
TOC (Total)		60.00 lb/MMscf	0.0228 lb/hr	0.0999 tpy	60.00 lb/MMscf	0.0239 lb/hr
Methane		10.16 lb/MMscf	0.0039 lb/hr	0.0169 tpy	10.16 lb/MMscf	0.0041 lb/hr
Ethane		13.69 lb/MMscf	0.0052 lb/hr	0.0228 tpy	13.69 lb/MMscf	0.0055 lb/hr
VOC (Total)		36.15 lb/MMscf	0.0137 lb/hr	0.0602 tpy	36.15 lb/MMscf	0.0144 lb/hr
VOC (non-HAP)		27.83 lb/MMscf	0.0106 lb/hr	0.0463 tpy	27.83 lb/MMscf	0.0111 lb/hr
HAP (Total)		8.32 lb/MMscf	0.0032 lb/hr	0.0138 tpy	8.32 lb/MMscf	0.0033 lb/hr
Acetaldehyde						
Acrolein						
Benzene		9.28E-03 lb/MMscf	3.53E-06 lb/hr	1.54E-05 tpy	9.28E-03 lb/MMscf	3.70E-06 lb/hr
Biphenyl						
Butadiene (1,3-)						
Carbon Tetrachloride						
Chlorobenzene						
Chloroform						
Dichloropropene (1,3-)						
Ethylbenzene						
Ethylene Dibromide						
Formaldehyde		3.31E-01 lb/MMscf	1.26E-04 lb/hr	5.51E-04 tpy	3.31E-01 lb/MMscf	1.32E-04 lb/hr
Hexane (n-)		7.95E+00 lb/MMscf	3.02E-03 lb/hr	1.32E-02 tpy	7.95E+00 lb/MMscf	3.17E-03 lb/hr
Methanol						
Methylene Chloride						
Methylnaphthalene (2-)		1.06E-04 lb/MMscf	4.03E-08 lb/hr	1.76E-07 tpy	1.06E-04 lb/MMscf	4.23E-08 lb/hr
Naphthalene		2.69E-03 lb/MMscf	1.02E-06 lb/hr	4.48E-06 tpy	2.69E-03 lb/MMscf	1.08E-06 lb/hr
PAH						
Phenol						
Propylene Oxide						
Styrene						
Tetrachloroethane (1,1,2,2-)						
Toluene		1.50E-02 lb/MMscf	5.71E-06 lb/hr	2.50E-05 tpy	1.50E-02 lb/MMscf	5.99E-06 lb/hr
Trichloroethane (1,1,2-)						
Trimethylpentane (2,2,4-)						
Vinyl Chloride						
Xylenes						

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Maximum hourly emissions based on 105% of rated capacity.
3. Vendor provided data on: heat output and heat input.
4. CO2 and N2O emission factors based on 40 CFR 98, Subpart C, Table C-1 and 40 CFR 98, Subpart C, Table C-2, respectively.
5. NOX, CO and TOC (Total) emission factors based on vendor data.
6. SO2 emission factors based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2 using Tariff (5 gr/100 scf).
7. PM10/2.5 emission factors based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2.
8. Remaining TOC specie emission factors based on scaling of AP-42, Section 1.4 (Revised 3/98), Table 1.4-3 using vendor HC data.
   $EF_i = (EF_{HC}/EF_{TOC\text{-}AP42})\ (EF_{i\text{-}AP42})$

TABLE D-1I
Natural Gas Combustion
Hourly and Annual Emission Estimates
Uncontrolled

Application		Boiler				
Combustion Process		Conventional				
Add-on Controls		None				
Package (Make: Model)		Cleaver-Brooks: CFLC-10000				
Burner (Make: Model)		Unknown: Unknown				
Fuel		Natural Gas				
Fuel Higher Heating Value (HHV)		1,020 BTU/scf			1,020 BTU/scf	
Heat Output at HHV		8.500 MMBTU/hr			8.925 MMBTU/hr	
Thermal Efficiency		85%			85%	
Operating Hours		8,760 hrs/yr				
Fuel Consumption		9,804 scfh			10,294 scfh	
		85.882 MMscf/yr				
Heat Input at HHV		10.000 MMBTU/hr			10.500 MMBTU/hr	
		87,600 MMBTU/yr	Uncontrolled			Uncontrolled
Pollutant	Control Efficiency	Uncontrolled	Average Hourly	Maximum Annual	Uncontrolled	Maximum Hourly
NO_X		11.07 lb/MMscf	0.1086 lb/hr	0.4755 tpy	11.07 lb/MMscf	0.1140 lb/hr
CO		37.50 lb/MMscf	0.3676 lb/hr	1.6103 tpy	37.50 lb/MMscf	0.3860 lb/hr
SO_2		14.29 lb/MMscf	0.1401 lb/hr	0.6134 tpy	14.29 lb/MMscf	0.1471 lb/hr
$PM_{10/2.5}$		7.60 lb/MMscf	0.0745 lb/hr	0.3264 tpy	7.60 lb/MMscf	0.0782 lb/hr
$CO_{2\text{-}e}$		120,117.74 lb/MMscf	1,177.6249 lb/hr	5,157.9970 tpy	120,117.74 lb/MMscf	1,236.5061 lb/hr
CO_2		120,017.45 lb/MMscf	1,176.6417 lb/hr	5,153.6907 tpy	120,017.45 lb/MMscf	1,235.4738 lb/hr
N_2O		0.23 lb/MMscf	0.0022 lb/hr	0.0097 tpy	0.23 lb/MMscf	0.0023 lb/hr
TOC (Total)		7.77 lb/MMscf	0.0761 lb/hr	0.3335 tpy	7.77 lb/MMscf	0.0800 lb/hr
Methane		1.32 lb/MMscf	0.0129 lb/hr	0.0565 tpy	1.32 lb/MMscf	0.0135 lb/hr
Ethane		1.77 lb/MMscf	0.0174 lb/hr	0.0761 tpy	1.77 lb/MMscf	0.0182 lb/hr
VOC (Total)		4.68 lb/MMscf	0.0459 lb/hr	0.2009 tpy	4.68 lb/MMscf	0.0482 lb/hr
VOC (non-HAP)		3.60 lb/MMscf	0.0353 lb/hr	0.1547 tpy	3.60 lb/MMscf	0.0371 lb/hr
HAP (Total)		1.08 lb/MMscf	0.0106 lb/hr	0.0462 tpy	1.08 lb/MMscf	0.0111 lb/hr
Acetaldehyde						
Acrolein						
Benzene		1.20E-03 lb/MMscf	1.18E-05 lb/hr	5.16E-05 tpy	1.20E-03 lb/MMscf	1.24E-05 lb/hr
Biphenyl						
Butadiene (1,3-)						
Carbon Tetrachloride						
Chlorobenzene						
Chloroform						
Dichloropropene (1,3-)						
Ethylbenzene						
Ethylene Dibromide						
Formaldehyde		4.29E-02 lb/MMscf	4.20E-04 lb/hr	1.84E-03 tpy	4.29E-02 lb/MMscf	4.41E-04 lb/hr
Hexane (n-)		1.03E+00 lb/MMscf	1.01E-02 lb/hr	4.42E-02 tpy	1.03E+00 lb/MMscf	1.06E-02 lb/hr
Methanol						
Methylene Chloride						
Methylnaphthalene (2-)		1.37E-05 lb/MMscf	1.35E-07 lb/hr	5.89E-07 tpy	1.37E-05 lb/MMscf	1.41E-07 lb/hr
Naphthalene		3.49E-04 lb/MMscf	3.42E-06 lb/hr	1.50E-05 tpy	3.49E-04 lb/MMscf	3.59E-06 lb/hr
PAH						
Phenol						
Propylene Oxide						
Styrene						
Tetrachloroethane (1,1,2,2-)						
Toluene		1.94E-03 lb/MMscf	1.91E-05 lb/hr	8.35E-05 tpy	1.94E-03 lb/MMscf	2.00E-05 lb/hr
Trichloroethane (1,1,2-)						
Trimethylpentane (2,2,4-)						
Vinyl Chloride						
Xylenes						

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Maximum hourly emissions based on 105% of rated capacity.
3. Vendor provided data on: heat output and heat input.
4. CO2 and N2O emission factors based on 40 CFR 98, Subpart C, Table C-1 and 40 CFR 98, Subpart C, Table C-2, respectively.
5. NOX, CO and TOC (Total) emission factors based on vendor data.
6. PM10/2.5 emission factor based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2.
7. SO2 emission factor based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2 using Tariff (5 gr/100 scf).
8. Remaining TOC specie emission factors based on scaling of AP-42, Section 1.4 (Revised 3/98), Table 1.4-3 using vendor VOC data.
   $EF_i = (EF_{VOC}/EF_{VOC\text{-}AP42})\ (EF_{i\text{-}AP42})$

TABLE D-1I
Natural Gas Combustion
Hourly and Annual Emission Estimates
Uncontrolled

Application		Boiler				
Combustion Process		Conventional				
Add-on Controls		None				
Package (Make: Model)		Cleaver-Brooks: CFLC-10000				
Burner (Make: Model)		Unknown: Unknown				
Fuel		Natural Gas				
Fuel Higher Heating Value (HHV)		1,020 BTU/scf			1,020 BTU/scf	
Heat Output at HHV		8.500 MMBTU/hr			8.925 MMBTU/hr	
Thermal Efficiency		85%			85%	
Operating Hours		8,760 hrs/yr				
Fuel Consumption		9,804 scfh			10,294 scfh	
		85.882 MMscf/yr				
Heat Input at HHV		10.000 MMBTU/hr			10.500 MMBTU/hr	
		87,600 MMBTU/yr	Uncontrolled			Uncontrolled
Pollutant	**Control Efficiency**	**Uncontrolled**	**Average Hourly**	**Maximum Annual**	**Uncontrolled**	**Maximum Hourly**
NO_X		11.07 lb/MMscf	0.1086 lb/hr	0.4755 tpy	11.07 lb/MMscf	0.1140 lb/hr
CO		37.50 lb/MMscf	0.3676 lb/hr	1.6103 tpy	37.50 lb/MMscf	0.3860 lb/hr
SO_2		14.29 lb/MMscf	0.1401 lb/hr	0.6134 tpy	14.29 lb/MMscf	0.1471 lb/hr
$PM_{10/2.5}$		7.60 lb/MMscf	0.0745 lb/hr	0.3264 tpy	7.60 lb/MMscf	0.0782 lb/hr
$CO_{2\text{-}e}$		120,117.74 lb/MMscf	1,177.6249 lb/hr	5,157.9970 tpy	120,117.74 lb/MMscf	1,236.5061 lb/hr
CO_2		120,017.45 lb/MMscf	1,176.6417 lb/hr	5,153.6907 tpy	120,017.45 lb/MMscf	1,235.4738 lb/hr
N_2O		0.23 lb/MMscf	0.0022 lb/hr	0.0097 tpy	0.23 lb/MMscf	0.0023 lb/hr
TOC (Total)		7.77 lb/MMscf	0.0761 lb/hr	0.3335 tpy	7.77 lb/MMscf	0.0800 lb/hr
Methane		1.32 lb/MMscf	0.0129 lb/hr	0.0565 tpy	1.32 lb/MMscf	0.0135 lb/hr
Ethane		1.77 lb/MMscf	0.0174 lb/hr	0.0761 tpy	1.77 lb/MMscf	0.0182 lb/hr
VOC (Total)		4.68 lb/MMscf	0.0459 lb/hr	0.2009 tpy	4.68 lb/MMscf	0.0482 lb/hr
VOC (non-HAP)		3.60 lb/MMscf	0.0353 lb/hr	0.1547 tpy	3.60 lb/MMscf	0.0371 lb/hr
HAP (Total)		1.08 lb/MMscf	0.0106 lb/hr	0.0462 tpy	1.08 lb/MMscf	0.0111 lb/hr
Acetaldehyde						
Acrolein						
Benzene		1.20E-03 lb/MMscf	1.18E-05 lb/hr	5.16E-05 tpy	1.20E-03 lb/MMscf	1.24E-05 lb/hr
Biphenyl						
Butadiene (1,3-)						
Carbon Tetrachloride						
Chlorobenzene						
Chloroform						
Dichloropropene (1,3-)						
Ethylbenzene						
Ethylene Dibromide						
Formaldehyde		4.29E-02 lb/MMscf	4.20E-04 lb/hr	1.84E-03 tpy	4.29E-02 lb/MMscf	4.41E-04 lb/hr
Hexane (n-)		1.03E+00 lb/MMscf	1.01E-02 lb/hr	4.42E-02 tpy	1.03E+00 lb/MMscf	1.06E-02 lb/hr
Methanol						
Methylene Chloride						
Methylnaphthalene (2-)		1.37E-05 lb/MMscf	1.35E-07 lb/hr	5.89E-07 tpy	1.37E-05 lb/MMscf	1.41E-07 lb/hr
Naphthalene		3.49E-04 lb/MMscf	3.42E-06 lb/hr	1.50E-05 tpy	3.49E-04 lb/MMscf	3.59E-06 lb/hr
PAH						
Phenol						
Propylene Oxide						
Styrene						
Tetrachloroethane (1,1,2,2-)						
Toluene		1.94E-03 lb/MMscf	1.91E-05 lb/hr	8.35E-05 tpy	1.94E-03 lb/MMscf	2.00E-05 lb/hr
Trichloroethane (1,1,2-)						
Trimethylpentane (2,2,4-)						
Vinyl Chloride						
Xylenes						

NOTES

1. Fuel higher heating value selected to correspond to AP-42 emissions factors.
2. Maximum hourly emissions based on 105% of rated capacity.
3. Vendor provided data on: heat output and heat input.
4. CO2 and N2O emission factors based on 40 CFR 98, Subpart C, Table C-1 and 40 CFR 98, Subpart C, Table C-2, respectively.
5. NOX, CO and TOC (Total) emission factors based on vendor data.
6. PM10/2.5 emission factor based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2.
7. SO2 emission factor based on AP-42, Section 1.4 (Revised 3/98), Table 1.4-2 using Tariff (5 gr/100 scf).
8. Remaining TOC specie emission factors based on scaling of AP-42, Section 1.4 (Revised 3/98), Table 1.4-3 using vendor VOC data.
   $EF_i = (EF_{VOC}/EF_{VOC\text{-}AP42})\ (EF_{i\text{-}AP42})$

TABLE E-1AC
Flash Analysis
Maximum Hourly and Annual Emission Estimates

Station ID	LAMT-SV-V1-C4				
Service	Pipeline Liquids				
Liquids Holding Capacity	44 gal			44 gal	
Liquids Input Rate	3.63 gal/yr			3.63 gal/hr	
Flash Gas Density	0.0769 lb/scf			0.0769 lb/scf	
Flash Factor	328.03 scf/bbl			328.03 scf/bbl	
Flash Gas Rate	28 scf/yr			28 scfh	
Flash Losses	2 lb/yr	Average	Maximum	2 lb/hr	Maximum
Flash Gas	100.00% by weight	0.0002 lb/hr	0.0011 tpy	100.00% by weight	2.1834 lb/hr
CO_{2-e}	1039.07% by weight	0.0026 lb/hr	0.0113 tpy	1039.07% by weight	23 lb/hr
CO_2	5.17% by weight	0.0000 lb/hr	0.0001 tpy	5.17% by weight	0.1128 lb/hr
TOC (Total)	94.73% by weight	0.0002 lb/hr	0.0010 tpy	94.73% by weight	2.0683 lb/hr
Methane	41.36% by weight	0.0001 lb/hr	0.0005 tpy	41.36% by weight	0.9030 lb/hr
Ethane	11.68% by weight	0.0000 lb/hr	0.0001 tpy	11.68% by weight	0.2551 lb/hr
VOC (Total)	41.69% by weight	0.0001 lb/hr	0.0005 tpy	41.69% by weight	0.9102 lb/hr
HAP (Total)	2.49% by weight	0.0000 lb/hr	0.0000 tpy	2.49% by weight	0.0544 lb/hr
Benzene	0.5089% by weight	0.0000 lb/hr	0.0000 tpy	0.5089% by weight	0.0111 lb/hr
Ethylbenzene	0.0275% by weight	0.0000 lb/hr	0.0000 tpy	0.0275% by weight	0.0006 lb/hr
Hexane (n-)	1.7932% by weight	0.0000 lb/hr	0.0000 tpy	1.7932% by weight	0.0392 lb/hr
Methanol					
Naphthalene					
Toluene	0.6253% by weight	0.0000 lb/hr	0.0000 tpy	0.6253% by weight	0.0137 lb/hr
Trimethylpentane (2,2,4-)	0.0091% by weight	0.0000 lb/hr	0.0000 tpy	0.0091% by weight	0.0002 lb/hr
Xylenes	0.3706% by weight	0.0000 lb/hr	0.0000 tpy	0.3706% by weight	0.0081 lb/hr

NOTES

1. Separator Characteristics: <u>Flash is only represented because the potential exists. The vast majority of liquids in this separator is moisture from ambient air due to temperature drop caused by pressure drop during a gas release.</u>

Orientation	Vertical Fixed Roof Tank		
Height/Length	4.85 ft		
Diameter	1.95 ft		
Capacity (physical)	110 gal		
Capacity (liquid)	44 gal	40%	of physical capacity

2. Liquid input rates:
   a. maximum hourly based on operator experience; 4 gal/hr
   b. maximum annual based on operating experience and safety factor; and 4 gal/yr
   c. average hourly is just the maximum annual divided by 8,760 hrs/yr.
3. Flash gas density is 110% of the value extracted from TABLE E-0b(ii).
   Density (TABLE E-0b(ii)): 0.0699 lb/scf Safety Factor: 110%
4. Flash factor extracted from TABLE E-0a(i).
5. Speciated emissions vapor weight percentages extracted from TABLE E-0b(ii).

TABLE E-1AD
Flash Analysis
Maximum Hourly and Annual Emission Estimates

Station ID	LAMT-SV-V1-C5				
Service	Pipeline Liquids				
Liquids Holding Capacity	44 gal			44 gal	
Liquids Input Rate	3.63 gal/yr			3.63 gal/hr	
Flash Gas Density	0.0769 lb/scf			0.0769 lb/scf	
Flash Factor	328.03 scf/bbl			328.03 scf/bbl	
Flash Gas Rate	28 scf/yr			28 scfh	
Flash Losses	2 lb/yr	Average	Maximum	2 lb/hr	Maximum
Flash Gas	100.00% by weight	0.0002 lb/hr	0.0011 tpy	100.00% by weight	2.1834 lb/hr
CO_{2-e}	1039.07% by weight	0.0026 lb/hr	0.0113 tpy	1039.07% by weight	23 lb/hr
CO_2	5.17% by weight	0.0000 lb/hr	0.0001 tpy	5.17% by weight	0.1128 lb/hr
TOC (Total)	94.73% by weight	0.0002 lb/hr	0.0010 tpy	94.73% by weight	2.0683 lb/hr
Methane	41.36% by weight	0.0001 lb/hr	0.0005 tpy	41.36% by weight	0.9030 lb/hr
Ethane	11.68% by weight	0.0000 lb/hr	0.0001 tpy	11.68% by weight	0.2551 lb/hr
VOC (Total)	41.69% by weight	0.0001 lb/hr	0.0005 tpy	41.69% by weight	0.9102 lb/hr
HAP (Total)	2.49% by weight	0.0000 lb/hr	0.0000 tpy	2.49% by weight	0.0544 lb/hr
Benzene	0.5089% by weight	0.0000 lb/hr	0.0000 tpy	0.5089% by weight	0.0111 lb/hr
Ethylbenzene	0.0275% by weight	0.0000 lb/hr	0.0000 tpy	0.0275% by weight	0.0006 lb/hr
Hexane (n-)	1.7932% by weight	0.0000 lb/hr	0.0000 tpy	1.7932% by weight	0.0392 lb/hr
Methanol					
Naphthalene					
Toluene	0.6253% by weight	0.0000 lb/hr	0.0000 tpy	0.6253% by weight	0.0137 lb/hr
Trimethylpentane (2,2,4-)	0.0091% by weight	0.0000 lb/hr	0.0000 tpy	0.0091% by weight	0.0002 lb/hr
Xylenes	0.3706% by weight	0.0000 lb/hr	0.0000 tpy	0.3706% by weight	0.0081 lb/hr

NOTES

1. Separator Characteristics: Flash is only represented because the potential exists. The vast majority of liquids in this separator is moisture from ambient air due to temperature drop caused by pressure drop during a gas release.

Orientation	Vertical Fixed Roof Tank	
Height/Length	4.85 ft	
Diameter	1.95 ft	
Capacity (physical)	110 gal	
Capacity (liquid)	44 gal	40% of physical capacity

2. Liquid input rates:
   a. maximum hourly based on operator experience; 4 gal/hr
   b. maximum annual based on operating experience and safety factor; and 4 gal/yr
   c. average hourly is just the maximum annual divided by 8,760 hrs/yr.
3. Flash gas density is 110% of the value extracted from TABLE E-0b(ii).
   Density (TABLE E-0b(ii)): 0.0699 lb/scf Safety Factor: 110%
4. Flash factor extracted from TABLE E-0a(i).
5. Speciated emissions vapor weight percentages extracted from TABLE E-0b(ii).

TABLE E-1EY
Flash Analysis
Maximum Hourly and Annual Emission Estimates

Station ID	LAMT-TK-V5-PE				
Service	Pipeline Liquids				
Liquids Holding Capacity	1,000 gal			1,000 gal	
Liquids Input Rate	4,000.00 gal/yr			1,000.00 gal/hr	
Flash Gas Density	0.0769 lb/scf			0.0769 lb/scf	
Flash Factor	328.03 scf/bbl			328.03 scf/bbl	
Flash Gas Rate	31,241 scf/yr			7,810 scfh	
Flash Losses	2,404 lb/yr	Average	Maximum	601 lb/hr	Maximum
Flash Gas	100.00% by weight	0.2744 lb/hr	1.2018 tpy	100.00% by weight	600.9213 lb/hr
CO_{2-e}	1039.07% by weight	2.8511 lb/hr	12.4880 tpy	1039.07% by weight	6,244 lb/hr
CO_2	5.17% by weight	0.0142 lb/hr	0.0621 tpy	5.17% by weight	31.0522 lb/hr
TOC (Total)	94.73% by weight	0.2599 lb/hr	1.1385 tpy	94.73% by weight	569.2380 lb/hr
Methane	41.36% by weight	0.1135 lb/hr	0.4970 tpy	41.36% by weight	248.5182 lb/hr
Ethane	11.68% by weight	0.0321 lb/hr	0.1404 tpy	11.68% by weight	70.2082 lb/hr
VOC (Total)	41.69% by weight	0.1144 lb/hr	0.5010 tpy	41.69% by weight	250.5115 lb/hr
HAP (Total)	2.49% by weight	0.0068 lb/hr	0.0300 tpy	2.49% by weight	14.9762 lb/hr
Benzene	0.5089% by weight	0.0014 lb/hr	0.0061 tpy	0.5089% by weight	3.0579 lb/hr
Ethylbenzene	0.0275% by weight	0.0001 lb/hr	0.0003 tpy	0.0275% by weight	0.1653 lb/hr
Hexane (n-)	1.7932% by weight	0.0049 lb/hr	0.0216 tpy	1.7932% by weight	10.7758 lb/hr
Methanol					
Naphthalene					
Toluene	0.6253% by weight	0.0017 lb/hr	0.0075 tpy	0.6253% by weight	3.7576 lb/hr
Trimethylpentane (2,2,4-)	0.0091% by weight	0.0000 lb/hr	0.0001 tpy	0.0091% by weight	0.0548 lb/hr
Xylenes	0.3706% by weight	0.0010 lb/hr	0.0045 tpy	0.3706% by weight	2.2272 lb/hr

NOTES

1. Separator Characteristics: Entire flashable liquids throughput is distributed through LAMT-TK-V5-PE since this vessel WILL receive vast majority of flashable liquids.

Orientation	Vertical Fixed Roof Tank	
Height/Length	7.00 ft	
Diameter	5.00 ft	
Capacity (physical)	1,000 gal	
Capacity (liquid)	1,000 gal	100% of physical capacity

2. Liquid input rates:
   a. maximum hourly based on operator experience; 1,000 gal/hr
   b. maximum annual based on operating experience and safety factor; and 4,000 gal/yr
   c. average hourly is just the maximum annual divided by 8,760 hrs/yr.
3. Flash gas density is 110% of the value extracted from TABLE E-0b(ii).
   Density (TABLE E-0b(ii)): 0.0699 lb/scf Safety Factor: 110%
4. Flash factor extracted from TABLE E-0a(i).
5. Speciated emissions vapor weight percentages extracted from TABLE E-0b(ii).

TABLE F-1AC
Volatile Organic Liquids Storage Tanks
Hourly and Annual Emission Estimates
Standing & Working Losses

Source		LAMT-SV-V1-C4				
Service		Pipeline Liquids				
Capacity		44 gal			44 gal	
Temperature of Stored Liquid		59.40 °F			85.57 °F	
Vapor Pressure		5.1972 psia			8.3188 psia	
Pumping Rate		135 gal/min			135 gal/min	
Throughput		0.08 turnover/yr				
		3.63 gal/yr			3.63 gal/hr	
Standing Losses					**July**	
					744 hrs/month	
					5.2927 lbs/month	
		34.6674 lb/yr			0.0071 lb/hr	
Working Losses		**8.17E-03** lb/gal			**1.04E-02** lb/gal	
		0.0297 lb/yr	Average	Maximum	0.0378 lb/hr	Maximum
Residual Liquid	Stand	358.84% by weight	0.0142 lb/hr	0.0622 tpy	358.84% by weight	0.0255 lb/hr
	Work		0.0000 lb/hr	0.0001 tpy		0.1357 lb/hr
	Total		0.0142 lb/hr	0.0623 tpy		0.1612 lb/hr
$CO_{2\text{-}e}$		5398.27% by weight	0.2138 lb/hr	0.9365 tpy	5398.27% by weight	2 lb/hr
CO_2		7.83% by weight	0.0003 lb/hr	0.0014 tpy	7.83% by weight	0.0035 lb/hr
TOC (Total)		351.00% by weight	0.0139 lb/hr	0.0609 tpy	351.00% by weight	0.1577 lb/hr
Methane		215.62% by weight	0.0085 lb/hr	0.0374 tpy	215.62% by weight	0.0969 lb/hr
Ethane		35.39% by weight	0.0014 lb/hr	0.0061 tpy	35.39% by weight	0.0159 lb/hr
VOC (Total)		100.00% by weight	0.0040 lb/hr	0.0173 tpy	100.00% by weight	0.0449 lb/hr
HAP (Total)		6.23% by weight	0.0002 lb/hr	0.0011 tpy	6.23% by weight	0.0028 lb/hr
Benzene		1.5063% by weight	5.97E-05 lb/hr	2.61E-04 tpy	1.5063% by weight	6.77E-04 lb/hr
Ethylbenzene		0.0477% by weight	1.89E-06 lb/hr	8.27E-06 tpy	0.0477% by weight	2.14E-05 lb/hr
Hexane (n-)		2.8866% by weight	1.14E-04 lb/hr	5.01E-04 tpy	2.8866% by weight	1.30E-03 lb/hr
Methanol						
Naphthalene						
Toluene		1.3668% by weight	5.41E-05 lb/hr	2.37E-04 tpy	1.3668% by weight	6.14E-04 lb/hr
Trimethylpentane (2,2,4-)		0.0139% by weight	5.50E-07 lb/hr	2.41E-06 tpy	0.0139% by weight	6.24E-06 lb/hr
Xylenes		0.4073% by weight	1.61E-05 lb/hr	7.07E-05 tpy	0.4073% by weight	1.83E-04 lb/hr

NOTES

1. Tank Characteristics:

		TANKS 4.09d			
Orientation	Vertical Fixed Roof Tank		Above Ground?	Yes	
Height/Length	4.85 ft	5.00 ft	Shell/Roof Color	Gray/Medium	or less solar
Diameter	1.95 ft	1.95 ft	Shell Condition	Good	absorptance
Capacity (estimated)	108 gal		Vacuum Setting	-0.03 psig	
Capacity (nominal)	110 gal		Pressure Setting	0.03 psig	

2. Stored Liquid Characteristics:

Basis	USEPA TANKS 4.09d	MET Station:	Allentown, Pennsylvania
Material	Gasoline (RVP 10)	Selection based on VOC vapor pressure (see TABLE F-0).	
Liquid Molecular Weight	92.00 lb/lb-mol	Vapor Molecular Weight	66.00 lb/lb-mol

Monthly Data

	Days	Vapor Pressure		Liquid Surface Temperature		TANKS Output		TANKS
		avg	max	avg	max	standing	working	Flow
January	31	3.8626	4.3314	45.24	50.88	1.0826	0.6677	110
February	28	4.0728	4.6957	47.83	54.93	1.3275	0.7040	110
March	31	4.6054	5.4871	53.95	62.93	2.1943	0.7961	110
April	30	5.2064	6.4160	60.21	71.21	3.0920	0.9000	110
May	31	5.8344	7.3096	66.15	78.32	4.1763	1.0085	110
June	30	6.3940	8.0681	71.03	83.84	4.9048	1.1052	110
July	31	6.6241	8.3188	72.94	85.57	5.2927	1.1450	110
August	31	6.3887	7.8813	70.98	82.52	4.5474	1.1043	110
September	30	5.8107	7.0105	65.93	76.03	3.3141	1.0044	110
October	31	5.0812	5.9753	58.95	67.41	2.3565	0.8783	110
November	30	4.4826	5.0574	52.59	58.71	1.3780	0.7749	110
December	31	4.0036	4.4306	46.99	52.01	1.0014	0.6920	110
ALL	365	5.1972	8.3188	59.40	85.57	34.6674	10.7805	1,320

3. Emission Estimate Basis: USEPA TANKS 4.09d & TCEQ RG-166/01
4. Speciation of emissions is based on vapor weight percentages in TABLE F-0 normalized on VOC to assure methodology is conservative.

TABLE F-1AD
Volatile Organic Liquids Storage Tanks
Hourly and Annual Emission Estimates
Standing & Working Losses

Source		LAMT-SV-V1-C5				
Service		Pipeline Liquids				
Capacity		44 gal			44 gal	
Temperature of Stored Liquid		59.40 °F			85.57 °F	
Vapor Pressure		5.1972 psia			8.3188 psia	
Pumping Rate		135 gal/min			135 gal/min	
Throughput		0.08 turnover/yr				
		3.63 gal/yr			3.63 gal/hr	
Standing Losses					**July**	
					744 hrs/month	
					5.2927 lbs/month	
		34.6674 lb/yr			0.0071 lb/hr	
Working Losses		**8.17E-03** lb/gal			**1.04E-02** lb/gal	
		0.0297 lb/yr	Average	Maximum	0.0378 lb/hr	Maximum
Residual Liquid	Stand	358.84% by weight	0.0142 lb/hr	0.0622 tpy	358.84% by weight	0.0255 lb/hr
	Work		0.0000 lb/hr	0.0001 tpy		0.1357 lb/hr
	Total		0.0142 lb/hr	0.0623 tpy		0.1612 lb/hr
CO_{2-e}		5398.27% by weight	0.2138 lb/hr	0.9365 tpy	5398.27% by weight	2 lb/hr
CO_2		7.83% by weight	0.0003 lb/hr	0.0014 tpy	7.83% by weight	0.0035 lb/hr
TOC (Total)		351.00% by weight	0.0139 lb/hr	0.0609 tpy	351.00% by weight	0.1577 lb/hr
Methane		215.62% by weight	0.0085 lb/hr	0.0374 tpy	215.62% by weight	0.0969 lb/hr
Ethane		35.39% by weight	0.0014 lb/hr	0.0061 tpy	35.39% by weight	0.0159 lb/hr
VOC (Total)		100.00% by weight	0.0040 lb/hr	0.0173 tpy	100.00% by weight	0.0449 lb/hr
HAP (Total)		6.23% by weight	0.0002 lb/hr	0.0011 tpy	6.23% by weight	0.0028 lb/hr
Benzene		1.5063% by weight	5.97E-05 lb/hr	2.61E-04 tpy	1.5063% by weight	6.77E-04 lb/hr
Ethylbenzene		0.0477% by weight	1.89E-06 lb/hr	8.27E-06 tpy	0.0477% by weight	2.14E-05 lb/hr
Hexane (n-)		2.8866% by weight	1.14E-04 lb/hr	5.01E-04 tpy	2.8866% by weight	1.30E-03 lb/hr
Methanol						
Naphthalene						
Toluene		1.3668% by weight	5.41E-05 lb/hr	2.37E-04 tpy	1.3668% by weight	6.14E-04 lb/hr
Trimethylpentane (2,2,4-)		0.0139% by weight	5.50E-07 lb/hr	2.41E-06 tpy	0.0139% by weight	6.24E-06 lb/hr
Xylenes		0.4073% by weight	1.61E-05 lb/hr	7.07E-05 tpy	0.4073% by weight	1.83E-04 lb/hr

NOTES

1. Tank Characteristics: TANKS 4.09d

Orientation	Vertical Fixed Roof Tank		Above Ground?	Yes
Height/Length	4.85 ft	5.00 ft	Shell/Roof Color	Gray/Medium (or less solar absorptance)
Diameter	1.95 ft	1.95 ft	Shell Condition	Good
Capacity (estimated)	108 gal		Vacuum Setting	-0.03 psig
Capacity (nominal)	110 gal		Pressure Setting	0.03 psig

2. Stored Liquid Characteristics:

Basis	USEPA TANKS 4.09d	MET Station:	Allentown, Pennsylvania
Material	Gasoline (RVP 10)	Selection based on VOC vapor pressure (see TABLE F-0).	
Liquid Molecular Weight	92.00 lb/lb-mol	Vapor Molecular Weight	66.00 lb/lb-mol

Monthly Data	Days	Vapor Pressure		Liquid Surface Temperature		TANKS Output		TANKS
		avg	max	avg	max	standing	working	Flow
January	31	3.8626	4.3314	45.24	50.88	1.0826	0.6677	110
February	28	4.0728	4.6957	47.83	54.93	1.3275	0.7040	110
March	31	4.6054	5.4871	53.95	62.93	2.1943	0.7961	110
April	30	5.2064	6.4160	60.21	71.21	3.0920	0.9000	110
May	31	5.8344	7.3096	66.15	78.32	4.1763	1.0085	110
June	30	6.3940	8.0681	71.03	83.84	4.9048	1.1052	110
July	31	6.6241	8.3188	72.94	85.57	5.2927	1.1450	110
August	31	6.3887	7.8813	70.98	82.52	4.5474	1.1043	110
September	30	5.8107	7.0105	65.93	76.03	3.3141	1.0044	110
October	31	5.0812	5.9753	58.95	67.41	2.3565	0.8783	110
November	30	4.4826	5.0574	52.59	58.71	1.3780	0.7749	110
December	31	4.0036	4.4306	46.99	52.01	1.0014	0.6920	110
ALL	365	5.1972	8.3188	59.40	85.57	34.6674	10.7805	1,320

3. Emission Estimate Basis: USEPA TANKS 4.09d & TCEQ RG-166/01
4. Speciation of emissions is based on vapor weight percentages in TABLE F-0 normalized on VOC to assure methodology is conservative.

TABLE F-1EA2
Volatile Organic Liquids Storage Tanks
Hourly and Annual Emission Estimates
Standing & Working Losses

Source		LAMT-TK-V5-307				
Service		Pipeline Liquids				
Capacity		2,940 gal			2,940 gal	
Temperature of Stored Liquid		59.40 °F			85.57 °F	
Vapor Pressure		5.1972 psia			8.3188 psia	
Pumping Rate		150 gal/min			150 gal/min	
Throughput		2.00 turnover/yr				
		5,880 gal/yr			1,623 gal/hr	
Standing Losses					**July**	
					744 hrs/month	
					134.1637 lbs/month	
		875.9078 lb/yr			0.1803 lb/hr	
Working Losses		**8.17E-03** lb/gal			**1.04E-02** lb/gal	
		48.0222 lb/yr	Average	Maximum	16.8942 lb/hr	Maximum
Residual Liquid	Stand	358.84% by weight	0.3588 lb/hr	1.5715 tpy	358.84% by weight	0.6471 lb/hr
	Work		0.0197 lb/hr	0.0862 tpy		60.6230 lb/hr
	Total		0.3785 lb/hr	1.6577 tpy		61.2701 lb/hr
CO_{2-e}		5398.27% by weight	5.6936 lb/hr	24.9381 tpy	5398.27% by weight	922 lb/hr
CO_2		7.83% by weight	0.0083 lb/hr	0.0362 tpy	7.83% by weight	1.3376 lb/hr
TOC (Total)		351.00% by weight	0.3702 lb/hr	1.6215 tpy	351.00% by weight	59.9325 lb/hr
Methane		215.62% by weight	0.2274 lb/hr	0.9961 tpy	215.62% by weight	36.8157 lb/hr
Ethane		35.39% by weight	0.0373 lb/hr	0.1635 tpy	35.39% by weight	6.0422 lb/hr
VOC (Total)		100.00% by weight	0.1055 lb/hr	0.4620 tpy	100.00% by weight	17.0746 lb/hr
HAP (Total)		6.23% by weight	0.0066 lb/hr	0.0288 tpy	6.23% by weight	1.0635 lb/hr
Benzene		1.5063% by weight	1.59E-03 lb/hr	6.96E-03 tpy	1.5063% by weight	2.57E-01 lb/hr
Ethylbenzene		0.0477% by weight	5.03E-05 lb/hr	2.20E-04 tpy	0.0477% by weight	8.14E-03 lb/hr
Hexane (n-)		2.8866% by weight	3.04E-03 lb/hr	1.33E-02 tpy	2.8866% by weight	4.93E-01 lb/hr
Methanol						
Naphthalene						
Toluene		1.3668% by weight	1.44E-03 lb/hr	6.31E-03 tpy	1.3668% by weight	2.33E-01 lb/hr
Trimethylpentane (2,2,4-)		0.0139% by weight	1.46E-05 lb/hr	6.41E-05 tpy	0.0139% by weight	2.37E-03 lb/hr
Xylenes		0.4073% by weight	4.30E-04 lb/hr	1.88E-03 tpy	0.4073% by weight	6.96E-02 lb/hr

NOTES

1. Tank Characteristics: TANKS 4.09d

Orientation	Vertical Fixed Roof Tank	Above Ground?	Yes	
Height/Length	5.00 ft	Shell/Roof Color	Gray/Medium	or less solar absorptance
Diameter	10.00 ft	Shell Condition	Good	
Capacity (estimated)	2,938 gal	Vacuum Setting	-0.03 psig	
Capacity (nominal)	2,940 gal	Pressure Setting	0.03 psig	

2. Stored Liquid Characteristics:

Basis	USEPA TANKS 4.09d	MET Station:	Allentown, Pennsylvania
Material	Gasoline (RVP 10)	Selection based on VOC vapor pressure (see TABLE F-0).	
Liquid Molecular Weight	92.00 lb/lb-mol	Vapor Molecular Weight	66.00 lb/lb-mol

Monthly Data	Days	Vapor Pressure		Liquid Surface Temperature		TANKS Output		TANKS
		avg	max	avg	max	standing	working	Flow
January	31	3.8626	4.3314	45.24	50.88	27.1520	17.8452	2,940
February	28	4.0728	4.6957	47.83	54.93	33.3288	18.8161	2,940
March	31	4.6054	5.4871	53.95	62.93	55.2236	21.2772	2,940
April	30	5.2064	6.4160	60.21	71.21	78.0052	24.0537	2,940
May	31	5.8344	7.3096	66.15	78.32	105.5973	26.9549	2,940
June	30	6.3940	8.0681	71.03	83.84	124.2444	29.5402	2,940
July	31	6.6241	8.3188	72.94	85.57	134.1637	30.6032	2,940
August	31	6.3887	7.8813	70.98	82.52	115.1879	29.5159	2,940
September	30	5.8107	7.0105	65.93	76.03	83.7902	26.8454	2,940
October	31	5.0812	5.9753	58.95	67.41	59.4206	23.4751	2,940
November	30	4.4826	5.0574	52.59	58.71	34.6610	20.7098	2,940
December	31	4.0036	4.4306	46.99	52.01	25.1330	18.4965	2,940
ALL	365	5.1972	8.3188	59.40	85.57	875.9078	288.1331	35,280

3. Emission Estimate Basis: USEPA TANKS 4.09d & TCEQ RG-166/01
4. Speciation of emissions is based on vapor weight percentages in TABLE F-0 normalized on VOC to assure methodology is conservative.

TABLE F-1EB2
Volatile Organic Liquids Storage Tanks
Hourly and Annual Emission Estimates
Standing & Working Losses

Source		LAMT-TK-V5-322				
Service		Pipeline Liquids				
Capacity		2,940 gal			2,940 gal	
Temperature of Stored Liquid		59.40 °F			85.57 °F	
Vapor Pressure		5.1972 psia			8.3188 psia	
Pumping Rate		150 gal/min			150 gal/min	
Throughput		2.00 turnover/yr				
		5,880 gal/yr			1,623 gal/hr	
Standing Losses					**July**	
					744 hrs/month	
					134.1637 lbs/month	
		875.9078 lb/yr			0.1803 lb/hr	
Working Losses		**8.17E-03** lb/gal			**1.04E-02** lb/gal	
		48.0222 lb/yr	Average	Maximum	16.8942 lb/hr	Maximum
Residual Liquid	Stand	358.84% by weight	0.3588 lb/hr	1.5715 tpy	358.84% by weight	0.6471 lb/hr
	Work		0.0197 lb/hr	0.0862 tpy		60.6230 lb/hr
	Total		0.3785 lb/hr	1.6577 tpy		61.2701 lb/hr
CO_{2-e}		5398.27% by weight	5.6936 lb/hr	24.9381 tpy	5398.27% by weight	922 lb/hr
CO_2		7.83% by weight	0.0083 lb/hr	0.0362 tpy	7.83% by weight	1.3376 lb/hr
TOC (Total)		351.00% by weight	0.3702 lb/hr	1.6215 tpy	351.00% by weight	59.9325 lb/hr
Methane		215.62% by weight	0.2274 lb/hr	0.9961 tpy	215.62% by weight	36.8157 lb/hr
Ethane		35.39% by weight	0.0373 lb/hr	0.1635 tpy	35.39% by weight	6.0422 lb/hr
VOC (Total)		100.00% by weight	0.1055 lb/hr	0.4620 tpy	100.00% by weight	17.0746 lb/hr
HAP (Total)		6.23% by weight	0.0066 lb/hr	0.0288 tpy	6.23% by weight	1.0635 lb/hr
Benzene		1.5063% by weight	1.59E-03 lb/hr	6.96E-03 tpy	1.5063% by weight	2.57E-01 lb/hr
Ethylbenzene		0.0477% by weight	5.03E-05 lb/hr	2.20E-04 tpy	0.0477% by weight	8.14E-03 lb/hr
Hexane (n-)		2.8866% by weight	3.04E-03 lb/hr	1.33E-02 tpy	2.8866% by weight	4.93E-01 lb/hr
Methanol						
Naphthalene						
Toluene		1.3668% by weight	1.44E-03 lb/hr	6.31E-03 tpy	1.3668% by weight	2.33E-01 lb/hr
Trimethylpentane (2,2,4-)		0.0139% by weight	1.46E-05 lb/hr	6.41E-05 tpy	0.0139% by weight	2.37E-03 lb/hr
Xylenes		0.4073% by weight	4.30E-04 lb/hr	1.88E-03 tpy	0.4073% by weight	6.96E-02 lb/hr

NOTES

1. Tank Characteristics: TANKS 4.09d

Orientation	Vertical Fixed Roof Tank	Above Ground?	Yes	
Height/Length	5.00 ft	Shell/Roof Color	Gray/Medium	or less solar
Diameter	10.00 ft	Shell Condition	Good	absorptance
Capacity (estimated)	2,938 gal	Vacuum Setting	-0.03 psig	
Capacity (nominal)	2,940 gal	Pressure Setting	0.03 psig	

2. Stored Liquid Characteristics:

Basis	USEPA TANKS 4.09d	MET Station: Allentown, Pennsylvania
Material	Gasoline (RVP 10)	Selection based on VOC vapor pressure (see TABLE F-0).
Liquid Molecular Weight	92.00 lb/lb-mol	Vapor Molecular Weight 66.00 lb/lb-mol

Monthly Data

	Days	Vapor Pressure		Liquid Surface Temperature		TANKS Output		TANKS
		avg	max	avg	max	standing	working	Flow
January	31	3.8626	4.3314	45.24	50.88	27.1520	17.8452	2,940
February	28	4.0728	4.6957	47.83	54.93	33.3288	18.8161	2,940
March	31	4.6054	5.4871	53.95	62.93	55.2236	21.2772	2,940
April	30	5.2064	6.4160	60.21	71.21	78.0052	24.0537	2,940
May	31	5.8344	7.3096	66.15	78.32	105.5973	26.9549	2,940
June	30	6.3940	8.0681	71.03	83.84	124.2444	29.5402	2,940
July	31	6.6241	8.3188	72.94	85.57	134.1637	30.6032	2,940
August	31	6.3887	7.8813	70.98	82.52	115.1879	29.5159	2,940
September	30	5.8107	7.0105	65.93	76.03	83.7902	26.8454	2,940
October	31	5.0812	5.9753	58.95	67.41	59.4206	23.4751	2,940
November	30	4.4826	5.0574	52.59	58.71	34.6610	20.7098	2,940
December	31	4.0036	4.4306	46.99	52.01	25.1330	18.4965	2,940
ALL	365	5.1972	8.3188	59.40	85.57	875.9078	288.1331	35,280

3. Emission Estimate Basis: USEPA TANKS 4.09d & TCEQ RG-166/01
4. Speciation of emissions is based on vapor weight percentages in TABLE F-0 normalized on VOC to assure methodology is conservative.

TABLE F-1EY
Volatile Organic Liquids Storage Tanks
Hourly and Annual Emission Estimates
Standing & Working Losses

Source		LAMT-TK-V5-PE				
Service		Pipeline Liquids				
Capacity		1,000 gal			1,000 gal	
Temperature of Stored Liquid		59.40 °F			85.57 °F	
Vapor Pressure		5.1972 psia			8.3188 psia	
Pumping Rate		150 gal/min			150 gal/min	
Throughput		4.00 turnover/yr				
		4,000 gal/yr			1,000 gal/hr	
Standing Losses					**July**	
					744 hrs/month	
					36.4851 lbs/month	
		240.0454 lb/yr			0.0490 lb/hr	
Working Losses		**8.17E-03** lb/gal			**1.04E-02** lb/gal	
		32.6682 lb/yr	Average	Maximum	10.4093 lb/hr	Maximum
Residual Liquid	Stand	358.84% by weight	0.0983 lb/hr	0.4307 tpy	358.84% by weight	0.1760 lb/hr
	Work		0.0134 lb/hr	0.0586 tpy		37.3524 lb/hr
	Total		0.1117 lb/hr	0.4893 tpy		37.5284 lb/hr
CO_{2-e}		5398.27% by weight	1.6806 lb/hr	7.3609 tpy	5398.27% by weight	565 lb/hr
CO_2		7.83% by weight	0.0024 lb/hr	0.0107 tpy	7.83% by weight	0.8193 lb/hr
TOC (Total)		351.00% by weight	0.1093 lb/hr	0.4786 tpy	351.00% by weight	36.7091 lb/hr
Methane		215.62% by weight	0.0671 lb/hr	0.2940 tpy	215.62% by weight	22.5499 lb/hr
Ethane		35.39% by weight	0.0110 lb/hr	0.0483 tpy	35.39% by weight	3.7009 lb/hr
VOC (Total)		100.00% by weight	0.0311 lb/hr	0.1364 tpy	100.00% by weight	10.4583 lb/hr
HAP (Total)		6.23% by weight	0.0019 lb/hr	0.0085 tpy	6.23% by weight	0.6514 lb/hr
Benzene		1.5063% by weight	4.69E-04 lb/hr	2.05E-03 tpy	1.5063% by weight	1.58E-01 lb/hr
Ethylbenzene		0.0477% by weight	1.48E-05 lb/hr	6.50E-05 tpy	0.0477% by weight	4.99E-03 lb/hr
Hexane (n-)		2.8866% by weight	8.99E-04 lb/hr	3.94E-03 tpy	2.8866% by weight	3.02E-01 lb/hr
Methanol						
Naphthalene						
Toluene		1.3668% by weight	4.26E-04 lb/hr	1.86E-03 tpy	1.3668% by weight	1.43E-01 lb/hr
Trimethylpentane (2,2,4-)		0.0139% by weight	4.32E-06 lb/hr	1.89E-05 tpy	0.0139% by weight	1.45E-03 lb/hr
Xylenes		0.4073% by weight	1.27E-04 lb/hr	5.55E-04 tpy	0.4073% by weight	4.26E-02 lb/hr

NOTES

1. Tank Characteristics: TANKS 4.09d

Orientation	Vertical Fixed Roof Tank	Above Ground?	Yes	
Height/Length	7.00 ft	Shell/Roof Color	Gray/Medium	or less solar
Diameter	5.00 ft	Shell Condition	Good	absorptance
Capacity (estimated)	1,028 gal	Vacuum Setting	-0.03 psig	
Capacity (nominal)	1,000 gal	Pressure Setting	0.03 psig	

2. Stored Liquid Characteristics:

Basis	USEPA TANKS 4.09d	MET Station:	Allentown, Pennsylvania
Material	Gasoline (RVP 10)	Selection based on VOC vapor pressure (see TABLE F-0).	
Liquid Molecular Weight	92.00 lb/lb-mol	Vapor Molecular Weight	66.00 lb/lb-mol

Monthly Data	Days	Vapor Pressure		Liquid Surface Temperature		TANKS Output		TANKS
		avg	max	avg	max	standing	working	Flow
January	31	3.8626	4.3314	45.24	50.88	7.5714	6.0698	1,000
February	28	4.0728	4.6957	47.83	54.93	9.2713	6.4000	1,000
March	31	4.6054	5.4871	53.95	62.93	15.2748	7.2371	1,000
April	30	5.2064	6.4160	60.21	71.21	21.4530	8.1815	1,000
May	31	5.8344	7.3096	66.15	78.32	28.8869	9.1683	1,000
June	30	6.3940	8.0681	71.03	83.84	33.8431	10.0477	1,000
July	31	6.6241	8.3188	72.94	85.57	36.4851	10.4093	1,000
August	31	6.3887	7.8813	70.98	82.52	31.3774	10.0394	1,000
September	30	5.8107	7.0105	65.93	76.03	22.9258	9.1311	1,000
October	31	5.0812	5.9753	58.95	67.41	16.3605	7.9847	1,000
November	30	4.4826	5.0574	52.59	58.71	9.5993	7.0441	1,000
December	31	4.0036	4.4306	46.99	52.01	6.9969	6.2913	1,000
ALL	365	5.1972	8.3188	59.40	85.57	240.0454	98.0045	12,000

3. Emission Estimate Basis: USEPA TANKS 4.09d & TCEQ RG-166/01
4. Speciation of emissions is based on vapor weight percentages in TABLE F-0 normalized on VOC to assure methodology is conservative.

TABLE F-1GY1
Volatile Organic Liquids Storage Tanks
Hourly and Annual Emission Estimates
Standing & Working Losses

Source		LAMT-TK-V11-PE1				
Service		Coolant				
Capacity		560 gal			560 gal	
Temperature of Stored Liquid		59.40 °F			85.57 °F	
Vapor Pressure		0.0010 psia			0.0036 psia	
Pumping Rate		150 gal/min			150 gal/min	
Throughput		365.00 turnover/yr				
		204,400 gal/yr			560 gal/hr	
Standing Losses					**July**	
					744 hrs/month	
					0.0029 lbs/month	
		0.0160 lb/yr			0.00000 lb/hr	
Working Losses		**1.87E-06** lb/gal			**3.43E-06** lb/gal	
		0.3820 lb/yr	Average	Maximum	0.0019 lb/hr	Maximum
Liquid	Stand	100.00% by weight	0.0000 lb/hr	0.0000 tpy	100.00% by weight	0.0000 lb/hr
	Work		0.0000 lb/hr	0.0002 tpy		0.0019 lb/hr
	Total		0.0000 lb/hr	0.0002 tpy		0.0019 lb/hr
TOC (Total)		100.00% by weight	0.0000 lb/hr	0.0002 tpy	100.00% by weight	0.0019 lb/hr
Methane						
Ethane						
VOC (Total)		100.00% by weight	0.0000 lb/hr	0.0002 tpy	100.00% by weight	0.0019 lb/hr
HAP (Total)		100.00% by weight	0.0000 lb/hr	0.0002 tpy	100.00% by weight	0.0019 lb/hr
Benzene						
Ethylbenzene						
Hexane (n-)						
Methanol						
Naphthalene						
Toluene						
Trimethylpentane (2,2,4-)						
Xylenes						

NOTES

1. Tank Characteristics: TANKS 4.09d

Orientation	Vertical Fixed Roof Tank	Above Ground?	Yes	
Height/Length	6.00 ft	Shell/Roof Color	Gray/Medium	or less solar
Diameter	4.00 ft	Shell Condition	Good	absorptance
Capacity (estimated)	564 gal	Vacuum Setting	-0.03 psig	
Capacity (nominal)	560 gal	Pressure Setting	0.03 psig	

2. Stored Liquid Characteristics:

Basis: USEPA TANKS 4.09d — MET Station: Allentown, Pennsylvania
Material: Propylene glycol — Selected purely for a worst-case scenario.
Liquid Molecular Weight: 76.11 lb/lb-mol — Vapor Molecular Weight: 76.11 lb/lb-mol

Monthly Data	Days	Vapor Pressure avg	Vapor Pressure max	Liquid Surface Temperature avg	Liquid Surface Temperature max	TANKS Output standing	TANKS Output working	TANKS Flow
January	31	0.0004	0.0006	45.24	50.88	0.0003	0.0004	560
February	28	0.0005	0.0007	47.83	54.93	0.0004	0.0005	560
March	31	0.0007	0.0011	53.95	62.93	0.0008	0.0007	560
April	30	0.0010	0.0017	60.21	71.21	0.0013	0.0010	560
May	31	0.0013	0.0025	66.15	78.32	0.0020	0.0013	560
June	30	0.0017	0.0033	71.03	83.84	0.0026	0.0017	560
July	31	0.0019	0.0036	72.94	85.57	0.0029	0.0019	560
August	31	0.0017	0.0031	70.98	82.52	0.0024	0.0017	560
September	30	0.0013	0.0022	65.93	76.03	0.0016	0.0013	560
October	31	0.0009	0.0014	58.95	67.41	0.0009	0.0009	560
November	30	0.0006	0.0009	52.59	58.71	0.0005	0.0006	560
December	31	0.0004	0.0006	46.99	52.01	0.0003	0.0005	560
ALL	365	0.0010	0.0036	59.40	85.57	0.0160	0.0126	6,720

3. Emission Estimate Basis: USEPA TANKS 4.09d & TCEQ RG-166/01
4. There is no basis for speciation of emissions.

TABLE F-1GY2
Volatile Organic Liquids Storage Tanks
Hourly and Annual Emission Estimates
Standing & Working Losses

Source		LAMT-TK-V11-PE2				
Service		Coolant				
Capacity		560 gal			560 gal	
Temperature of Stored Liquid		59.40 °F			85.57 °F	
Vapor Pressure		0.0010 psia			0.0036 psia	
Pumping Rate		150 gal/min			150 gal/min	
Throughput		365.00 turnover/yr				
		204,400 gal/yr			560 gal/hr	
Standing Losses					**July**	
					744 hrs/month	
					0.0029 lbs/month	
		0.0160 lb/yr			0.00000 lb/hr	
Working Losses		**1.87E-06** lb/gal			**3.43E-06** lb/gal	
		0.3820 lb/yr	Average	Maximum	0.0019 lb/hr	Maximum
Liquid	Stand	100.00% by weight	0.0000 lb/hr	0.0000 tpy	100.00% by weight	0.0000 lb/hr
	Work		0.0000 lb/hr	0.0002 tpy		0.0019 lb/hr
	Total		0.0000 lb/hr	0.0002 tpy		0.0019 lb/hr
TOC (Total)		100.00% by weight	0.0000 lb/hr	0.0002 tpy	100.00% by weight	0.0019 lb/hr
Methane						
Ethane						
VOC (Total)		100.00% by weight	0.0000 lb/hr	0.0002 tpy	100.00% by weight	0.0019 lb/hr
HAP (Total)		100.00% by weight	0.0000 lb/hr	0.0002 tpy	100.00% by weight	0.0019 lb/hr
Benzene						
Ethylbenzene						
Hexane (n-)						
Methanol						
Naphthalene						
Toluene						
Trimethylpentane (2,2,4-)						
Xylenes						

NOTES

1. Tank Characteristics: TANKS 4.09d

Orientation	Vertical Fixed Roof Tank	Above Ground?	Yes
Height/Length	6.00 ft	Shell/Roof Color	Gray/Medium (or less solar absorptance)
Diameter	4.00 ft	Shell Condition	Good
Capacity (estimated)	564 gal	Vacuum Setting	-0.03 psig
Capacity (nominal)	560 gal	Pressure Setting	0.03 psig

2. Stored Liquid Characteristics:

Basis	USEPA TANKS 4.09d	MET Station:	Allentown, Pennsylvania
Material	Propylene glycol	Selected purely for a worst-case scenario.	
Liquid Molecular Weight	76.11 lb/lb-mol	Vapor Molecular Weight	76.11 lb/lb-mol

Monthly Data

	Days	Vapor Pressure		Liquid Surface Temperature		TANKS Output		TANKS
		avg	max	avg	max	standing	working	Flow
January	31	0.0004	0.0006	45.24	50.88	0.0003	0.0004	560
February	28	0.0005	0.0007	47.83	54.93	0.0004	0.0005	560
March	31	0.0007	0.0011	53.95	62.93	0.0008	0.0007	560
April	30	0.0010	0.0017	60.21	71.21	0.0013	0.0010	560
May	31	0.0013	0.0025	66.15	78.32	0.0020	0.0013	560
June	30	0.0017	0.0033	71.03	83.84	0.0026	0.0017	560
July	31	0.0019	0.0036	72.94	85.57	0.0029	0.0019	560
August	31	0.0017	0.0031	70.98	82.52	0.0024	0.0017	560
September	30	0.0013	0.0022	65.93	76.03	0.0016	0.0013	560
October	31	0.0009	0.0014	58.95	67.41	0.0009	0.0009	560
November	30	0.0006	0.0009	52.59	58.71	0.0005	0.0006	560
December	31	0.0004	0.0006	46.99	52.01	0.0003	0.0005	560
ALL	365	0.0010	0.0036	59.40	85.57	0.0160	0.0126	6,720

3. Emission Estimate Basis: USEPA TANKS 4.09d & TCEQ RG-166/01
4. There is no basis for speciation of emissions.

TABLE F-1HAB
Volatile Organic Liquids Loading (Tanker Trucks)
Hourly and Annual Emission Estimates

Source	LAMT-TL-PL-PE				
Supply Vessel	LAMT-TK-V5-PE				
	Pipeline Liquids				
	1,000 gal			1,000 gal	
Tanker Truck Service	Vapor Balance			Vapor Balance	
Loading Method	Submerged			Submerged	
Saturation Factor	1.00 n.d.			1.00 n.d.	
Vapor Molecular Weight	66.00 lb/lb-mol			66.00 lb/lb-mol	
Bulk Liquid Temperature	59.40 °F			85.57 °F	
	519.40 R			545.57 R	
Vapor Pressure	5.1972 psia			8.3188 psia	
Loading Loss Factor	8.2287 lb/kgal			12.5393 lb/kgal	
Pumping Rate				150 gpm	
Throughput	4.00 turnover/yr				
	4,000 gal/yr			1,000 gal/hr	
Loading Losses	32.9147 lb/yr	Average	Maximum	12.5393 lb/hr	Maximum
Residual Liquid	358.84% by weight	0.0135 lb/hr	0.0591 tpy	358.84% by weight	44.9957 lb/hr
CO_{2-e}	5398.27% by weight	0.2028 lb/hr	0.8884 tpy	5398.27% by weight	676.9041 lb/hr
CO_2	7.83% by weight	0.0003 lb/hr	0.0013 tpy	7.83% by weight	0.9823 lb/hr
TOC (Total)	351.00% by weight	0.0132 lb/hr	0.0578 tpy	351.00% by weight	44.0134 lb/hr
Methane	215.62% by weight	0.0081 lb/hr	0.0355 tpy	215.62% by weight	27.0369 lb/hr
Ethane	35.39% by weight	0.0013 lb/hr	0.0058 tpy	35.39% by weight	4.4373 lb/hr
VOC (Total)	100.00% by weight	0.0038 lb/hr	0.0165 tpy	100.00% by weight	12.5393 lb/hr
HAP (Total)	6.23% by weight	0.0002 lb/hr	0.0010 tpy	6.23% by weight	0.7810 lb/hr
Benzene	1.5063% by weight	5.66E-05 lb/hr	2.48E-04 tpy	1.5063% by weight	1.89E-01 lb/hr
Ethylbenzene	0.0477% by weight	1.79E-06 lb/hr	7.85E-06 tpy	0.0477% by weight	5.98E-03 lb/hr
Hexane (n-)	2.8866% by weight	1.08E-04 lb/hr	4.75E-04 tpy	2.8866% by weight	3.62E-01 lb/hr
Methanol					
Naphthalene					
Toluene	1.3668% by weight	5.14E-05 lb/hr	2.25E-04 tpy	1.3668% by weight	1.71E-01 lb/hr
Trimethylpentane (2,2,4-)	0.0139% by weight	5.22E-07 lb/hr	2.29E-06 tpy	0.0139% by weight	1.74E-03 lb/hr
Xylenes	0.4073% by weight	1.53E-05 lb/hr	6.70E-05 tpy	0.4073% by weight	5.11E-02 lb/hr

NOTES

1. Emissions calculated using methods provided in USEPA, AP-42 Section 5.2 dated 1/95. $L_L = 12.46[(S)M_V P/T]$
2. Physical property, throughput and speciation data based data from supply vessel emission calculation spreadsheet.

TABLE F-1HCB
Volatile Organic Liquids Loading (Tanker Trucks)
Hourly and Annual Emission Estimates

Source	LAMT-TL-EC-PE				
Supply Vessel	LAMT-TK-V11-PE1 and LAMT-TK-V11-PE2				
	Coolant				
	560 gal			560 gal	
Tanker Truck Service	Dedicated Normal			Dedicated Normal	
Loading Method	Splash			Splash	
Saturation Factor	1.45 n.d.			1.45 n.d.	
Vapor Molecular Weight	76.11 lb/lb-mol			76.11 lb/lb-mol	
Bulk Liquid Temperature	59.40 °F			85.57 °F	
	519.40 R			545.57 R	
Vapor Pressure	0.0010 psia			0.0036 psia	
Loading Loss Factor	0.0027 lb/kgal			0.0090 lb/kgal	
Pumping Rate				150 gpm	
Throughput	12.00 turnover/yr				
	6,720 gal/yr			560 gal/hr	
Loading Losses	0.0183 lb/yr	Average	Maximum	0.0051 lb/hr	Maximum
Residual Liquid	100.00% by weight	0.00000 lb/hr	0.0000 tpy	100.00% by weight	0.0051 lb/hr
TOC (Total)	100.00% by weight	0.00000 lb/hr	0.0000 tpy	100.00% by weight	0.0051 lb/hr
Methane					
Ethane					
VOC (Total)	100.00% by weight	0.00000 lb/hr	0.0000 tpy	100.00% by weight	0.0051 lb/hr
HAP (Total)	100.00% by weight	0.00000 lb/hr	0.0000 tpy	100.00% by weight	0.0051 lb/hr
Benzene					
Ethylbenzene					
Hexane (n-)					
Methanol					
Naphthalene					
Toluene					
Trimethylpentane (2,2,4-)					
Xylenes					

NOTES

1. Emissions calculated using methods provided in USEPA, AP-42 Section 5.2 dated 1/95. $L_L = 12.46[(S)M_V P/T]$
2. Physical property, throughput and speciation data based data from supply vessel emission calculation spreadsheet.

TABLE G-1B
Gas Releases
Hourly and Annual Emission Estimates

Category	Station Operations					
Source	LAMT-GR-ST			LAMT-GR-PL		
	Avg. Hourly	Max. Annual	Max. Hourly	Avg. Hourly	Max. Annual	Max. Hourly
Gas Release	3,661 scfh	32,066,667 scf/yr	2,033,333 scfh	1,081 scfh	9,466,667 scf/yr	3,786,667 scfh
	162 lb/hr	1,422,458 lb/yr	93,455 lb/hr	48 lb/hr	419,936 lb/yr	174,041 lb/hr
NO_X						
CO						
SO_2						
$PM_{10/2.5}$						
$CO_{2\text{-}e}$	3,664 lb/hr	16,047 tpy	2,245,387 lb/hr	1,082 lb/hr	4,737 tpy	4,181,573 lb/hr
CO_2	2.2736 lb/hr	9.9584 tpy	3,981.2028 lb/hr	0.8464 lb/hr	3.7071 tpy	7,414.1743 lb/hr
N_2O						
TOC (Total)	162 lb/hr	711 tpy	93,455 lb/hr	48 lb/hr	210 tpy	174,041 lb/hr
Methane	146 lb/hr	641 tpy	89,656 lb/hr	43 lb/hr	189 tpy	166,966 lb/hr
Ethane	14 lb/hr	63 tpy	14,635 lb/hr	4 lb/hr	19 tpy	27,255 lb/hr
VOC (Total)	1.9667 lb/hr	8.6141 tpy	3,658.1248 lb/hr	0.7777 lb/hr	3.4063 tpy	6,812.5078 lb/hr
VOC (non-HAP)	1.9264 lb/hr	8.4377 tpy	3,524.7856 lb/hr	0.7493 lb/hr	3.2821 tpy	6,564.1910 lb/hr
HAP (Total)	0.0403 lb/hr	0.1764 tpy	133.3392 lb/hr	0.0283 lb/hr	0.1242 tpy	248.3169 lb/hr
Acetaldehyde						
Acrolein						
Benzene	0.0076 lb/hr	0.0335 tpy	66.0398 lb/hr	0.0140 lb/hr	0.0615 tpy	122.9855 lb/hr
Biphenyl						
Butadiene (1,3-)						
Carbon Tetrachloride						
Chlorobenzene						
Chloroform						
Dichloropropene (1,3-)						
Ethylbenzene	0.0104 lb/hr	0.0455 tpy	10.7334 lb/hr	0.0031 lb/hr	0.0134 tpy	19.9887 lb/hr
Ethylene Dibromide						
Formaldehyde						
Hexane (n-)	0.0250 lb/hr	0.1095 tpy	68.6165 lb/hr	0.0146 lb/hr	0.0639 tpy	127.7841 lb/hr
Methanol						
Methylene Chloride						
Methylnaphthalene (2-)						
Naphthalene						
PAH						
Phenol						
Propylene Oxide						
Styrene						
Tetrachloroethane (1,1,2,2-)						
Toluene	0.0090 lb/hr	0.0392 tpy	32.1948 lb/hr	0.0068 lb/hr	0.0300 tpy	59.9561 lb/hr
Trichloroethane (1,1,2-)						
Trimethylpentane (2,2,4-)	0.0110 lb/hr	0.0483 tpy	6.4626 lb/hr	0.0033 lb/hr	0.0143 tpy	12.0353 lb/hr
Vinyl Chloride						
Xylenes	0.0196 lb/hr	0.0856 tpy	57.7405 lb/hr	0.0123 lb/hr	0.0538 tpy	107.5299 lb/hr

NOTES

1. Gas release estimates based on engineering evaluation of several other compressor stations.
2. Data used in estimates is based upon model deemed to be most representative of natural gas at the site.
   There are five (5) models to choose from which are based on laboratory extended analysis of samples collected at various locations along Enbridge pipelines.

Selected Grouping of Available Samples:	**PLQNG**	Samples that conform with Tariff
Number of Samples in Grouping:	421	
States Represented in Grouping:	AR, CT, IN, KY, LA, MA, MD, ME, MO, MS, NJ, NS, NY, OH, OK, PA, RI, TN, TX, VA and WV	
Dates Represented in Grouping:	2011 thru 2016	
Selected Class for Grouping:	**BC**	→ Selected Model: **PLQNG: BC**

3. If necessary, customizations (SF) are applied to make the models more representative of natural gas at the site.

	Average	SF	Maximum	SF
Upper Percentile Limit Applied:	60%		98%	
Heating Value (BTU/scf)	1,049 BTU/scf	130%	1,082 BTU/scf	120%
Density (lb/scf) at USEPA Standard Conditions	0.0444 lb/scf	130%	0.0460 lb/scf	120%
VOC (Total)	1.21% by wt.	130%	3.91% by wt.	120%
HAP (Total)	0.02% by wt.	130%	0.14% by wt.	120%

TABLE G-1D
Gas Releases
Hourly and Annual Emission Estimates

Category	Station Operations					
Source	LAMT-GR-PE-ST			LAMT-GR-PE-PL		
	Avg. Hourly	Max. Annual	Max. Hourly	Avg. Hourly	Max. Annual	Max. Hourly
Gas Release	0 scfh	0 scf/yr	0 scfh	1,298 scfh	11,367,935 scf/yr	2,133,019 scfh
	0 lb/hr	0 lb/yr	0 lb/hr	58 lb/hr	504,275 lb/yr	98,037 lb/hr
NO_X						
CO						
SO_2						
$PM_{10/2.5}$						
$CO_{2\text{-}e}$	0 lb/hr	0 tpy	0 lb/hr	1,299 lb/hr	5,689 tpy	2,355,469 lb/hr
CO_2	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.8060 lb/hr	3.5304 tpy	4,176.3840 lb/hr
N_2O						
TOC (Total)	0 lb/hr	0 tpy	0 lb/hr	58 lb/hr	252 tpy	98,037 lb/hr
Methane	0 lb/hr	0 tpy	0 lb/hr	52 lb/hr	227 tpy	94,052 lb/hr
Ethane	0 lb/hr	0 tpy	0 lb/hr	5 lb/hr	22 tpy	15,352 lb/hr
VOC (Total)	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.6972 lb/hr	3.0538 tpy	3,837.4669 lb/hr
VOC (non-HAP)	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.6829 lb/hr	2.9913 tpy	3,697.5907 lb/hr
HAP (Total)	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.0160 lb/hr	0.0699 tpy	139.8762 lb/hr
Acetaldehyde						
Acrolein						
Benzene	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.0079 lb/hr	0.0346 tpy	69.2774 lb/hr
Biphenyl						
Butadiene (1,3-)						
Carbon Tetrachloride						
Chlorobenzene						
Chloroform						
Dichloropropene (1,3-)						
Ethylbenzene	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.0037 lb/hr	0.0161 tpy	11.2596 lb/hr
Ethylene Dibromide						
Formaldehyde						
Hexane (n-)	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.0089 lb/hr	0.0388 tpy	71.9805 lb/hr
Methanol						
Methylene Chloride						
Methylnaphthalene (2-)						
Naphthalene						
PAH						
Phenol						
Propylene Oxide						
Styrene						
Tetrachloroethane (1,1,2,2-)						
Toluene	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.0039 lb/hr	0.0169 tpy	33.7731 lb/hr
Trichloroethane (1,1,2-)						
Trimethylpentane (2,2,4-)	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.0039 lb/hr	0.0171 tpy	6.7794 lb/hr
Vinyl Chloride						
Xylenes	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr	0.0069 lb/hr	0.0304 tpy	60.5713 lb/hr

NOTES

1. Gas release estimates based on engineering evaluation of several other compressor stations.
2. Data used in estimates is based upon model deemed to be most representative of natural gas at the site.
   There are five (5) models to choose from which are based on laboratory extended analysis of samples collected at various locations along Enbridge pipelines.
   Selected Grouping of Available Samples: **PLQNG** Samples that conform with Tariff
   Number of Samples in Grouping: 421
   States Represented in Grouping: AR, CT, IN, KY, LA, MA, MD, ME, MO, MS, NJ, NS, NY, OH, OK, PA, RI, TN, TX, VA and WV
   Dates Represented in Grouping: 2011 thru 2016
   Selected Class for Grouping: **BC** → Selected Model: **PLQNG: BC**
3. If necessary, customizations (SF) are applied to make the models more representative of natural gas at the site.

	Average	SF	Maximum	SF
Upper Percentile Limit Applied:	60%		98%	
Heating Value (BTU/scf)	1,049 BTU/scf	130%	1,082 BTU/scf	120%
Density (lb/scf) at USEPA Standard Conditions	0.0444 lb/scf	130%	0.0460 lb/scf	120%
VOC (Total)	1.21% by wt.	130%	3.91% by wt.	120%
HAP (Total)	0.02% by wt.	130%	0.14% by wt.	120%

TABLE H-1Ba
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-NG			
Service			Gas			
			Natural Gas			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	818 components			
		Emission Factor	4.50E-03 kg/hr/component			
	Connectors	Count	4,644 components			
		Emission Factor	2.00E-04 kg/hr/component			
	Flanges	Count	654 components			
		Emission Factor	3.90E-04 kg/hr/component			
	Open-Ended Lines	Count	44 components			
		Emission Factor	2.00E-03 kg/hr/component			
	Pump Seals	Count	0 components			
		Emission Factor	2.40E-03 kg/hr/component			
	Other	Count	118 components	**Emissions**		
		Emission Factor	8.80E-03 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	CO_{2-e}		2256.21% by weight	298.0058 lb/hr	1,305.2653 tpy	317.3459 lb/hr
	CO_2		1.40% by weight	0.1849 lb/hr	0.8100 tpy	0.5627 lb/hr
	TOC (Total)		100.00% by weight	13.2082 lb/hr	57.8521 tpy	13.2082 lb/hr
	Methane		90.192% by weight	11.9128 lb/hr	52.1782 tpy	12.6713 lb/hr
	Ethane		8.904% by weight	1.1761 lb/hr	5.1513 tpy	2.0684 lb/hr
	VOC (Total)		1.211% by weight	0.1600 lb/hr	0.7007 tpy	0.5170 lb/hr
	VOC (non-HAP)		1.186% by weight	0.1567 lb/hr	0.6863 tpy	0.4982 lb/hr
	HAP (Total)		0.025% by weight	0.0033 lb/hr	0.0143 tpy	0.0188 lb/hr
	Benzene		0.005% by weight	6.22E-04 lb/hr	2.72E-03 tpy	9.33E-03 lb/hr
	Ethylbenzene		0.006% by weight	8.44E-04 lb/hr	3.70E-03 tpy	1.52E-03 lb/hr
	Hexane (n-)		0.015% by weight	2.03E-03 lb/hr	8.90E-03 tpy	9.70E-03 lb/hr
	Methanol					
	Naphthalene					
	Toluene		0.006% by weight	7.29E-04 lb/hr	3.19E-03 tpy	4.55E-03 lb/hr
	Trimethylpentane (2,2,4-)		0.007% by weight	8.98E-04 lb/hr	3.93E-03 tpy	9.13E-04 lb/hr
	Xylenes		0.012% by weight	1.59E-03 lb/hr	6.97E-03 tpy	8.16E-03 lb/hr

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The average SOCMI w/o ethylene emission factor is used for pumps in heavy oil service (Table 2-1) since an emission factor isn't provided in Table 2-4.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based on gas analysis used to estimate gas release annual emissions (TABLE G-1B).
Maximum hourly emissions are based on the worst-case short-term weight percents even though the values are NOT presented.

TABLE H-1Bb
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-PL			
Service			Light Oil			
			Pipeline Liquids			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	125 components			
		Emission Factor	2.50E-03 kg/hr/component			
	Connectors	Count	602 components			
		Emission Factor	2.10E-04 kg/hr/component			
	Flanges	Count	273 components			
		Emission Factor	1.10E-04 kg/hr/component			
	Open-Ended Lines	Count	34 components			
		Emission Factor	1.40E-03 kg/hr/component			
	Pump Seals	Count	1 components			
		Emission Factor	1.30E-02 kg/hr/component			
	Other	Count	5 components	**Emissions**		
		Emission Factor	7.50E-03 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	CO_{2-e}		0.96% by weight	0.0120 lb/hr	0.0526 tpy	0.0144 lb/hr
	CO_2		0.01% by weight	0.0002 lb/hr	0.0007 tpy	0.0002 lb/hr
	TOC (Total)		99.99% by weight	1.2499 lb/hr	5.4748 tpy	1.4999 lb/hr
	Methane		0.04% by weight	0.0005 lb/hr	0.0021 tpy	0.0006 lb/hr
	Ethane		0.09% by weight	0.0011 lb/hr	0.0049 tpy	0.0013 lb/hr
	VOC (Total)		99.86% by weight	1.2484 lb/hr	5.4678 tpy	1.4980 lb/hr
	VOC (non-HAP)		85.32% by weight	1.0666 lb/hr	4.6715 tpy	1.2799 lb/hr
	HAP (Total)		14.54% by weight	0.1818 lb/hr	0.7963 tpy	0.2182 lb/hr
	Benzene		1.44% by weight	1.80E-02 lb/hr	7.89E-02 tpy	2.16E-02 lb/hr
	Ethylbenzene		0.48% by weight	5.95E-03 lb/hr	2.61E-02 tpy	7.14E-03 lb/hr
	Hexane (n-)		1.69% by weight	2.12E-02 lb/hr	9.27E-02 tpy	2.54E-02 lb/hr
	Methanol					
	Naphthalene					
	Toluene		4.49% by weight	5.61E-02 lb/hr	2.46E-01 tpy	6.74E-02 lb/hr
	Trimethylpentane (2,2,4-)		0.03% by weight	3.23E-04 lb/hr	1.41E-03 tpy	3.87E-04 lb/hr
	Xylenes		6.42% by weight	8.02E-02 lb/hr	3.51E-01 tpy	9.62E-02 lb/hr

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The average SOCMI w/o ethylene emission factor is used for pumps in heavy oil service (Table 2-1) since an emission factor isn't provided in Table 2-4.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based on composition estimate (TABLE F-0).
5. Maximum hourly emissions are based on 120% of the hourly emissions estimated in an effort to be conservative.

TABLE H-1Bc
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-OIL			
Service			Heavy Oil			
			Oil			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	419 components			
		Emission Factor	8.40E-06 kg/hr/component			
	Connectors	Count	1,591 components			
		Emission Factor	7.50E-06 kg/hr/component			
	Flanges	Count	394 components			
		Emission Factor	3.90E-07 kg/hr/component			
	Open-Ended Lines	Count	6 components			
		Emission Factor	1.40E-04 kg/hr/component			
	Pump Seals	Count	25 components			
		Emission Factor	8.62E-03 kg/hr/component			
	Other	Count	12 components	**Emissions**		
		Emission Factor	3.20E-05 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	CO_{2-e}					
	CO_2					
	TOC (Total)		100.00% by weight	0.5121 lb/hr	2.2430 tpy	0.6145 lb/hr
	Methane					
	Ethane					
	VOC (Total)		100.00% by weight	0.5121 lb/hr	2.2430 tpy	0.6145 lb/hr
	VOC (non-HAP)		100.00% by weight	0.5121 lb/hr	2.2430 tpy	0.6145 lb/hr
	HAP (Total)					
	Benzene					
	Ethylbenzene					
	Hexane (n-)					
	Methanol					
	Naphthalene					
	Toluene					
	Trimethylpentane (2,2,4-)					
	Xylenes					

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The emission factor for pumps in heavy oil service is obtained from Table 2-1.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based listed on MSDS.
5. Maximum hourly emissions are based on 120% of the hourly emissions estimated in an effort to be conservative.

TABLE H-1Bd
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-EC			
Service			Water/Oil			
			Coolant			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	87 components			
		Emission Factor	9.80E-05 kg/hr/component			
	Connectors	Count	660 components			
		Emission Factor	1.10E-04 kg/hr/component			
	Flanges	Count	174 components			
		Emission Factor	2.90E-06 kg/hr/component			
	Open-Ended Lines	Count	6 components			
		Emission Factor	2.50E-04 kg/hr/component			
	Pump Seals	Count	4 components			
		Emission Factor	2.40E-05 kg/hr/component			
	Other	Count	3 components	**Emissions**		
		Emission Factor	1.40E-02 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	CO_{2-e}					
	CO_2					
	TOC (Total)		60.00% by weight	0.1656 lb/hr	0.7255 tpy	0.1988 lb/hr
	Methane					
	Ethane					
	VOC (Total)		60.00% by weight	0.1656 lb/hr	0.7255 tpy	0.1988 lb/hr
	VOC (non-HAP)					
	HAP (Total)		60.00% by weight	0.1656 lb/hr	0.7255 tpy	0.1988 lb/hr
	Benzene					
	Ethylbenzene					
	Hexane (n-)					
	Methanol					
	Naphthalene					
	Toluene					
	Trimethylpentane (2,2,4-)					
	Xylenes					

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The average SOCMI w/o ethylene emission factor is used for pumps in heavy oil service (Table 2-1) since an emission factor isn't provided in Table 2-4.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based listed on MSDS.
5. Maximum hourly emissions are based on 120% of the hourly emissions estimated in an effort to be conservative.

TABLE H-1Da
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-PE-NG			
Service			Gas			
			Natural Gas			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	514 components			
		Emission Factor	4.50E-03 kg/hr/component			
	Connectors	Count	439 components			
		Emission Factor	2.00E-04 kg/hr/component			
	Flanges	Count	529 components			
		Emission Factor	3.90E-04 kg/hr/component			
	Open-Ended Lines	Count	66 components			
		Emission Factor	2.00E-03 kg/hr/component			
	Pump Seals	Count	0 components			
		Emission Factor	2.40E-03 kg/hr/component			
	Other	Count	17 components	**Emissions**		
		Emission Factor	8.80E-03 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	CO_{2-e}		2256.21% by weight	143.6847 lb/hr	629.3389 tpy	153.0096 lb/hr
	CO_2		1.40% by weight	0.0892 lb/hr	0.3906 tpy	0.2713 lb/hr
	TOC (Total)		100.00% by weight	6.3684 lb/hr	27.8936 tpy	6.3684 lb/hr
	Methane		90.192% by weight	5.7438 lb/hr	25.1579 tpy	6.1095 lb/hr
	Ethane		8.904% by weight	0.5671 lb/hr	2.4837 tpy	0.9973 lb/hr
	VOC (Total)		1.211% by weight	0.0771 lb/hr	0.3378 tpy	0.2493 lb/hr
	VOC (non-HAP)		1.186% by weight	0.0756 lb/hr	0.3309 tpy	0.2402 lb/hr
	HAP (Total)		0.025% by weight	0.0016 lb/hr	0.0069 tpy	0.0091 lb/hr
	Benzene		0.005% by weight	3.00E-04 lb/hr	1.31E-03 tpy	4.50E-03 lb/hr
	Ethylbenzene		0.006% by weight	4.07E-04 lb/hr	1.78E-03 tpy	7.31E-04 lb/hr
	Hexane (n-)		0.015% by weight	9.80E-04 lb/hr	4.29E-03 tpy	4.68E-03 lb/hr
	Methanol					
	Naphthalene					
	Toluene		0.006% by weight	3.51E-04 lb/hr	1.54E-03 tpy	2.19E-03 lb/hr
	Trimethylpentane (2,2,4-)		0.007% by weight	4.33E-04 lb/hr	1.90E-03 tpy	4.40E-04 lb/hr
	Xylenes		0.012% by weight	7.67E-04 lb/hr	3.36E-03 tpy	3.93E-03 lb/hr

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The average SOCMI w/o ethylene emission factor is used for pumps in heavy oil service (Table 2-1) since an emission factor isn't provided in Table 2-4.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based on gas analysis used to estimate gas release annual emissions (TABLE G-1D).
Maximum hourly emissions are based on the worst-case short-term weight percents even though the values are NOT presented.

TABLE H-1Db
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-PE-PL			
Service			Light Oil			
			Pipeline Liquids			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	80 components			
		Emission Factor	2.50E-03 kg/hr/component			
	Connectors	Count	48 components			
		Emission Factor	2.10E-04 kg/hr/component			
	Flanges	Count	104 components			
		Emission Factor	1.10E-04 kg/hr/component			
	Open-Ended Lines	Count	0 components			
		Emission Factor	1.40E-03 kg/hr/component			
	Pump Seals	Count	0 components			
		Emission Factor	1.30E-02 kg/hr/component			
	Other	Count	0 components	**Emissions**		
		Emission Factor	7.50E-03 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	CO_{2-e}		0.96% by weight	0.0047 lb/hr	0.0205 tpy	0.0056 lb/hr
	CO_2		0.01% by weight	0.0001 lb/hr	0.0003 tpy	0.0001 lb/hr
	TOC (Total)		99.99% by weight	0.4883 lb/hr	2.1387 tpy	0.5860 lb/hr
	Methane		0.04% by weight	0.0002 lb/hr	0.0008 tpy	0.0002 lb/hr
	Ethane		0.09% by weight	0.0004 lb/hr	0.0019 tpy	0.0005 lb/hr
	VOC (Total)		99.86% by weight	0.4877 lb/hr	2.1360 tpy	0.5852 lb/hr
	VOC (non-HAP)		85.32% by weight	0.4167 lb/hr	1.8249 tpy	0.5000 lb/hr
	HAP (Total)		14.54% by weight	0.0710 lb/hr	0.3111 tpy	0.0852 lb/hr
	Benzene		1.44% by weight	7.03E-03 lb/hr	3.08E-02 tpy	8.44E-03 lb/hr
	Ethylbenzene		0.48% by weight	2.33E-03 lb/hr	1.02E-02 tpy	2.79E-03 lb/hr
	Hexane (n-)		1.69% by weight	8.27E-03 lb/hr	3.62E-02 tpy	9.92E-03 lb/hr
	Methanol					
	Naphthalene					
	Toluene		4.49% by weight	2.19E-02 lb/hr	9.61E-02 tpy	2.63E-02 lb/hr
	Trimethylpentane (2,2,4-)		0.03% by weight	1.26E-04 lb/hr	5.52E-04 tpy	1.51E-04 lb/hr
	Xylenes		6.42% by weight	3.13E-02 lb/hr	1.37E-01 tpy	3.76E-02 lb/hr

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The average SOCMI w/o ethylene emission factor is used for pumps in heavy oil service (Table 2-1) since an emission factor isn't provided in Table 2-4.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based on composition estimate (TABLE F-0).
5. Maximum hourly emissions are based on 120% of the hourly emissions estimated in an effort to be conservative.

TABLE H-1Dc
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-PE-OIL			
Service			Heavy Oil			
			Oil			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	0 components			
		Emission Factor	8.40E-06 kg/hr/component			
	Connectors	Count	0 components			
		Emission Factor	7.50E-06 kg/hr/component			
	Flanges	Count	0 components			
		Emission Factor	3.90E-07 kg/hr/component			
	Open-Ended Lines	Count	0 components			
		Emission Factor	1.40E-04 kg/hr/component			
	Pump Seals	Count	0 components			
		Emission Factor	8.62E-03 kg/hr/component			
	Other	Count	0 components	**Emissions**		
		Emission Factor	3.20E-05 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	$CO_{2\text{-}e}$					
	CO_2					
	TOC (Total)		100.00% by weight	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr
	Methane					
	Ethane					
	VOC (Total)		100.00% by weight	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr
	VOC (non-HAP)		100.00% by weight	0.0000 lb/hr	0.0000 tpy	0.0000 lb/hr
	HAP (Total)					
	Benzene					
	Ethylbenzene					
	Hexane (n-)					
	Methanol					
	Naphthalene					
	Toluene					
	Trimethylpentane (2,2,4-)					
	Xylenes					

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The emission factor for pumps in heavy oil service is obtained from Table 2-1.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based listed on MSDS.
5. Maximum hourly emissions are based on 120% of the hourly emissions estimated in an effort to be conservative.

TABLE H-1Dd
Piping Components
Hourly and Annual Emission Estimates

Source			LAMT-PC-PE-EC			
Service			Water/Oil			
			Coolant			
Minimum hours when component purged with inert gas			0 hrs/yr			
Component	Valves	Count	101 components			
		Emission Factor	9.80E-05 kg/hr/component			
	Connectors	Count	107 components			
		Emission Factor	1.10E-04 kg/hr/component			
	Flanges	Count	184 components			
		Emission Factor	2.90E-06 kg/hr/component			
	Open-Ended Lines	Count	12 components			
		Emission Factor	2.50E-04 kg/hr/component			
	Pump Seals	Count	6 components			
		Emission Factor	2.40E-05 kg/hr/component			
	Other	Count	12 components	**Emissions**		
		Emission Factor	1.40E-02 kg/hr/component	**Avg. Hourly**	**Max. Annual**	**Max. Hourly**
Speciation	$CO_{2\text{-}e}$					
	CO_2					
	TOC (Total)		60.00% by weight	0.2557 lb/hr	1.1202 tpy	0.3069 lb/hr
	Methane					
	Ethane					
	VOC (Total)		60.00% by weight	0.2557 lb/hr	1.1202 tpy	0.3069 lb/hr
	VOC (non-HAP)					
	HAP (Total)		60.00% by weight	0.2557 lb/hr	1.1202 tpy	0.3069 lb/hr
	Benzene					
	Ethylbenzene					
	Hexane (n-)					
	Methanol					
	Naphthalene					
	Toluene					
	Trimethylpentane (2,2,4-)					
	Xylenes					

NOTES

1. Emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates (EPA 453/R-95-017).
The average SOCMI w/o ethylene emission factor is used for pumps in heavy oil service (Table 2-1) since an emission factor isn't provided in Table 2-4.
2. Piping component counts based on design drawings for a similar compressor station.
3. The component type "Other" includes blowdown valves, relief valves, and compressor seals.
4. Weight percents based listed on MSDS.
5. Maximum hourly emissions are based on 120% of the hourly emissions estimated in an effort to be conservative.

APPENDIX B: SUBCHAPTER 18 E-NAT TOOL

NETTING ANALYSIS RESULTS

Consistent with N.J.A.C. 7:27-18.7

Facility Information → Facility PI: 80337 Facility Name: Lambertville Compressor Station BOP Activity:

Calculation of NI for this Permit Action - NO DATA ENTRY REQUIRED

This table is automatically populated after Table 1 and Table 2 below are completed.

Air Contaminant	IP Emission Increase from Permitted Sources	INP Emission Increase from Non-Permitted Sources	IF Emission Increase from Fugitive Emissions	IA Emission Increase from the Current Modification	DO Emission Decrease from Emission Offsets	DC Emission Decrease from Creditable Emission Reductions	NI Net Emission Increase at the Facility	Significant Net Emission Increase Thresholds (N.J.A.C. 7:27-18.7 Table 3)	Significant Net Emission Increase? Yes/No
VOC	0.00	0.00	0.00	22.48	0.00	0.01	22.47	25	No
NOx	0.00	0.00	0.00	29.58	0.00	5.18	24.40	25	No
CO	0.00	0.00	0.00	40.75	0.00	1.22	39.53	100	No
SO2	0.00	0.00	0.00	15.65	0.00	0.57	15.08	40	No
TSP	0.00	0.00	0.00	7.68	0.00	1.10	6.58	25	No
PM10	0.00	0.00	0.00	7.68	0.00	1.10	6.58	15	No
PM2.5	0.00	0.00	0.00	7.68	0.00	1.10	6.58	10	No

Table 1 - Calculation of Total IA for this Permit Action (Modification or GOP) - ENTER ALL DATA FOR THIS PERMIT ACTION

Equipment ID	Emission Unit / Batch Process	Equipment Description	Start of Constr. Date	Start of Operation Date	VOC TPY	NOx TPY	CO TPY	SO2 TPY	TSP TPY	PM10 TPY	PM2.5 TPY
E14/E15	U8	New Solar Taurus 70 Turbines	3/1/2019	10/1/2019	8.15	24.99	26.61	10.67	5.03	5.03	5.03
E16	U9	New Waukesha VGF36GL EGen	3/1/2019	10/1/2019	0.17	0.19	0.39	0.00	0.00	0.00	0.00
	IS1	New Cameron Fuel Gas Heaters	3/1/2019	10/1/2019	0.12	0.33	0.50	0.05	0.03	0.03	0.03
	IS1	New Reznor Space Heaters	3/1/2019	10/1/2019	0.01	0.10	0.04	0.01	0.01	0.01	0.01
	IS36	New Pipeline Liquids Storage Tanks	3/1/2019	10/1/2019	0.04						
	FG1/IS2 - IS15	New Turbine PC & Gas Releases	3/1/2019	10/1/2019	6.05						
E17 - E24	U10	New PennEast Step Down Heaters	3/1/2019	10/1/2019	1.61	3.80	12.88	4.91	2.61	2.61	2.61
E25	U11	New PennEast Caterpillar G3412C EGen	3/1/2019	10/1/2019	0.15	0.17	0.33	0.00	0.00	0.00	0.00
	FG2	New PennEast Piping Components	3/1/2019	10/1/2019	2.47						
	IS31	New PennEast Gas Releases	3/1/2019	10/1/2019	3.05						
	IS32/IS34	New PennEast Storage Vessels	3/1/2019	10/1/2019	0.64						
	IS33/IS35	New PennEast Truck Loading	3/1/2019	10/1/2019	0.02						
				Totals for this Permit Action (IA):	22.48	29.58	40.75	15.65	7.68	7.68	7.68

NETTING ANALYSIS RESULTS

Consistent with N.J.A.C. 7:27-18.7

Table 2 - Total IP, INP, IF, DO, & DC for the Contemporaneous Period – ENTER ALL DATA FOR THE CONTEMPORANEOUS PERIOD SHOWN BELOW

Contemporaneous Period Start:	1/1/2014	Contemporaneous Period End:	10/1/2019

Use the Equipment ID drop-down filter to uncheck blank rows before printing.

Equipment ID	Emission Unit / Batch Process	Equipment Description	BOP Activity	Permit Approval Date	Netting Term	VOC TPY	NOx TPY	CO TPY	SO2 TPY	TSP TPY	PM10 TPY	PM2.5 TPY
E1	U1	Gas Turbine - Clark DC-990			DC	0.01	2.49	0.66	0.28	0.54	0.54	0.54
E2	U2	Gas Turbine - Clark DC-990			DC	0.00	2.69	0.56	0.29	0.56	0.56	0.56

APPENDIX C: CRITERIA POLLUTANT MODELING PROTOCOL

CRITERIA POLLUTANT MODELING PROTOCOL

Texas Eastern Transmission LP > Lambertville Station

Prepared For:

Texas Eastern Transmission LP

1325 Highway 179
Hunterdon County
Lambertville, New Jersey, 08530

Prepared by:

TRINITY CONSULTANTS
100 Overlook Center, 2nd Floor
Princeton, NJ 08540
(609) 375-2665

November 2017

Project 173101.0075

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1. INTRODUCTION

Texas Eastern Transmission, L.P. (Texas Eastern) operates a natural gas compressor station in Lambertville, Hunterdon County, New Jersey (Lambertville Station). The Lambertville Station is currently operating under Title V Operating Permit Number BOP140001, issued on December 1, 2014. Texas Eastern is submitting an air permit application that seeks approval from the New Jersey Department of Environmental Protection (NJDEP) for two proposed projects at the Lambertville Station. These projects include the following:

- The **Lambertville East Expansion Project** involves the replacement of the two existing natural gas-fired Dresser Clark model DC 990 compressor turbines (Emission Unit U1) with two new lower NO_X-emitting natural gas-fired Solar Taurus 70 compressor turbines. This project is being implemented as part of a system-wide project scheduled to begin construction in 2019. The project will also provide for compliance with the recently published amendments to Title 7, Chapter 27 of the New Jersey Administrative Code, N.J.A.C. 7:27, which pertain to Reasonably Available Control Technology (RACT) requirements for NO_X (N.J.A.C. 7:27-19: Control and Prohibition of Air Pollution from Oxides of Nitrogen or "NO_X RACT rule").

- The **PennEast Interconnect Project** involves the construction of connecting piping and associated flow control devices (metering and regulating equipment) in order to receive natural gas via the PennEast pipeline, owned and operated by PennEast Pipeline Company, LLC (PennEast), at the Lambertville Compressor Station.

Although not required by regulation, as part of the application for modification to the existing Title V permit for the Lambertville Compressor Station (BOP140001), Texas Eastern will conduct a National Ambient Air Quality Standards (NAAQS) analysis. This protocol document serves to outline the proposed methodology for conducting the air dispersion modeling performed to demonstrate compliance with the NAAQS.

1.1. PROJECT DETAILS

1.1.1. Lambertville East Expansion Project

Under this project, Texas Eastern is proposing to install the following equipment that emit criteria pollutants to be addressed with this modeling:

- Two new 10,915 HP (ISO) Solar Taurus 70 natural gas-fired turbines, which will replace the two existing 5,800 HP (ISO) Dresser Clark DC 990 natural gas-fired compressor turbines (Emission Unit U1);
- A new 880 bhp Waukesha VGF36GL natural gas-fired emergency generator which will replace the existing Caterpillar G-398 emergency generator (Emission Unit U3); and
- Two new natural gas-fired gas heaters associated with the new turbine compressors (rated at < 1 MMBtu/hr heat input); and
- Four new natural gas-fired warehouse space heaters (all rated at < 1 MMBtu/hr heat input).

1.1.2. PennEast Interconnect Project

Under this project, Texas Eastern is installing the piping, metering and regulating equipment needed to connect both the Algonquin and Texas Eastern pipeline systems (both owned by Enbridge) to the proposed PennEast Pipeline at the Lambertville Station. PennEast owns the property adjacent to the Lambertville

Station. The agreement between Texas Eastern and PennEast is that Texas Eastern will design and construct this equipment, however ownership and operations will be divided between the two companies.
Under this project, Texas Eastern is proposing to install the following equipment that emit criteria pollutants to be addressed with this modeling:

- Eight (8) new 10 MMBtu/hr step down heaters; and
- One (1) Caterpillar G3412C emergency generator.

1.2. MODELING OBJECTIVE

A Title V Significant Modification Application for the two projects is being prepared for submittal to the NJDEP. Based on discussion with the NJDEP permitting group on October 11, 2017, a criteria pollutant modeling analysis would be beneficial for the permit application review and permit issuance process. Texas Eastern will utilize the AERMOD modeling system in executing these analyses. Both projects and existing sources will be considered in the modeling analysis for all criteria pollutant. This protocol has been prepared to serve as the approved modeling approach for evaluating the model impacts of criteria pollutants. The modeling will be conducted, and modeling results will be submitted in a report, after Texas Eastern receives written approval of this protocol from NJDEP.

This protocol was prepared based on modeling guidance from the NJDEP and United States Environmental Protection Agency (USEPA), including NJDEP's *Guideline on Air Quality Impact Modeling Analysis* (Technical Manual 1002), USEPA's AERMOD Implementation Guide and the *Guideline on Air Quality Models* (40 CFR 51, Appendix W).

The remainder of this modeling protocol is organized as follows:

- Section 2 provides a brief description of the facilities;
- Section 3 provides discussion on the source parameters to be used in the analysis;
- Section 4 discusses air quality analyses to be performed; and
- Section 5 describes the air dispersion modeling methodology.

2. FACILITY DESCRIPTION

The Lambertville Station is located in Lambertville, Hunterdon County, New Jersey. Figure 2-1 presents an aerial map of the facility.

The facility is located at the following address:

1325 Highway 179
West Amwell Township
Lambertville, New Jersey 08530

AERSURFACE (13016) was used to determine whether the rural or urban option within AERMOD should be used for this modeling analysis. As shown in Table 2-1, which summarizes the land use types within 3 km of the Lambertville Station, the vast majority of the area within 3 km of the site is comprised of pasture/hay, deciduous forest, and mixed forest. Approximately 52% of the land use is considered pasture/hay, approximately 19% of the land use is considered deciduous forest, and approximately 19% of the land use is considered mixed forest. Landuse categories 22 (high intensity residential) and 23 (commercial/industrial/transportation) are the only urban classifications under NLCD 1992. As such, this land use is considered rural. In addition, topography within the facility is relatively uniform, with elevations increasing to the southeast of the facility. The typical terrain elevations at the facility are approximately 160 feet above sea level. Terrain surrounding the Lambertville Station can be summarized as rolling hills and a river valley lies to the west about 3 miles distant.

Figure 2-1. Aerial Map of the Lambertville Station

Table 2-1. Land Use in 3 KM Surrounding the Lambertville Station

Land Use Type	**Grid Cell Count**	**% of Total Grid Cells**
Open Water	175	0.6%
Perennial Ice/Snow	0	0.0%
Low Intensity Residential	194	0.6%
High Intensity Residential	0	0.0%
Commercial/Industrial/Transp	96	0.3%
Bare Rock/Sand/Clay	0	0.0%
Quarries/Strip Mines/Gravel	23	0.1%
Transitional	0	0.0%
Deciduous Forest	5908	18.8%
Evergreen Forest	496	1.6%
Mixed Forest	5906	18.8%
Shrubland	0	0.0%
Orchards/Vineyard/Other	0	0.0%
Grasslands/Herbaceous	0	0.0%
Pasture/Hay	16202	51.6%
Row Crops	2313	7.4%
Small Grains	0	0.0%
Fallow	0	0.0%
Urban/Recreational Grasses	19	0.1%
Woody Wetlands	58	0.2%
Emergent Herbaceous Wetlands	2	0.0%
Total	**31392**	
Total Urban	**96**	**0.3%**

3.1. MODELED SOURCE TYPES

Based on the project description provided in Section 1 of the protocol and an inventory of existing emissions sources for criteria pollutants, the following sources will be consider in these analyses:

- New or modified sources:
  - Lambertville East Expansion Project:
    - Two (2) new Solar Taurus 70 combustion turbines (modeled at 100% load, 10,915 HP, ISO)
    - One (1) new Waukesha VGF36L emergency generator, rated at 880 HP
    - Six (6) new heaters each rated at less than 0.2 MMBtu/hr
  - PennEast Interconnect Project:
    - Eight (8) new heaters, each rated at 10 MMBtu/hr heat input
    - One (1) new Caterpillar G3412C emergency generator, rated at 755 HP
- Existing sources at Lambertville Compressor Station that will remain in operation post-projects:
  - Emission Unit 7: Two (2) Cooper-Bessemer reciprocating engines (modeled at 100% load, 2,310 HP, ISO);
  - Insignificant Source: Six(6) heaters , each rated less than 0.2 MMBtu/hr;
  - Emission Unit 5: One (1) Waukesha F11GSI engine rated for 250 HP;

Note that Emissions Unit 1 (two DC 990 turbines) and Emission Unit 3 (one Caterpillar G-398 emergency generator) are to be shut down as a result of the proposed projects at Lambertville Station.

The AERMOD dispersion model allows for emissions units to be represented as point, area, or volume sources. All of the sources modeled in this analysis will be represented as unobstructed, vertical release point sources.

3.2. EMISSION RATES AND STACK PARAMETERS

The modeling should contain sufficient detail to determine the maximum ambient concentration of the pollutant under consideration, and it is likely this will involve modeling several operating loads or production rates. As such, the modeling analysis will consider the combustion turbine operating at various loads. Texas Eastern proposes to model 50% and 100 % load scenarios. For each operating scenario, emission rates during normal, low temperature, and high temperature conditions will also be evaluated. These scenarios will encompass the variations in stack exit temperature and flow potentially resulting from reduced loading and varying temperatures. Texas Eastern proposes to model the following scenarios:

- **Scenario 1** – Maximum Hourly “Normal Temperature” Operation under 100% load;
- **Scenario 2** – Maximum Hourly “Low Temperature” Operation under 100% load;
- **Scenario 3** – Maximum Hourly “High Temperature” Operation with under 100% load;
- **Scenario 4** – Maximum Hourly “Normal Temperature” Operation under 50% load;
- **Scenario 5** – Maximum Hourly “Low Temperature” Operation under 50% load; and
- **Scenario 6** – Maximum Hourly “High Temperature” Operation with under 50%.

In this analysis, the “normal temperature” operating condition represents an ambient air temperature of 51.11 degrees Fahrenheit (°F) which represents the annual average temperature at the Lambertville Station, “low temperature” operating conditions include an ambient air temperature of -0.01 °F and “high temperature” operating conditions include an ambient air temperature of 100 °F. Texas Eastern has assumed the low temperature scenario will only occur up to 2 hours in a year. With respect to probabilistic based standards (e.g., 1-hour NO_2 NAAQS and 1-hour SO_2 NAAQS), USEPA has expressed that it is inappropriate (i.e., overly conservative) for intermittent emissions, such as those emissions associated with the 2 hours of low temperature operation. This is particularly true since the frequency of the low temperature scenario (2 hours in a year) is such that the events cannot reasonably be expected to contribute significantly to the annual distribution of daily maximum 1-hour concentrations.[1] As such, Texas Eastern will not consider low temperature operation in the 1-hour NO_2 and 1-hour SO_2 NAAQS analysis. The scenario will be considered for other pollutants (e.g., carbon monoxide).

All criteria pollutant emissions sources at the Lambertville Compressor Station will be included in the model at their potential emission rates and at their design exhaust parameters (temperature and exit velocity). Note that a weighted average approach will be employed for emergency generators. For these units, the emissions will be weighted over the course of the year (e.g., emission rate multiplied by ratio of permitted hours of operation to number of hours per year, 8760 hours) to reflect the intermittent nature of their operation. Startup and shutdown modeling is included in Section 3.4.

3.3. NO_2 MODELING APPROACH

The revised Appendix W now indicates Ambient Ratio Method 2 (ARM2) has replaced ARM as the regulatory default Tier 2 NO_2 modeling method. Therefore, Texas Eastern proposes to utilize ARM2 for modeling NO_2. The default ambient ratio range (0.5 to 0.9) of ARM2 will be utilized.

If Tier 2 modeled concentrations are greater than the NAAQS design values, the more refined Tier 3 approach (i.e., the Plume Volume Molar Ratio Method [PVMRM] or the Ozone Limiting Method [OLM]) may be used. PVMRM considers the conversion of NO_X emissions to NO_2 in the atmosphere on an hour-by-hour basis. For each hour, the volume of the source-specific plume is calculated for that hour's meteorological conditions. Emissions of NO_X predominately consist of nitric oxide (NO) which is oxidized into NO_2. The limiting factor in this reaction is an equilibrium state that is usually established among NO, NO_2, and ozone concentrations in the atmosphere. It is of fundamental importance that an ozone-limited atmosphere will limit the amount of conversion of NO to NO_2. The amount of available NO_X, NO, and ozone and the eventual conversion to NO_2 is determine by the plume volume. Both Tier 3 approaches are now regulatory default options that are to be used in consultation with the local agency.

At this time, Texas Eastern intends to utilize the Tier 2 approach. Should a refined Tier 3 or ARM2 approach be required for the analysis, then Texas Eastern will work with NJDEP to gain concurrence on the Tier 3 inputs.

3.4. STARTUP AND SHUTDOWN MODELING

The turbine operation includes periods of startup and shutdown. Based on vendor data, the startup process for each turbine is estimated to take approximately nine minutes from the initiation of startup to normal operation. The shutdown process for each turbine is estimated to take approximately 8.5 minutes from normal operation to shutdown. The shutdown event consists only of loading/thermal stabilization operation (Step 3). For permitting purposes, potential emissions estimates are based on a maximum frequency of 2 startup and 2 shutdown events per hour, with a maximum frequency of 260 startup and 260 shutdown events per year.

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[1] https://www3.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

Therefore, Texas Eastern proposes to estimate the maximum hourly emission rate for startup/shutdown modeling purposes assuming that there will be up to 18 minutes of startup and up to 17 minutes of shutdown for each turbine during any given hour. This will be achieved by modeling three "virtual stacks" at the same location for each of the two turbines: one stack representing startup conditions, one stack representing shutdown conditions and one stack representing the normal operating conditions. Each stack's exhaust temperature and exit velocity will be set equal to the values associated with each mode of operation. The emission rate input for the startup and shutdown "virtual stacks" will be set as the mass emission rate for 2 events. The normal operating conditions stack emission rate will be established as the rate that is proportional to the fraction of the hour for which the conditions occur (i.e., multiply the normal operating conditions emission rate by the ratio of 25 minutes over 60 minutes).

4.1. SIGNIFICANCE AND NAAQS ANALYSIS

The first step of the air dispersion modeling analysis will be a significance analysis. In the significance analysis, modeled (predicted) impacts will be compared to the USEPA Prevention of Significant Deterioration (PSD) Significant Impact Levels (SILs). For this project, a significance analysis will be performed for each pollutant and averaging period with an established Significant Impact Level (SIL) as follows:

- Nitrogen Dioxide (NO_2): 1-hour and Annual
- Particulate Matter with a diameter less than 2.5 microns ($PM_{2.5}$): 24-hour and Annual
- Particulate Matter with a diameter less than 10 microns (PM_{10}): 24-hour and Annual
- Carbon Monoxide (CO): 1-hour and 8-hour
- Sulfur Dioxide (SO_2): 1-hour, 3-hour, 24-hour, and Annual

SILs are ambient concentration thresholds that represent a fraction of the NAAQS and, based on the USEPA's guidance, are deemed to indicate the level above which a particular facility may cause or contribute to air quality degradation.[2] In accordance with USEPA guidance, predicted air quality impacts of a project in excess of the SIL indicates a need for further analysis to determine whether a project's emissions might cause or contribute to an exceedance of the corresponding NAAQS. In the significance analysis, the maximum-modeled ground-level concentration is compared to the appropriate SIL established by the USEPA (shown in Table 4-1).[3]

Per NJDEP modeling guidance in Section 4.2.1 of Technical Manual 1002, if maximum predicted impacts are less than the applicable SILs, no multisource modeling analysis is required. However, the applicant still needs to ensure that the modeled site complies with the NAAQS and PSD Increment (see Section 4.2). For the NAAQS analysis in this scenario, the model output concentration from all sources at the site is combined with the representative ambient background concentrations for comparison with the applicable NAAQS. If maximum predicted impacts are above the applicable SILs, a cumulative impacts analysis for comparison against the NAAQS is required. In evaluating cumulative impacts with respect to the NAAQS, the potential emissions from all proposed and existing emission units at the Lambertville Compressor Station would be combined with the emissions of sources included in the regional inventory (see discussion in Section 5.9) and the representative ambient background concentrations for comparison with the applicable NAAQS, also shown in Table 4-1.

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[2] U.S. EPA Memorandum from Gerald Emison, U.S. EPA OAQPS, to Thomas Maslany, U. S EPA Air Management Division, *Air Quality Analysis for Prevention of Significant Deterioration (PSD),* July 5, 1988.
[3] As this is a minor non-PSD permitting action, no evaluation or consideration of secondary $PM_{2.5}$ should be required.

Table 4-1. Significant Impact Levels and NAAQS for Criteria Air Pollutants

Pollutant	Averaging Period	Class II SILs ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO	1-hour	2,000	40,000 (35 ppm)[1]
	8-hour	500	10,000 (9 ppm)[1]
SO_2	1-hour	7.8[9]	196 (0.075 ppm)[2]
	3-hour	25	1,300 (0.5 ppm)[1]
	24-hour[3]	5	365 (0.14 ppm)[1]
	Annual[3]	1	80 (0.03 ppm)[4]
NO_2	1-hour	10[12]	188 (100 ppb)[5]
	Annual	1	100 (0.053 ppm)[4]
PM_{10}	Annual	1	N/A
	24-hour	5	150[6]
$PM_{2.5}$	24-hour	1.2[10]	35[7]
	Annual	0.3[11]	12[8]
Lead	Rolling 3-month avg	N/A	0.15

1 Not to be exceeded more than once per year.
2 The 3-year average of the 99th percentile of the daily maximum 1-hr average.
3 Effective August 23, 2010 USEPA revoked the 24-hr and Annual SO_2 NAAQS (75 FR 35520, *Primary National Ambient Air Quality Standards for Sulfur Dioxide*, June 22, 2010), however, they remain in place until the state implementation plans are approved.
4 Annual arithmetic average.
5 The 3-year average of the 98th percentile of the daily maximum 1-hr average.
6 Not to be exceeded more than three times in 3 consecutive years.
7 The 3-year average of the 98th percentile 24-hour average concentration.
8 The 3-year average of the annual arithmetic average concentration.
9 USEPA has not finalized SILs for the 1-hour SO_2 and 1-hour NO_2 standards. The numbers above reflect interim SILs based on USEPA guidance.
10 The $PM_{2.5}$ SILs were effectively remanded and vacated as result of a United States Court of Appeals decision, Sierra Club v. USEPA, No. 1—1413. However, the NJDEP has previously recognizes the previously established $PM_{2.5}$ SILS for the purposes of significance modeling. As such, the SILs will be utilized in this modeling analysis.
11 USEPA's "*Draft Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program*" published in August 2016 recommends updated value of 0.2 $\mu g/m^3$ as the annual $PM_{2.5}$ SIL. However, it still allows for the use of 0.3 $\mu g/m^3$ at the discretion of the permitting authority. Texas Eastern proposes to continue using 0.3 $\mu g/m^3$ as the annual $PM_{2.5}$ SIL since it is consistent with the value listed in Table 4-1 of Technical Manual 1002.
12 The 10 $\mu g/m^3$ 1-hour NO2 SIL is based on NESCAUM's value. The EPA interim SIL of 7.5 $\mu g/m^3$ will be used for any cause or contribute test.

4.2. CLASS II INCREMENT ANALYSIS

The PSD regulations were enacted primarily to "prevent significant deterioration" of air quality in areas of the country where the air quality was better than the NAAQS. Therefore, to promote economic growth in areas where attainment of the NAAQS occurs, some deterioration in ambient air concentrations, from a baseline date, is allowed. To achieve this goal, the USEPA established PSD Increments for PM_{10}, $PM_{2.5}$, SO_2, and NO_2 as delineated in Table 4-2. The PSD Increments are further broken into Class I, II, and III Increments. The baseline concentration is the ambient concentration at the time that the first completed PSD permit application affecting the area was submitted. Per Section A.3 of Technical Manual 1002, the PSD minor source baseline dates have not been established for Hunterdon County for any of the pollutants for which there is an Increment standard. Since this proposed project does not require PSD permitting for any pollutants, the Project cannot be considered to consume Increment since the PSD minor source baseline date (i.e., the baseline concentration) has not been established. No PSD Increment analysis will be performed for this Project.

Table 4-2. Class II Increments

Pollutant	Averaging Period	Class II Increment (μg/m^3)
$PM_{2.5}$	24-hour	9
	Annual	4
PM_{10}	24-hour	30
	Annual	17
NO_2	Annual	25
SO_2	3-hour	512
	24-hour	91
	Annual	20

5. MODELING METHODOLOGY

This section of the modeling protocol describes the procedures and data resources to be utilized in the air dispersion modeling analyses. The techniques proposed for the air dispersion modeling analysis are consistent with current USEPA and NJDEP guidance.

5.1. DISPERSION MODEL SELECTION AND BUILDING DOWNWASH ANALYSIS

Dispersion models predict downwind pollutant concentrations by simulating the evolution of the pollutant plume over time and space given data inputs including the quantity of emissions and the initial conditions (e.g., velocity, flowrate, and temperature) of the stack exhaust to the atmosphere. Building structures that obstruct wind flow near emission points may cause stack discharges to become caught in the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent. These effects generally cause higher ground level pollutant concentrations since building downwash inhibits dispersion from elevated stack discharges. For this reason, building downwash algorithms are considered an integral component of the selected air dispersion model.

The latest version (16216r) of the AERMOD model will be used to estimate maximum ground-level concentrations in air pollutant analyses conducted. AERMOD is a refined, steady-state, multiple source, dispersion model and was promulgated in December 2005 as the preferred model to use for industrial sources in this type of air dispersion modeling analysis.[4] The AERMOD modeling will be performed using regulatory default options except as otherwise noted in this protocol. The AERMOD model has the Plume Rise Modeling Enhancements (PRIME) incorporated in the regulatory version, so the direction-specific building downwash dimensions used as input will be determined by the Building Profile Input Program PRIME (BPIP PRIME), version 04274.[5] Table 5-1 summarizes the model control options that will be utilized in this analysis.

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[4] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Appendix A.1– AMS/EPA Regulatory Model (AERMOD).
[5] Earth Tech, Inc., *Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model,* Concord, MA.

Table 5-1. Model Selection Options

Control Option	Option Selected	Justification
Pollutant ID	CO, NO_2, PM_{10}, $PM_{2.5}$, SO_2	--
Terrain	Elevated, Meters	The receptor grid covers varying terrain elevations; as such, the elevated option will be selected.
Flagpole Receptors	N/A	--
Run or Not	Run	--
Averaging Times	1-hour, 3-hour, 8-hour, 24-hour, and annual	Texas Eastern will select appropriate averaging periods for each pollutant modeled
Model	PRIME	The PRIME algorithms are default.
Dispersion	Concentration, Rural, Regulatory Default Option	Modeling analysis will be in compliance with concentration standards. Texas Eastern is located in a predominantly rural area (refer to Section 5). The regulatory default option will be selected as it is recommended in Appendix W.
NO_X Model Options	N/A	The ambient ratio method (ARM2) will be utilized in AERMOD. Texas Eastern reserves the right to utilize Tier 3 mechanisms (PVMRM or OLM) in consultation with NJDEP. Refer to Section 3.3 for specifics on these modeling mechanisms.
Particulate Model Options	N/A	Texas Eastern will not utilize particle deposition or depletion options for particulate modeling.
Output Files	.aml	Model output file from Breeze User Interface

5.2. METEOROLOGICAL DATA

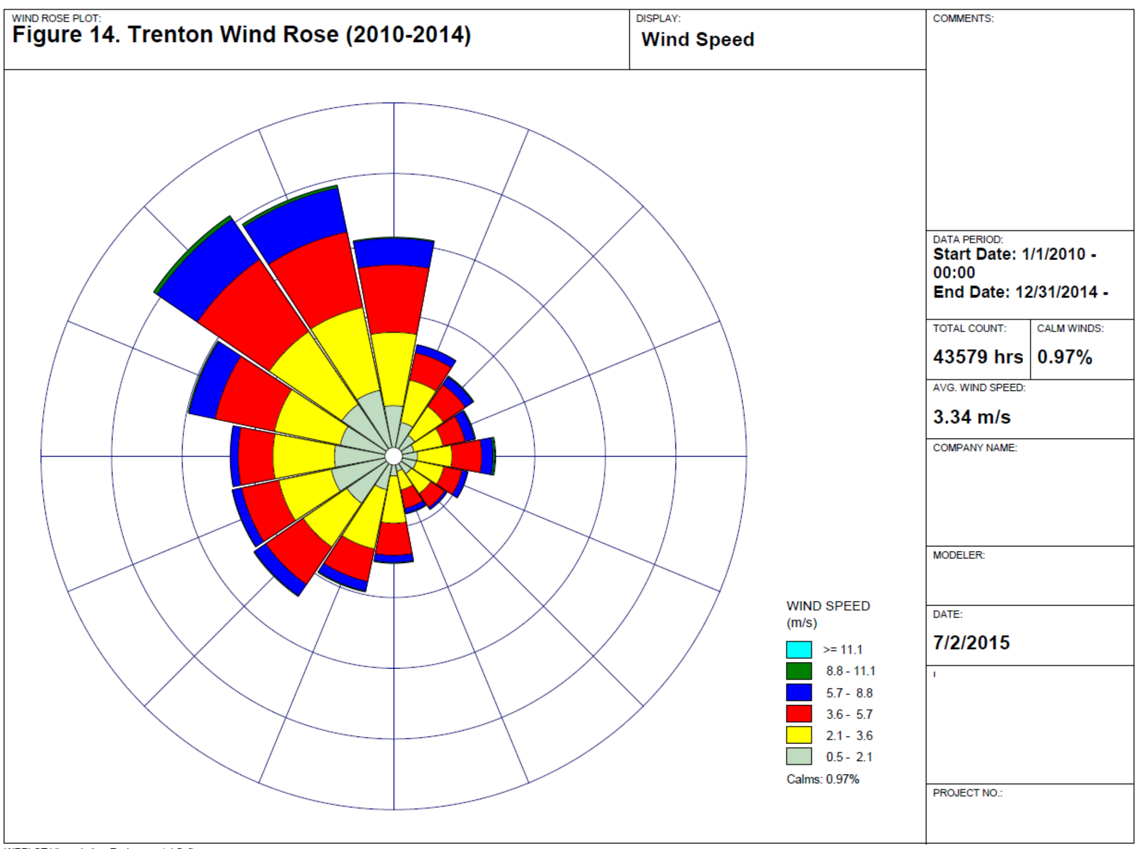
AERMOD require a sequential hourly record of dispersion meteorology representative of the region within which the source is located. In the absence of site-specific measurements, readily available data are commonly used from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data that includes hourly records of the following parameters:

- Wind speed;
- Wind direction;
- Air temperature;
- Micrometeorological Parameters (e.g., friction velocity, Monin-Obukhov length);
- Mechanical mixing height; and
- Convective mixing height.

The first three of these parameters are directly measured by monitoring equipment located at typical surface observation stations. The friction velocity, Monin-Obukhov length, and mixing heights are derived from characteristic micrometeorological parameters and from observed and correlated values of cloud cover, solar insulation, time of day and year, and latitude of the surface observation station. Surface observation stations form a relatively dense network, are almost always found at airports, and are typically operated by the NWS. Upper air stations are fewer in number than surface observing points since the upper atmosphere is less vulnerable to local effects caused by terrain or other land influences and is therefore less variable. The NWS operates virtually all available upper air measurement stations in the United States.

Texas Eastern has obtained processed 2010-2014 meteorological data from the NJDEP.[6] The meteorological data was processed through the latest version of AERMET (16216) to include upper air measurements from Sterling, Virginia and surface data from Trenton Mercer Airport. In determining the appropriate and representative surface station, land use surrounding the Trenton Mercer Airport (KTTN) and the Lambertville Station was compared. As shown in the plots found in Appendix B, the Trenton Mercer Airport and the Lambertville share very similar land use characteristics. The two locations also share similar elevations; 160 ft at the Lambertville Station and 213 ft for Trenton Mercer Airport. The AERMET processing includes use of regulatory default settings including ADJ_U*. Figure 5-1 provides a wind rose for the Trenton Mercer Airport for the data period of 2010 to 2014.

Figure 5-1. Trenton Mercer Airport Wind Rose



[6] Email from Mr. Greg John (NJDEP) to Mr. Ian Donaldson (Trinity) on June 28, 2017.

5.3. BACKGROUND AIR QUALITY

In any NAAQS analysis conducted, maximum model output concentrations will be added to representative ambient background concentrations and evaluated with regard to the NAAQS. Selection of the existing monitoring station data that is "representative" of the ambient air quality in the area surrounding the proposed facility is determined based on the following three criteria: 1) monitor location, 2) data quality, and 3) data currentness. Key considerations based on the monitor location criteria include proximity to the significant impact area of the facility, similarity of emission sources impacting the monitor to the emission sources impacting the airshed surrounding the proposed Project, and the similarity of the land use and land cover (LULC) surrounding the monitor and proposed facility. Consideration was given to the direction of the monitoring station from the Project (i.e., upwind station preferred to capture emissions transported to region). The data quality criteria refers to the monitor being an approved State and Local Air Monitoring Station (SLAM) or similar monitor type subject to the quality assurance requirements in 40 CFR Part 58 Appendix A. Data currentness refers to the fact that the most recent three complete years of quality assured data are generally preferred.

Texas Eastern reviewed publicly available design concentration values from USEPA's Air Data website.[7] The chosen background values are shown in Table 5-2. Note that Texas Eastern reserves the right to re-evaluate the background concentrations for 24-hour $PM_{2.5}$, 1-hour NO_2, and 1-hour SO_2 on a seasonally and/or temporally varying basis. This is consistent with guidance for modeling these pollutants.[8][9]

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7 https://www.epa.gov/outdoor-air-quality-data

8 https://www3.epa.gov/ttn/scram/guidance/guide/Guidance_for_PM25_Permit_Modeling.pdf

9 https://www3.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

Table 5-2. Selected Background Concentrations

PSD Pollutant	Averaging Period	2014-2016 Monitor Background Concentration (μg/m³)	Metric	Monitor Location
PM_{10}	24-hour	42.0	3-yr average of second-high	State Hospital, 1600 Hanover Ave., Allentown, PA
$PM_{2.5}$	24-hour	21.8	3-yr average of 98th percentile	Trenton, NJ
	Annual	8.1	3-yr arithmetic mean average	
NO_2	1-hour	82.2	3-yr average of 98th percentile	Washington & Cambria St., Northampton County, PA
	Annual	18.3	3-yr arithmetic mean maximum	
SO_2	1-hour	26.2	3-yr average of 99th percentile	Bristol, PA
	3-hour	29.6	Highest-second-high (H2H)	
	24-hour	17.6	H2H	
	Annual	4.48	3-yr arithmetic mean maximum	
CO	1-hour 8-hour	2,406 2,177	H2H H2H	Torresdale Station, Philadelphia, PA

5.4. COORDINATE SYSTEM

In modeling analysis data files, the location of emission sources, structures, and receptors, are represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). The datum for this modeling analysis is based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all reside within UTM Zone 18.

5.5. TREATMENT OF TERRAIN

Through the use of the AERMOD terrain preprocessor (AERMAP), AERMOD incorporates not only the receptor heights, but also an effective height (hill height scale) that represents the significant terrain features surrounding a given receptor that could lead to plume recirculation and other terrain interaction.[10]

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[10] EPA, *Users Guide for the AERMOD Terrain Preprocessor (AERMAP)*, EPA-454/B-03-003, Research Triangle Park, NC

Receptor terrain elevations input to the model will be those interpolated from 1/3 arc second National Elevation Dataset (NED) data obtained from the U.S. Geological Survey (USGS). The array elevations will be interpolated using the latest version of AERMAP (11103). Base elevations for facility sources and buildings will also be determined using AERMAP, except where refined based on site-specific survey data or observations.

5.6. RECEPTOR GRIDS

For this air dispersion modeling analysis, ground-level concentrations will be calculated along the facility boundary and also within a Cartesian receptor grid. As an area of concern, the facility boundary will have boundary receptors spaced 50 meters apart starting at an arbitrary point on the boundary. The Cartesian grid will generally consist of the following receptors spacing as seen in Table 5-3. The proposed grid is consistent with or more stringent that the recommendations outlined in Technical Manual 1002.

Table 5-3. Proposed Cartesian Receptor Grid

Grid Dimension	Receptor Spacing (m)	Extent from Station in Cardinal Direction
1 km x 1 km	50 m	1 km
1.5 km x 1.5 km	100 m	1.5 km
3 km x 3 km	250 m	3 km
5 km x 5 km	500 m	5 km

In addition to the grid outlined above, an additional grid of fine receptors, spaced 50 meters, will be placed over the area of maximum concentration if the maximum does not occur along the boundary or within the 1 km grid dimension. Images depicting the receptor grid(s) used in the modeling will be provided in the modeling report.

Receptor elevations required by AERMOD will be determined using the AERMAP terrain preprocessor (version 11103). AERMAP also calculates hill height parameters required by AERMOD. Terrain elevations from the USGS 1/3 arc second NED will be used for AERMAP processing.

5.7. BUILDING DOWNWASH

The emissions units will be evaluated in terms of their proximity to nearby structures. The site buildings will be digitized in the model using detailed project drawings. The purpose of the building downwash evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures, leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent.

All stacks modeled in this analysis will be evaluated for cavity and wake effects from building downwash. The current version of the AERMOD dispersion model treats the trajectory of the plume near the building and uses the position of the plume relative to the building to calculate interactions with the building wake. AERMOD calculates fields of turbulence intensity, wind speed, and slopes of the mean streamlines as a function of the projected building dimensions.

The direction-specific building dimensions used as input to the AERMOD model will be calculated using BPIP-PRIME (version 04274).[11] BPIP-PRIME is sanctioned by the USEPA and is designed to incorporate the concepts and procedures expressed in the "Good Engineering Practice" (GEP) Technical Support document, the Building Downwash Guidance document, and other related documents.[12]

5.8. GEP STACK HEIGHT ANALYSIS

Stack height regulations exist that restrict the use of stack heights in excess of GEP in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

H_{GEP} = H + 1.5L, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or projected width).

The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP PRIME. In general, the lowest GEP stack height for any source is 65 meters by default.[13] Since none of the proposed emission sources at the Lambertville Station have stack heights exceeding 65 meters, the project will comply with GEP requirements.

5.9. REGIONAL SOURCE INVENTORY

For any off-site impact calculated in the Significance Analysis that is greater than the SIL for a given pollutant, a NAAQS analysis incorporating nearby sources is required. Texas Eastern will provide significance analysis results to the NJDEP and ask for NJDEP's assistance in identifying any regional sources of pollutants for which the SILs will be exceeded. Such sources provided by the NJDEP will be included in the NAAQS analysis at their actual emissions levels per revised Appendix W.[14] Texas Eastern will note that it did not identify any existing, significant sources of air emissions for inclusion in a NAAQS analysis, if required.

5.10. RESULTS PRESENTATION

The model results will be presented as a brief report to NJDEP. Electronic copies of the input and output files will be included with the modeling report submitted as a modeling CD.

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[11] U.S. EPA, *User's Guide to the Building Profile Input Program,* (Research Triangle Park, NC: U.S. EPA), EPA-454/R-93-038, Revised February 8, 1995.

[12] U.S. EPA, Office of Air Quality Planning and Standards, Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised), (Research Triangle Park, NC: U.S. EPA), EPA 450/4-80-023R, June 1985.

[13] 40 CFR §51.100(ii).

[14] https://www3.epa.gov/ttn/scram/appendix_w/2016/AppendixW_2017.pdf

5.11. SPECIAL MODELING CONSIDERATIONS

There are no special modeling considerations in this analysis. Coastal fumigation, secondary $PM_{2.5}$, and deposition, ozone modeling and odor modeling are not relevant.

5.12. SUMMARY AND APPROVAL OF MODELING PROTOCOL

Texas Eastern is supplying this written air dispersion modeling protocol so that NJDEP can formally comment on and approve the methodologies and data resources to be used in this analysis. Texas Eastern requests a written response to this protocol at NJDEP's earliest convenience.

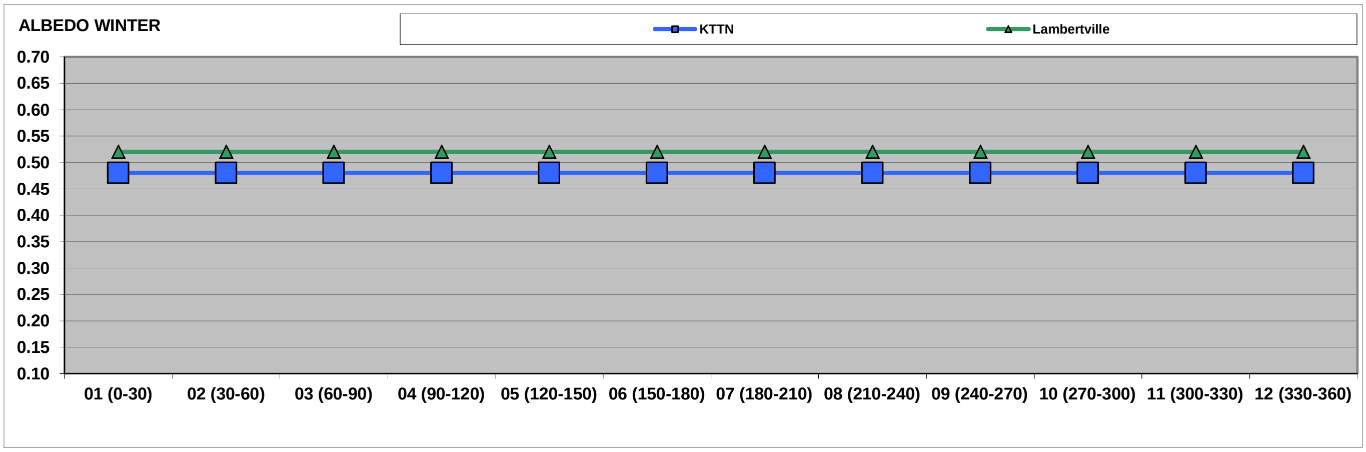
APPENDIX A. FACILITY PLOT PLAN

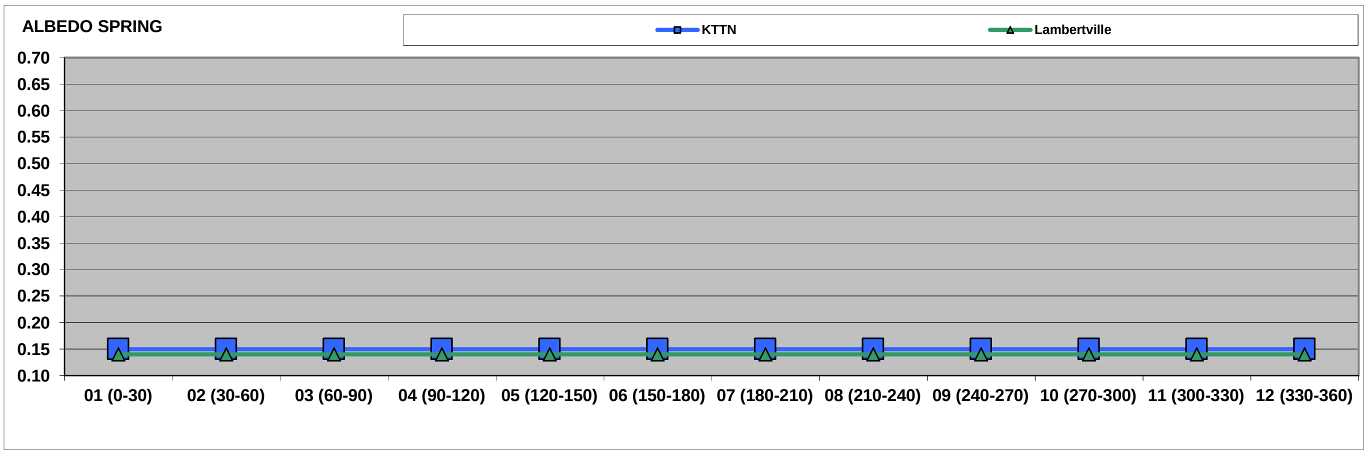
Provided Under Separate Cover in Volume IV

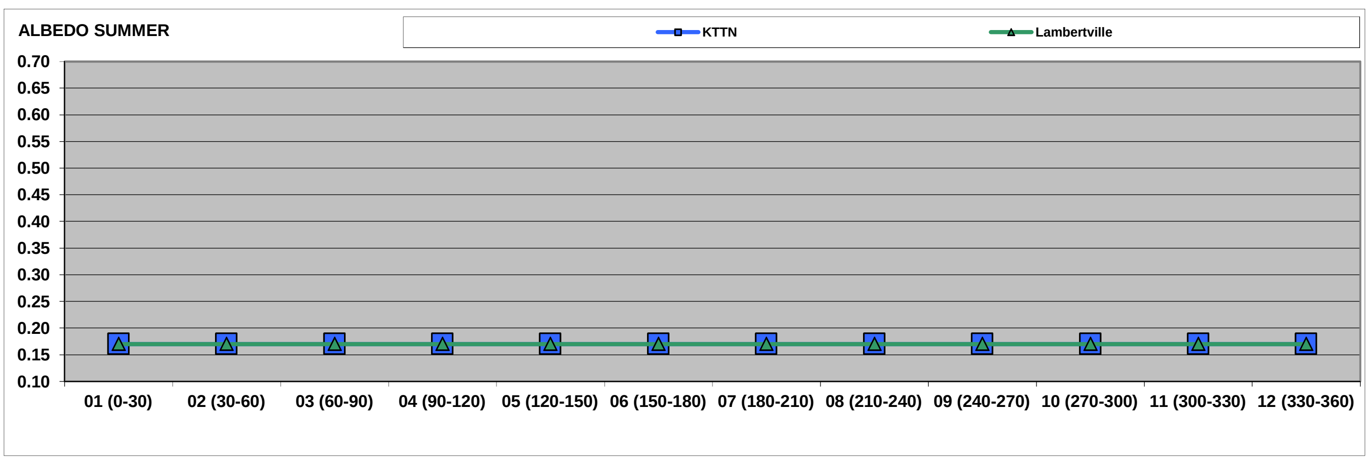
CUI//CEII – CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION – DO NOT RELEASE

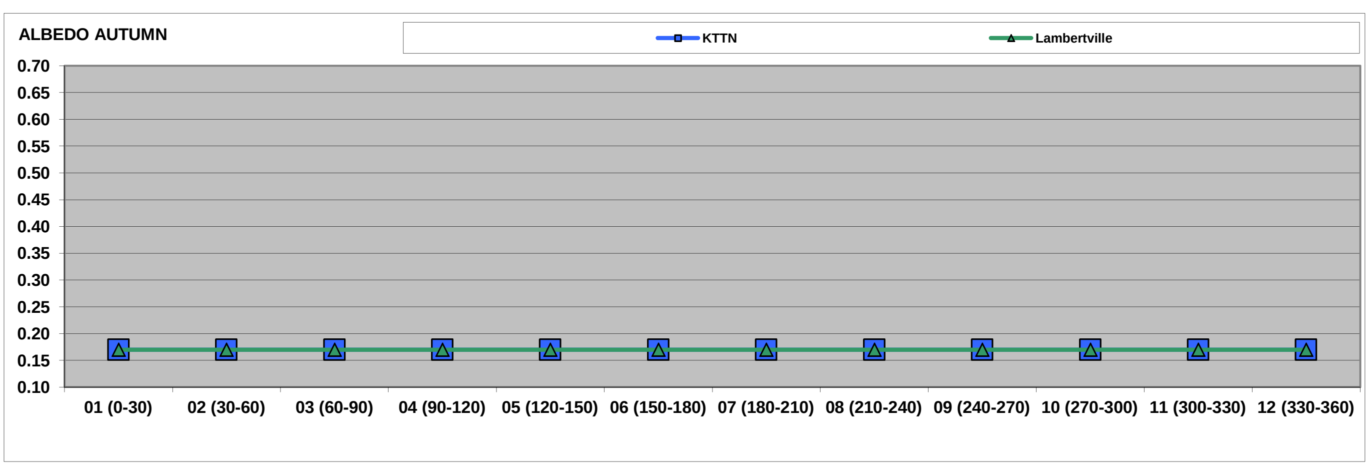
APPENDIX B. LAND USE COMPARISON

COMPARISON OF ALBEDO VALUES

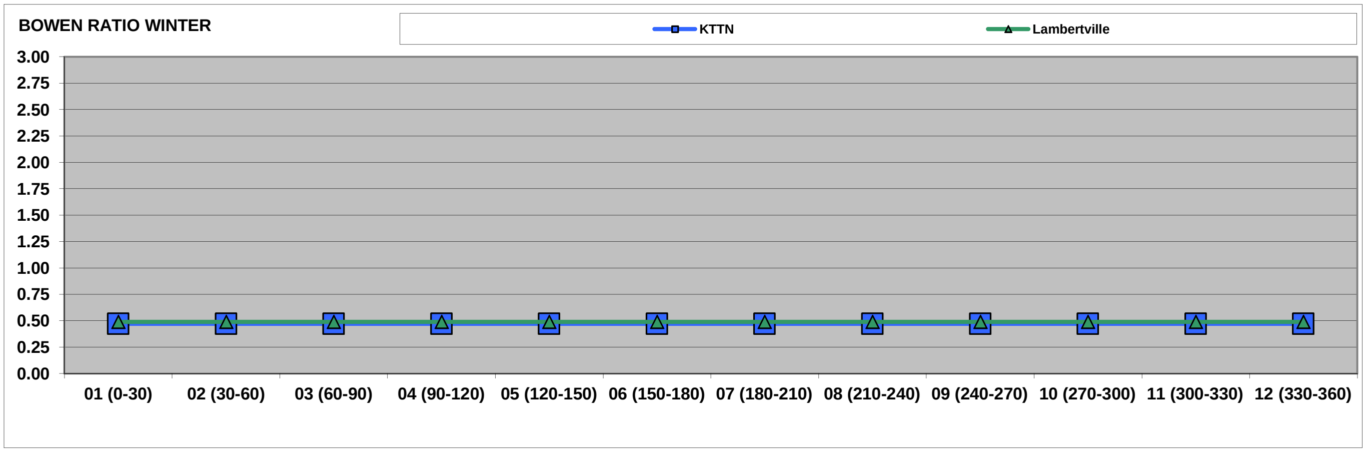


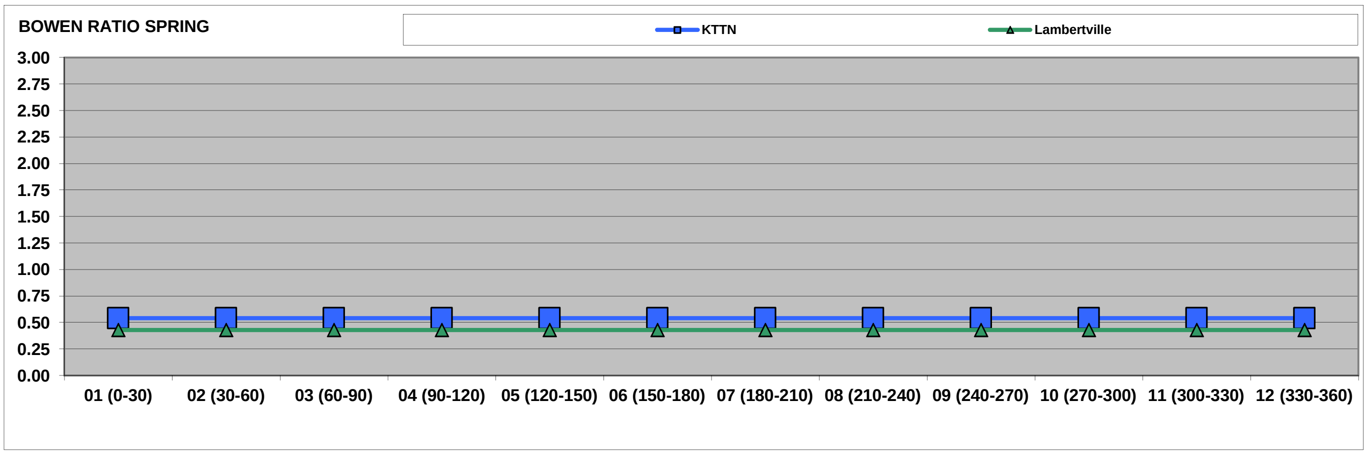


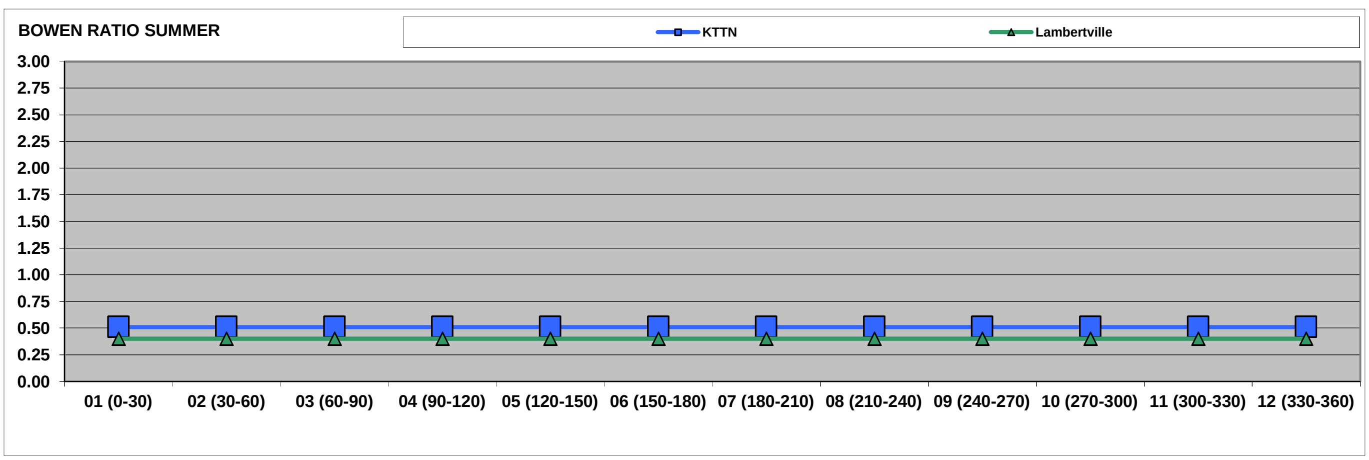


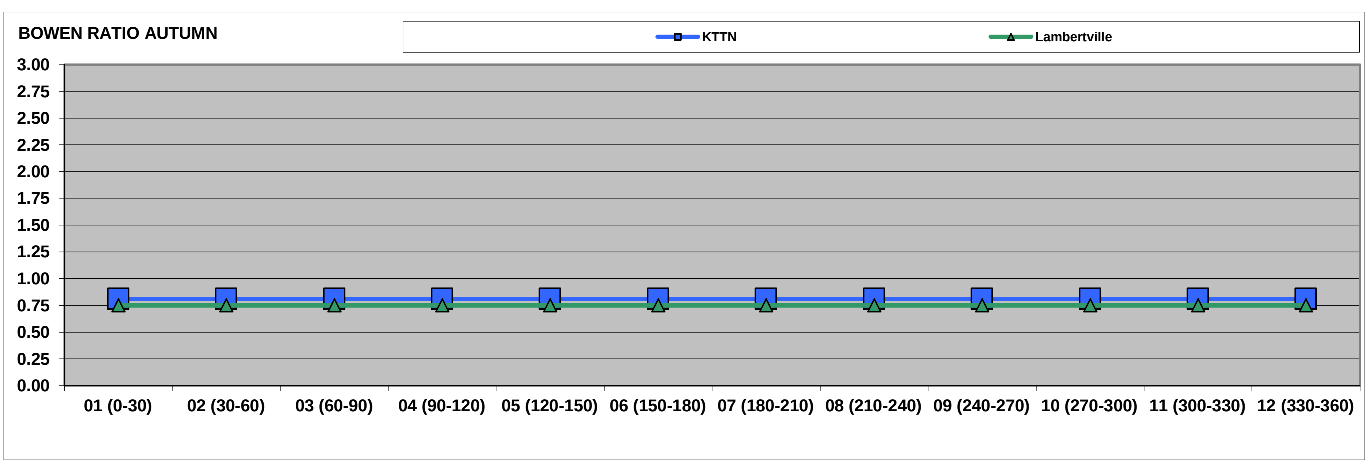


COMPARISON OF BOWEN RATIO VALUES

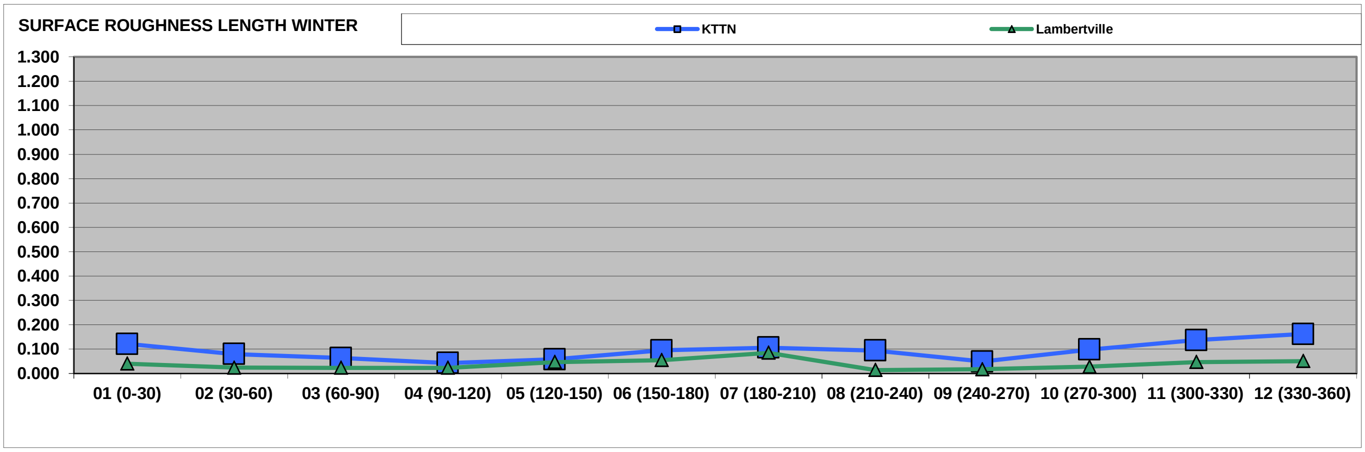


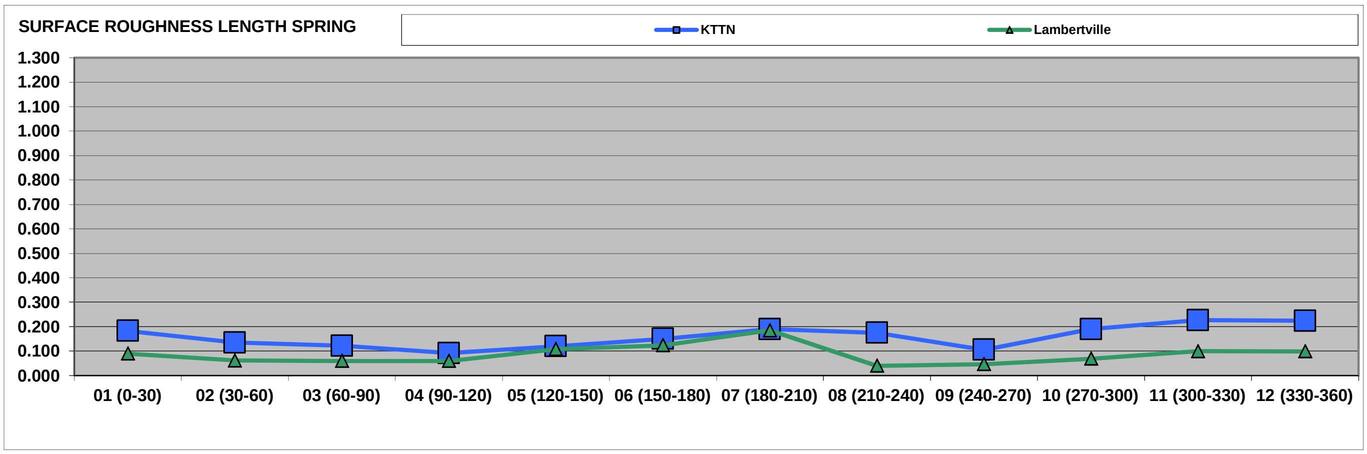


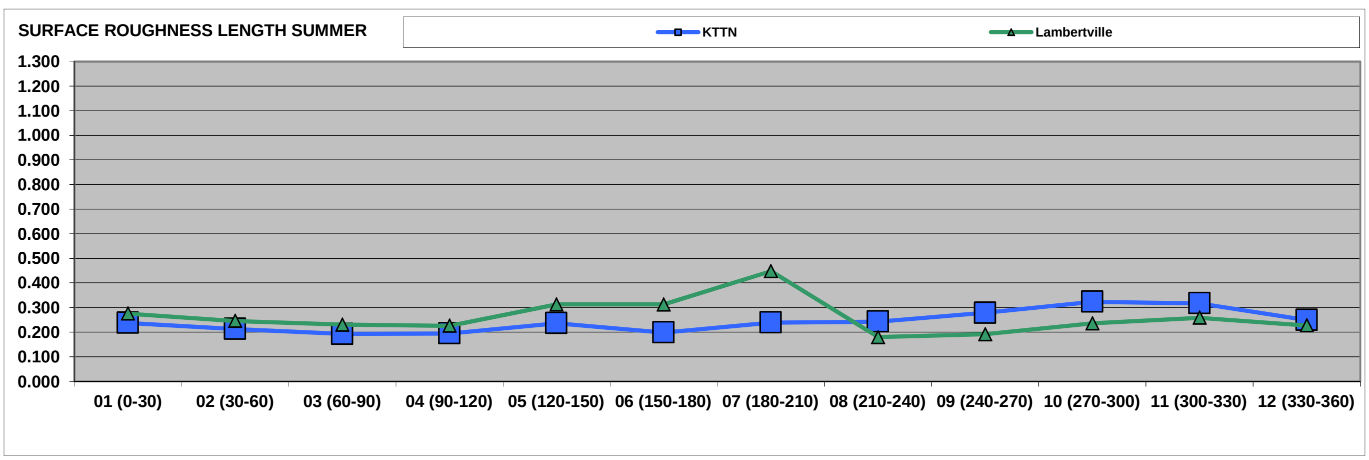


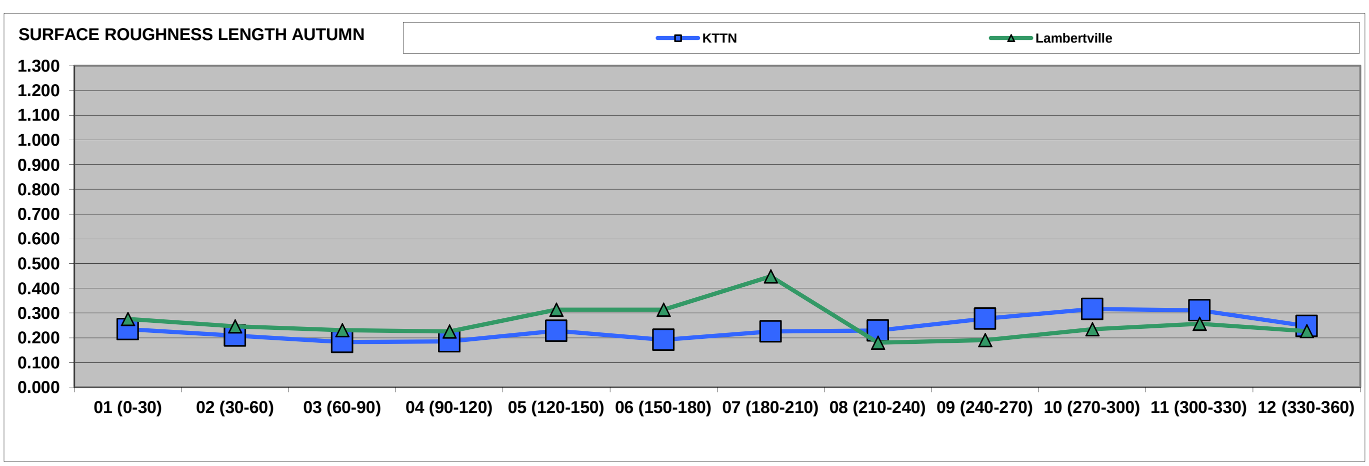


COMPARISON OF SURFACE ROUGHNESS LENGTH VALUES









APPENDIX D: AIR TOXICS MODELING PROTOCOL

AIR TOXICS DISPERSION MODELING PROTOCOL

Texas Eastern Transmission LP > Lambertville Station

Prepared For:

Texas Eastern Transmission LP

1325 Highway 179
Hunterdon County
Lambertville, New Jersey, 08530

Prepared by:

TRINITY CONSULTANTS
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(609) 375-2665

November 2017

Project 173101.0075

Environmental solutions delivered uncommonly well

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1. INTRODUCTION

Texas Eastern Transmission, L.P. (Texas Eastern) operates a natural gas compressor station in Lambertville, Hunterdon County, New Jersey (Lambertville Station). The Lambertville Station is currently operating under Title V Operating Permit Number BOP140001, issued on December 1, 2014. Texas Eastern is submitting an air permit application that seeks approval from the New Jersey Department of Environmental Protection (NJDEP) for two proposed projects at the Lambertville Station. These projects include the following:

- The **Lambertville East Expansion Project** involves the replacement of the two existing natural gas-fired Dresser Clark model DC 990 compressor turbines (Emission Unit U1) with two new lower NO_X-emitting natural gas-fired Solar Taurus 70 compressor turbines. This project is being implemented as part of a system-wide project scheduled to begin construction in 2019. The project will also provide for compliance with the recently published amendments to Title 7, Chapter 27 of the New Jersey Administrative Code, N.J.A.C. 7:27, which pertain to Reasonably Available Control Technology (RACT) requirements for NO_X (N.J.A.C. 7:27-19: Control and Prohibition of Air Pollution from Oxides of Nitrogen or "NO_X RACT rule").

- The **PennEast Interconnect Project** involves the construction of connecting piping and associated flow control devices (metering and regulating equipment) in order to receive natural gas via the PennEast pipeline, owned and operated by PennEast Pipeline Company, LLC (PennEast), at the Lambertville Compressor Station.

As part of the permit application for modification to the existing Title V permit for the Lambertville Compressor Station (BOP140001), Texas Eastern will conduct a facility-wide Risk Assessment for Air Contaminant Emissions (i.e., air toxics). This protocol document serves to outline the proposed methodology for conducting the refined air dispersion modeling of air toxic emissions.

1.1. PROJECT DETAILS

1.1.1. Lambertville East Expansion Project

Under this project, Texas Eastern is proposing to install the following equipment at the existing Lambertville Station:

- Two new 10,915 HP (ISO) Solar Taurus 70 natural gas-fired turbines, which will replace the two existing 5,800 HP (ISO) Dresser Clark DC 990 natural gas-fired compressor turbines (Emission Unit U1);
- A new 880 bhp Waukesha VGF36GL natural gas-fired emergency generator which will replace the existing Caterpillar G-398 emergency generator (Emission Unit U3); and
- Two new natural gas-fired gas heaters associated with the new turbine compressors (rated at < 1 MMBtu/hr heat input);
- Four new natural gas-fired warehouse space heaters (all rated at < 1 MMBtu/hr heat input); and
- Piping components and blowdown vents for gas releases associated with the new turbines which will replace existing piping components and blowdown vents associated with the existing turbines.

1.1.2. PennEast Interconnect Project

Under this project, Texas Eastern is installing the piping, metering and regulating equipment needed to connect both the Algonquin and Texas Eastern pipeline systems (both owned by Enbridge) to the proposed PennEast Pipeline at the Lambertville Station. PennEast owns the property adjacent to the Lambertville Station. The agreement between Texas Eastern and PennEast is that Texas Eastern will design and construct this equipment, however ownership and operations will be divided between the two companies. Under this project, Texas Eastern is proposing to install the following equipment:

- Eight (8) new 10 MMBtu/hr step down heaters;
- One (1) Caterpillar G3412C emergency generator;
- New piping components; and
- New blowdown vents for periodic gas releases for maintenance and repair purposes.

1.2. MODELING OBJECTIVE

A Title V Significant Modification Application for the two projects is being prepared for submittal to the NJDEP. In accordance with NJDEP guidance, a Risk Assessment for Air Contaminant Emissions will be performed. Based on draft project emissions calculations, it is expected that a refined analysis, using the AERMOD model, will be necessary to evaluate predicted model output concentration of air toxics associated with the projects. The objective of the refined modeling is to demonstrate compliance with the thresholds established within NJDEP's Technical Manual 1003, Guidance on Risk Assessment for Air Contaminant Emissions. Both projects and existing sources will be considered in the modeling analysis for all air toxics with the exception of formaldehyde from existing reciprocating engines since they were modeled in 2011. This protocol is prepared to serve as the approved modeling approach for evaluating the model impacts of air toxics associated with projects.

This protocol was prepared based on modeling guidance from the NJDEP and United States Environmental Protection Agency (USEPA), including NJDEP's *Guideline on Air Quality Impact Modeling Analysis* (Technical Manual 1002), NJDEP's *Guidance on Risk Assessment for Air Contaminant Emissions* (Technical Manual 1003), USEPA's AERMOD Implementation Guide and the *Guideline on Air Quality Models* (40 CFR 51, Appendix W).

The remainder of this modeling protocol is organized as follows:

- Section 2 provides a brief description of the facilities;
- Section 3 discusses the risk assessment procedure and presentation of modeling results; and
- Section 4 describes the air dispersion modeling methodology.

2. FACILITY DESCRIPTION

The Lambertville Station is located in Lambertville, Hunterdon County, New Jersey. Figure 2-1 presents an aerial map of the facility.

The facility is located at the following address:

1325 Highway 179
West Amwell Township
Lambertville, New Jersey 08530

As shown in Table 2-1, which summarizes the land use types within 3 km of the Lambertville Station, the vast majority of the area within 3 km of the site is comprised of pasture/hay, deciduous forest, and mixed forest. Approximately 52% of the land use is considered pasture/hay, approximately 19% of the land use is considered deciduous forest, and approximately 19% of the land use is considered mixed forest. As such, this land use is considered rural. In addition, topography within the facility is relatively uniform, with elevations increasing to the southeast of the facility. The typical terrain elevations at the facility are approximately 160 feet above sea level. Terrain surrounding the Lambertville Station can be summarized as rolling hills and a river valley lies to the west about 3 miles distant.

Figure 2-1. Aerial Map of the Lambertville Station

Table 2-1. Land Use in 3 KM Surrounding the Lambertville Station

Land Use Type	Grid Cell Count	% of Total Grid Cells
Open Water	175	0.6%
Perennial Ice/Snow	0	0.0%
Low Intensity Residential	194	0.6%
High Intensity Residential	0	0.0%
Commercial/Industrial/Transp	96	0.3%
Bare Rock/Sand/Clay	0	0.0%
Quarries/Strip Mines/Gravel	23	0.1%
Transitional	0	0.0%
Deciduous Forest	5908	18.8%
Evergreen Forest	496	1.6%
Mixed Forest	5906	18.8%
Shrubland	0	0.0%
Orchards/Vineyard/Other	0	0.0%
Grasslands/Herbaceous	0	0.0%
Pasture/Hay	16202	51.6%
Row Crops	2313	7.4%
Small Grains	0	0.0%
Fallow	0	0.0%
Urban/Recreational Grasses	19	0.1%
Woody Wetlands	58	0.2%
Emergent Herbaceous Wetlands	2	0.0%
Total	**31392**	
Total Urban	**96**	**0.3%**

3.1. OVERVIEW OF RISK ASSESSMENT PROCEDURES

The first step of this air toxics modeling analysis will be the computation of the facility-wide total potential to emit for each air toxic and the comparison of those totals to the reporting thresholds. If the facility-wide potential to emit of an air toxic is less than the reporting threshold, then no further analysis of that air toxic is warranted. At this time, the following air toxics have potential to emit in excess of the reporting threshold:

- Acetaldehyde;
- Acrolein;
- Benzene;
- Biphenyl;
- Butadiene (1,3-);
- Carbon Tetrachloride;
- Chloroform;
- Dichloroethane (1,2-);
- Dichloropropane (1,2-);
- Ethylbenzene;
- Ethylene Dibromide;
- Formaldehyde;
- Naphthalene;
- PAH (evaluated as benzo(a)pyrene);
- Propylene oxide;
- Tetrachloroethane (1,1,2,2-);
- Toluene;
- Trichloroethane (1,1,2-); and
- Vinyl Chloride.

The second step is the completion of a risk screening worksheet for each emissions source at the Lambertville Station or PennEast Interconnect that emits any of the air toxics that were computed to exceed the reporting threshold. The worksheet calculations estimate the cancer and non-cancer health risks without specific dispersion modeling. This worksheet cannot be used for the continuous fugitive emission sources since they do not have emissions through vents, but it can be used for the turbines, heaters, engines, and other releases that occur through stacks (e.g. rod packing, dry seal leakage).

If unacceptable risk is shown in any of the source-specific risk screening worksheets, a refined risk assessment will be performed in accordance with Technical Manual 1003. Furthermore, Texas Eastern will compute the cumulative risk for each air toxic by adding the risk result in each workbook and comparing the sum to the facility-wide risk threshold of one in a million. If the cumulative risk is determined to be in excess of the one in a million threshold, then a refined risk assessment will be performed. This refined assessment consists of an atmospheric dispersion modeling analysis using AERMOD (See Section 4). The individual source and facility-wide risk will be assessed in this modeling analysis. The refined risk assessment will evaluate the cancer risk and short- and long-term non-cancer health risks for each air toxic that triggers further risk evaluation. It is expected that a refined analysis will be necessary for multiple air toxics. The following is a preliminary list of air toxics projected to require a refined analysis:

- Acrolein;
- Benzene;
- Butadiene (1,3-);

- Ethylene Dibromide;
- Formaldehyde; and
- PAH (evaluated as benzo(a)pyrene).

In accordance with Technical Manual 1002 and Technical Manual 1003, the objective of this modeling protocol is to outline the procedures required for refined dispersion modeling required as part of a refined risk assessment.

3.2. MODELED SOURCES

Based on the project description provided in Section 1 of this protocol, the following new or modified sources will be modeled in the risk assessment analysis:

- Lambertville East Project:
  - Two (2) new Solar Taurus 70 combustion turbines (modeled at 100% load, 10,915 HP, ISO)
  - Six (6) new heaters each rated at less than 0.2 MMBtu/hr
  - Continuous, low level gas releases associated with routine operation and maintenance of the new turbine-driven compressor units which include:
    - Centrifugal compressor dry seal venting; and
    - Through-valve leakage from the compressors.
  - Associated new piping components
- PennEast Interconnect Project:
  - Eight (8) new heaters, each rated at 10 MMBtu/hr heat input
  - Associated new piping components.

The above sources will be evaluated on an individual basis against the cancer and non-cancer risk standards in Tables 5.1 and 5.3 of Technical Manual 1003. The following existing sources will also be modeled in determining the facility-wide cancer risk and individual non-cancer risk basis per Tables 5.2 and 5.3 of Technical Manual 1003:

- Lambertville Station
  - Emission Unit 7: Two (2) Cooper-Bessemer reciprocating engines (modeled at 100% load, 2,310 HP, ISO);
  - Insignificant Source: Six(6) heaters , each rated less than 0.2 MMBtu/hr;
  - Insignificant Sources: Continuous, low level gas releases associated with routine operation and maintenance of the existing reciprocating engines which include:
    - Reciprocating compressor rod packing venting;
    - Through-valve leakage from the compressors; and
  - Station-wide piping components.

Emissions Unit 1 (two DC 990 turbines) and Emission Unit 3 (one Caterpillar G-398 emergency generator) are to be shut down as a result of the proposed projects at Lambertville Station. Apart from the piping components, which will be treated as fugitive volume sources in the model, all emissions sources will be modeled with actual physical stacks parameters (stack height and stack diameter) and exhaust characteristics (stack flowrate and stack exit temperature). Existing source parameters will be based on as-built conditions. These point source stack parameters will be specified in the modeling report. Texas Eastern will conduct the refined analysis using, for each modeled source identified in the lists above, the maximum hourly emission rate under normal operating conditions.

3.3. OTHER SOURCES

In addition to the sources outlined above, there are additional gas releases associated with routine operations and maintenance that may occur intermittently at the Lambertville Station or PennEast Station. These sources are identified as insignificant sources in the permit related to compressor and station yard blowdowns and purges, pigging, draining and valve actuation. They occur infrequently (e.g.,, less than 10 events per year per source) and for limited durations on an individual release basis (e.g., less than 10 minutes per event) as well as a cumulative basis (less than 10 hours in aggregate per year). The total annual potential emissions from these sources are also very low as provided in the air permit application.

In consultation with the NJDEP, these sources will not be included in the proposed modeling due to their small annual emissions profile and their very low frequency and short duration. NJDEP has also specified that emergency generators are not required to be included in the air toxics analysis due to the intermittent, and unpredictable, nature of operation. As such, these sources will not be included in the proposed modeling.

3.4. DETERMINING HEALTH RISKS AND RESULTS PRESENTATION

The results from the refined risk assessment will be evaluated for incremental cancer risk (where applicable) and short-term and long-term non-carcinogen risk (hazard quotient). The cancer risk is determined by multiplying the maximum AERMOD annual average air concentrations for each air toxic by the pollutant-specific inhalation unit risk factor (URF). The hazard quotient is determined by dividing the maximum AERMOD annual average air concentrations for each air toxics by the pollutant-specific reference concentration (RfC). The recently updated URF and RfC values published by NJDEP will be used for this assessment.[1]

For each new or modified source, the resulting cancer risk for each air toxic will be compared to Technical Manual 1003 Tables 5.1. The cumulative, facility-wide cancer risk for each air toxic will be compared to the guidelines in Technical Manual 1003 Table 5.2. The computed hazard quotient for each air toxic for each source will be compared to the non-cancer risk guidelines in Table 5.3 of the Technical Manual 1003. Results will be presented in a tabular format and risk contour plots will be developed for the air toxic(s) that are computed to have the highest risk.

---

[1] "Toxicity Values for Inhalation Exposure" document, dated May 2017, available for download at www.nj.gov/dep/aqpp/risk.html.

4. AIR DISPERSION MODELING METHODOLOGY

This section of the modeling protocol describes the AERMOD modeling procedures and data resources to be utilized in the refined risk assessment analysis.

4.1. DISPERSION MODEL SELECTION AND BUILDING DOWNWASH ANALYSIS

Dispersion models predict downwind pollutant concentrations by simulating the evolution of the pollutant plume over time and space given data inputs including the quantity of emissions and the initial conditions (e.g., velocity, flowrate, and temperature) of the stack exhaust to the atmosphere. Building structures that obstruct wind flow near emission points may cause stack discharges to become caught in the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent. These effects generally cause higher ground level pollutant concentrations since building downwash inhibits dispersion from elevated stack discharges. For this reason, building downwash algorithms are considered an integral component of the selected air dispersion model.

The latest version (16216r) of the AERMOD model will be used to estimate maximum ground-level concentrations in risk assessment analyses conducted. AERMOD is a refined, steady-state, multiple source, dispersion model and was promulgated in December 2005 as the preferred model to use for industrial sources in this type of air dispersion modeling analysis.[2] The AERMOD modeling will be performed using regulatory default options except as otherwise noted in this protocol. The AERMOD model has the Plume Rise Modeling Enhancements (PRIME) incorporated in the regulatory version, so the direction-specific building downwash dimensions used as input will be determined by the Building Profile Input Program PRIME (BPIP PRIME), version 04274.[3] BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents,[4] while incorporating the PRIME enhancements to improve prediction of ambient impacts in building cavities and wake regions.

4.2. TREATMENT OF TERRAIN

Through the use of the AERMOD terrain preprocessor (AERMAP), AERMOD incorporates not only the receptor heights, but also an effective height (hill height scale) that represents the significant terrain features surrounding a given receptor that could lead to plume recirculation and other terrain interaction.[5]

Receptor terrain elevations input to the model will be those interpolated from 1/3 arc second National Elevation Dataset (NED) data obtained from the U.S. Geological Survey (USGS). The array elevations will be interpolated using the latest version of AERMAP (11103). Base elevations for facility sources and buildings will also be determined using AERMAP, except where refined based on site-specific survey data or observations.

---

[2] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Appendix A.1– AMS/EPA Regulatory Model (AERMOD).

[3] Earth Tech, Inc., *Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model*, Concord, MA.

[4] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised)*, Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

[5] EPA, *Users Guide for the AERMOD Terrain Preprocessor (AERMAP)*, EPA-454/B-03-003, Research Triangle Park, NC

4.3. METEOROLOGICAL DATA

AERMOD require a sequential hourly record of dispersion meteorology representative of the region within which the source is located. In the absence of site-specific measurements, readily available data are commonly used from the closest and most representative National Weather Service (NWS) station. Regulatory air dispersion modeling using AERMOD requires five years of quality-assured meteorological data that includes hourly records of the following parameters:

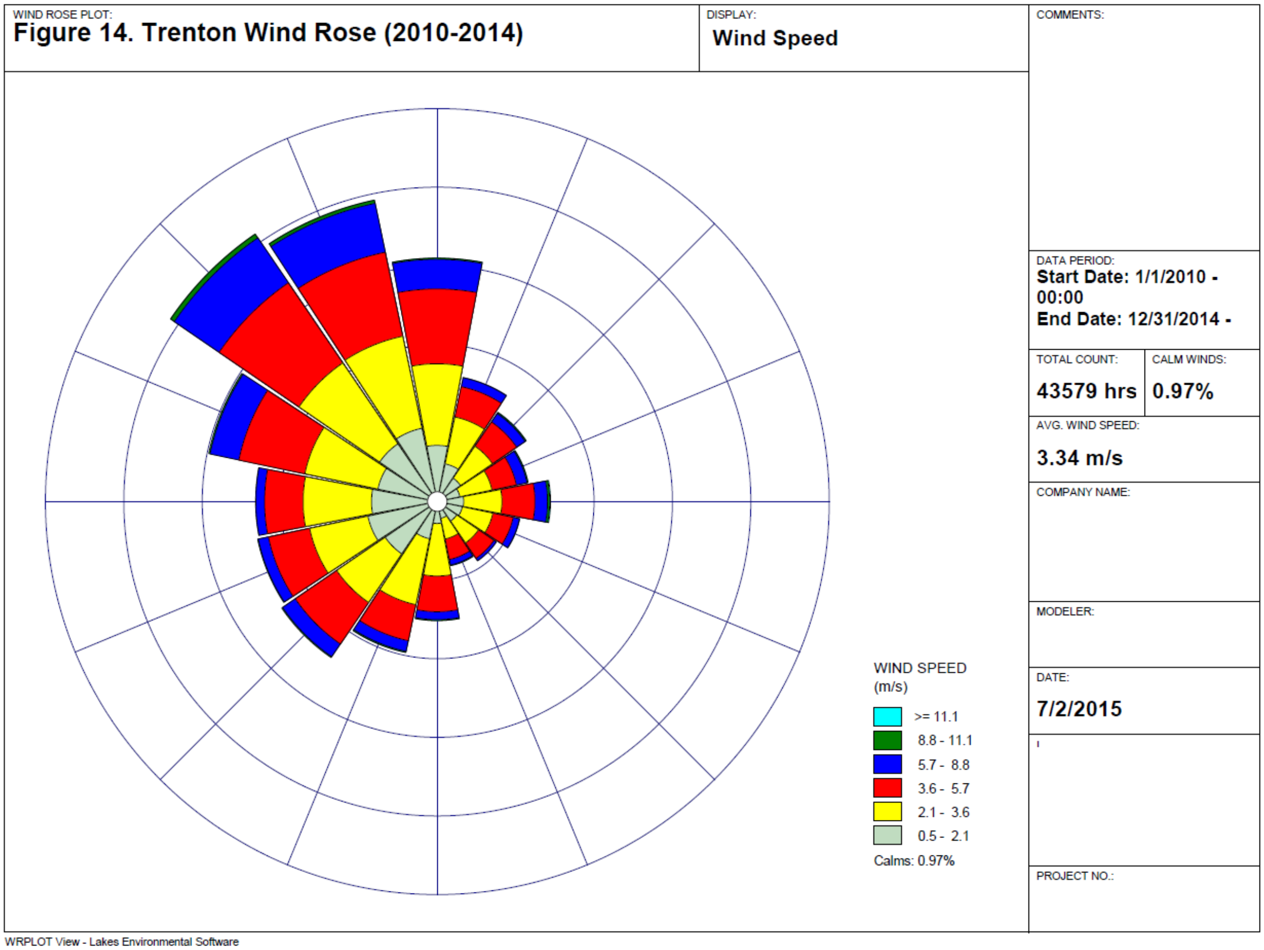
- Wind speed;
- Wind direction;
- Air temperature;
- Micrometeorological Parameters (e.g., friction velocity, Monin-Obukhov length);
- Mechanical mixing height; and
- Convective mixing height.

The first three of these parameters are directly measured by monitoring equipment located at typical surface observation stations. The friction velocity, Monin-Obukhov length, and mixing heights are derived from characteristic micrometeorological parameters and from observed and correlated values of cloud cover, solar insulation, time of day and year, and latitude of the surface observation station. Surface observation stations form a relatively dense network, are almost always found at airports, and are typically operated by the NWS. Upper air stations are fewer in number than surface observing points since the upper atmosphere is less vulnerable to local effects caused by terrain or other land influences and is therefore less variable. The NWS operates virtually all available upper air measurement stations in the United States.

Texas Eastern has obtained processed 2010-2014 meteorological data from the NJDEP.[6] The meteorological data was processed through the latest version of AERMET (16216) to include upper air measurements from Sterling, Virginia and surface data from Trenton Mercer Airport. In determining the appropriate and representative surface station, land use surrounding the Trenton Mercer Airport (KTTN) and the Lambertville Station was compared. As shown in the plots found in Appendix B, the Trenton Mercer Airport and the Lambertville share very similar land use characteristics. The two locations also share similar elevations; 160 ft at the Lambertville Station and 213 ft for Trenton Mercer Airport. The AERMET processing includes use of regulatory default settings including ADJ_U*. Figure 5-1 provides a wind rose for the Trenton Mercer Airport for the data period of 2010 to 2014.

[6] Email from Mr. Greg John (NJDEP) to Mr. Ian Donaldson (Trinity) on June 28, 2017.

Figure 4-1. Trenton Mercer Airport Wind Rose



4.4. COORDINATE SYSTEM

In modeling analysis data files, the location of emission sources, structures, and receptors, are represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). The datum for this modeling analysis is based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all reside within UTM Zone 18.

4.5. RECEPTOR GRIDS

For this air dispersion modeling analysis, ground-level concentrations will be calculated along the facility boundary and also within a Cartesian receptor grid. As an area of concern, the facility boundary will have boundary receptors spaced 50 meters apart starting at an arbitrary point on the boundary. The Cartesian grid will generally consist of the following receptors spacing as seen in Table 5-1. The proposed grid is consistent with or more stringent that the recommendations outlined in Technical Manual 1002.

Table 4-1. Proposed Cartesian Receptor Grid

Grid Dimension	Receptor Spacing (m)	Extent from Station in Cardinal Direction
1 km x 1 km	50 m	1 km
1.5 km x 1.5 km	100 m	1.5 km
3 km x 3 km	250 m	3 km
5 km x 5 km	500 m	5 km

In addition to the grid outlined above, an additional grid of fine receptors, spaced 50 meters, will be placed over the area of maximum concentration if the maximum does not occur along the boundary or within the 1 km grid dimension. Images depicting the receptor grid(s) used in the modeling will be provided in the modeling report.

Receptor elevations required by AERMOD will be determined using the AERMAP terrain preprocessor (version 11103). AERMAP also calculates hill height parameters required by AERMOD. Terrain elevations from the USGS 1/3 arc second NED will be used for AERMAP processing.

As per the March 22, 2011 second level risk assessment memorandum for the Texas Eastern permit application for BOP100001, there are no sensitive receptors nearby the source. It was noted that there is a residential area approximately 530 feet from the source. A current review of aerial imagery confirms this prior conclusion.

4.6. GEP STACK HEIGHT ANALYSIS

Stack height regulations exist that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

H_{GEP} = H + 1.5L, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or projected width).

The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP PRIME. In general, the lowest GEP stack height for any source is 65 meters by default.[7] Since none of the proposed emission sources at the Lambertville Station have stack heights exceeding 65 meters, the project will comply with GEP requirements.

[7] 40 CFR §51.100(ii).

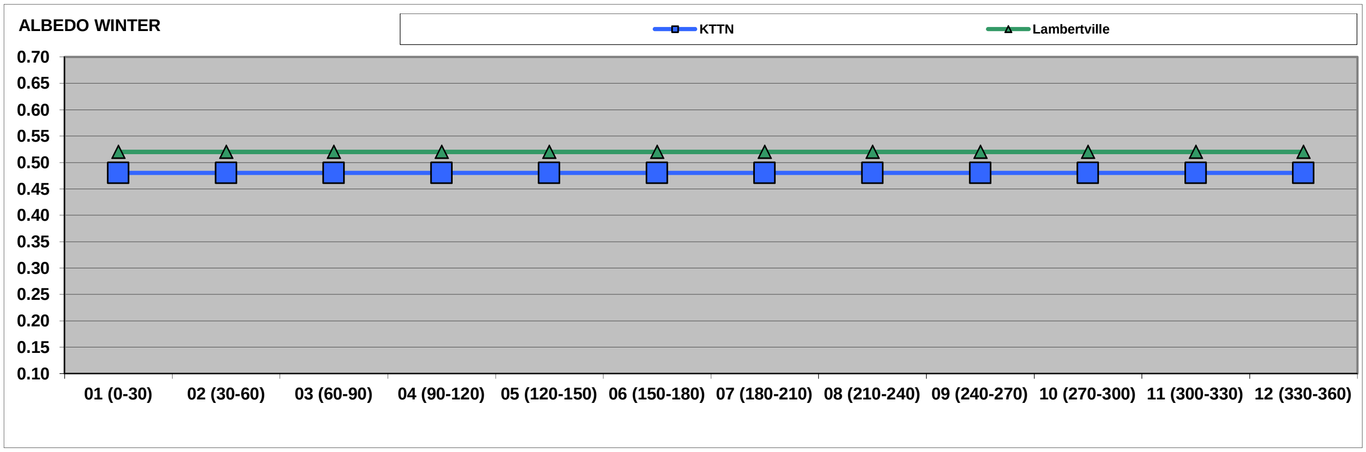
Appendix A. Facility Plot Plan

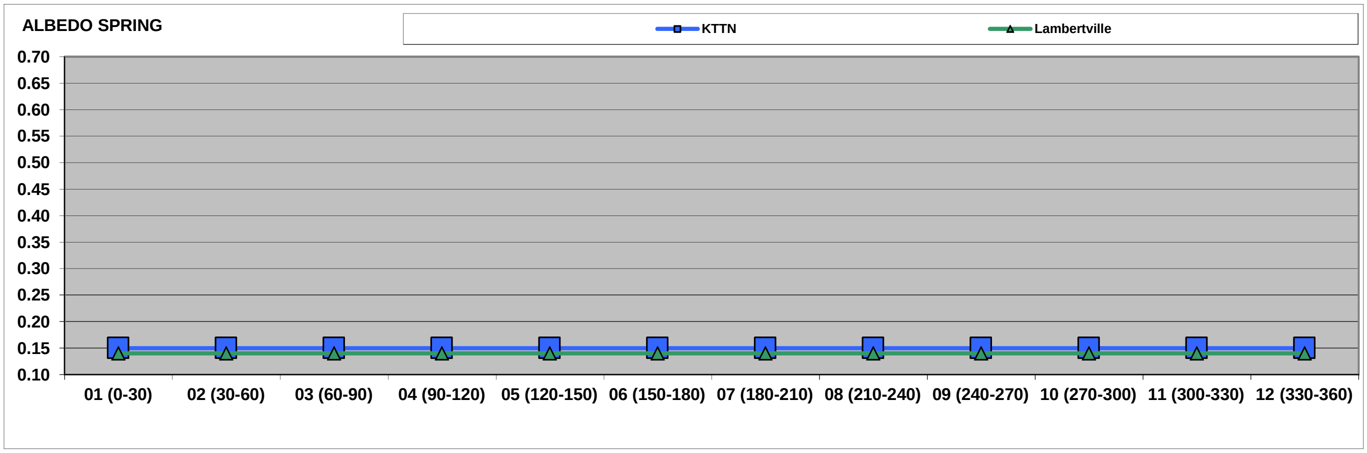
Provided Under Separate Cover in Volume IV

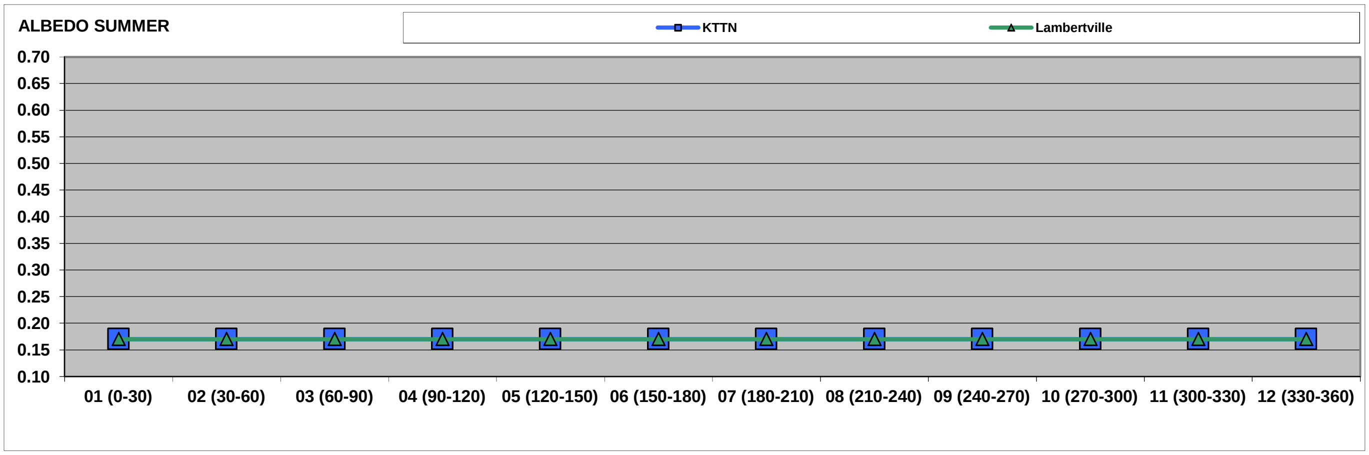
CUI//CEII – CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION – DO NOT RELEASE

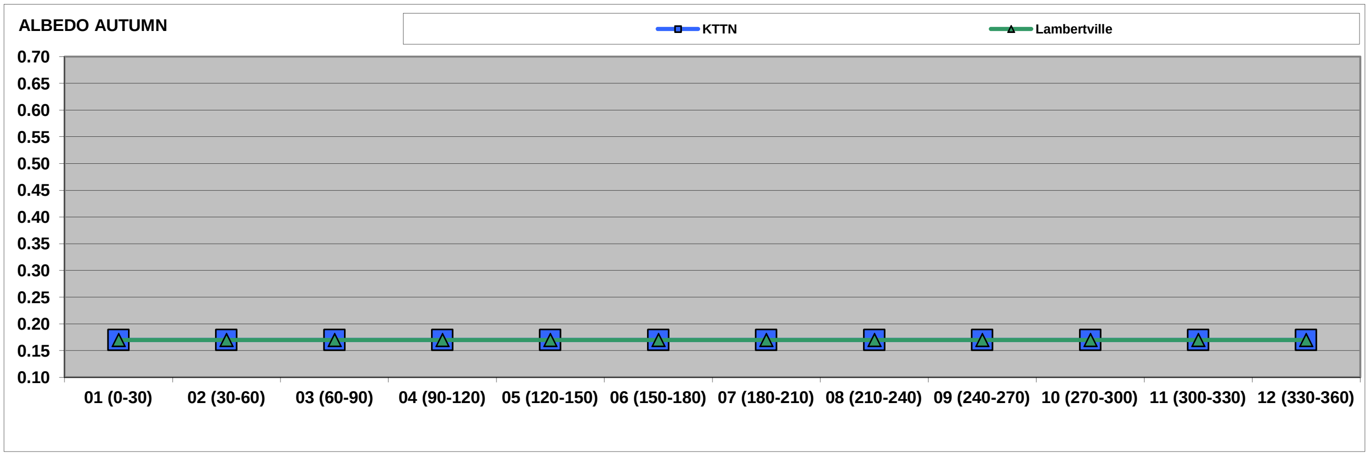
Appendix B. Land Use Comparison

COMPARISON OF ALBEDO VALUES

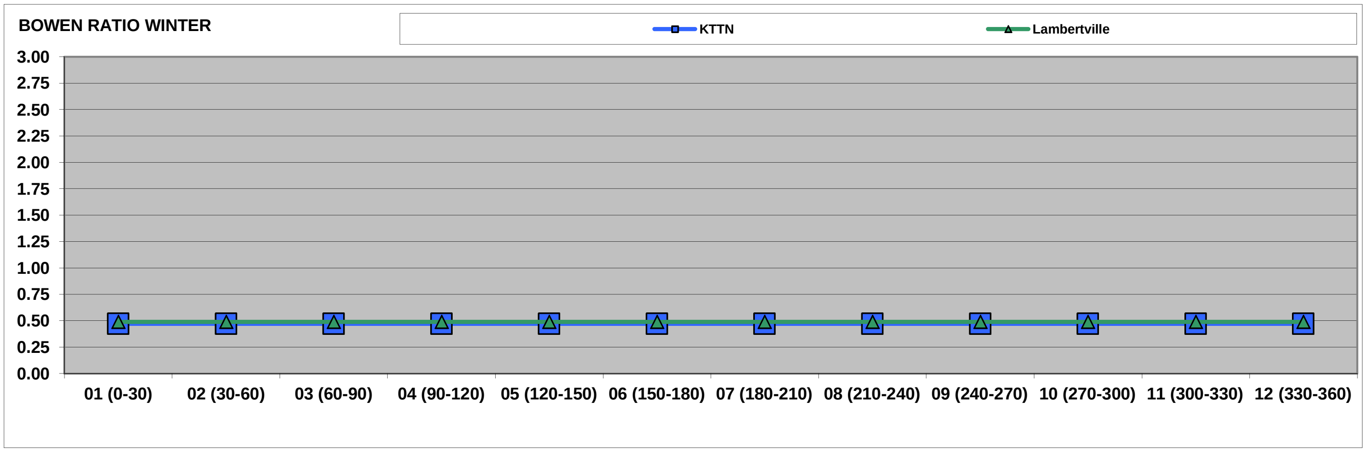


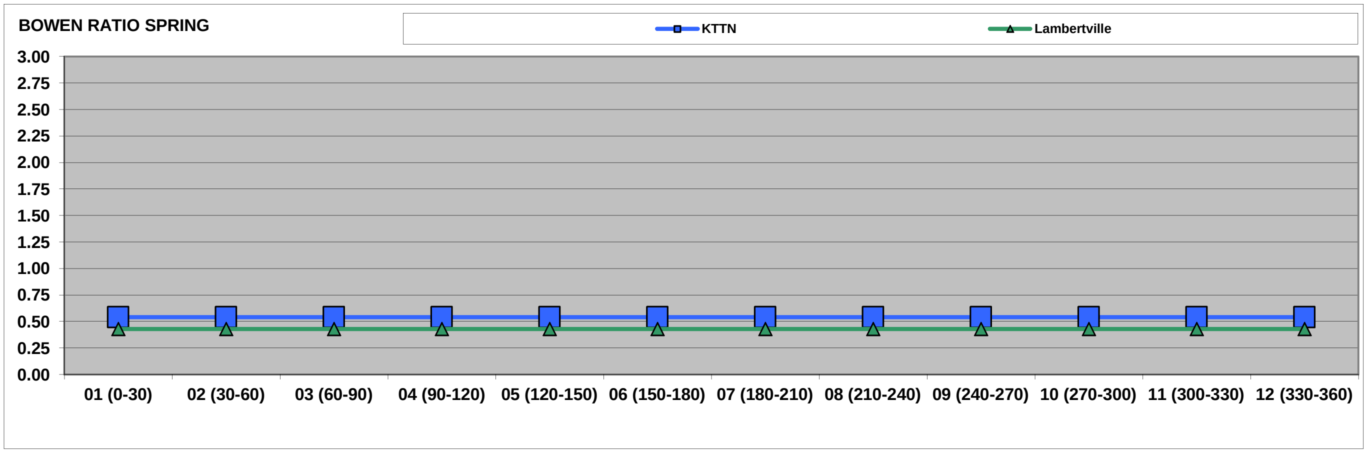


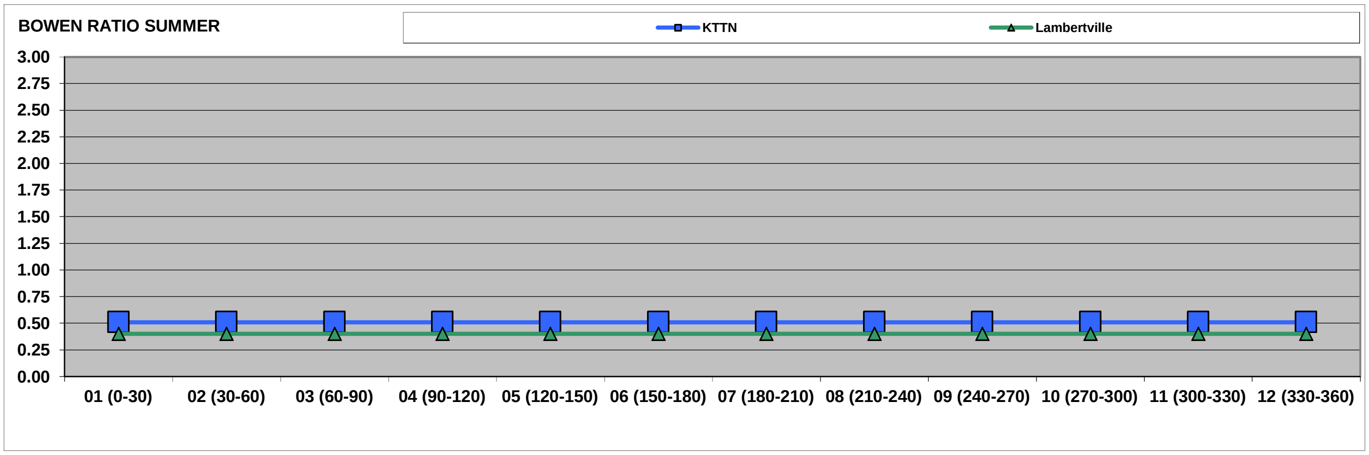


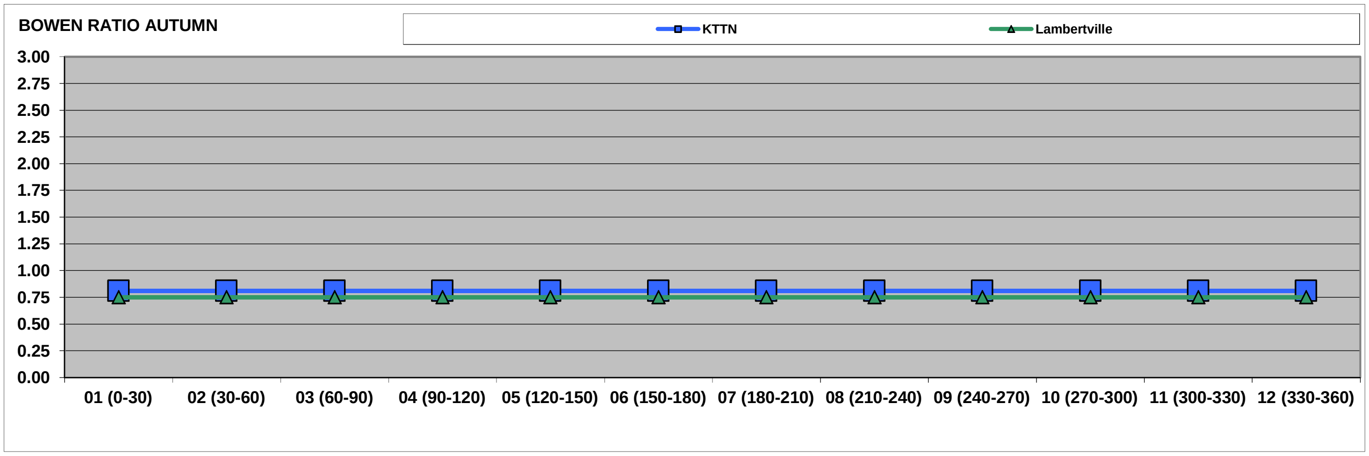


COMPARISON OF BOWEN RATIO VALUES

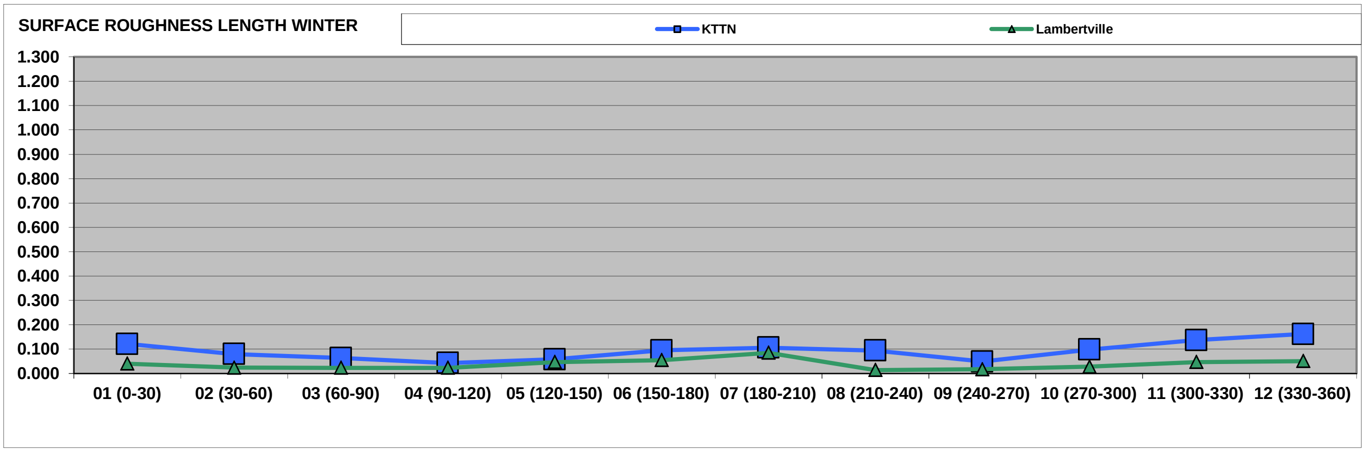


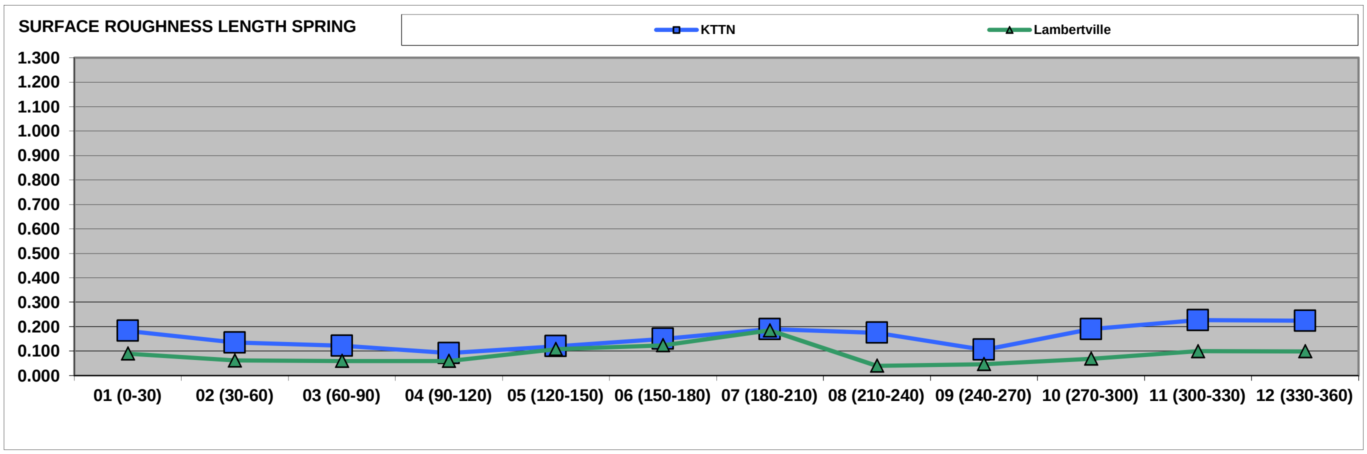


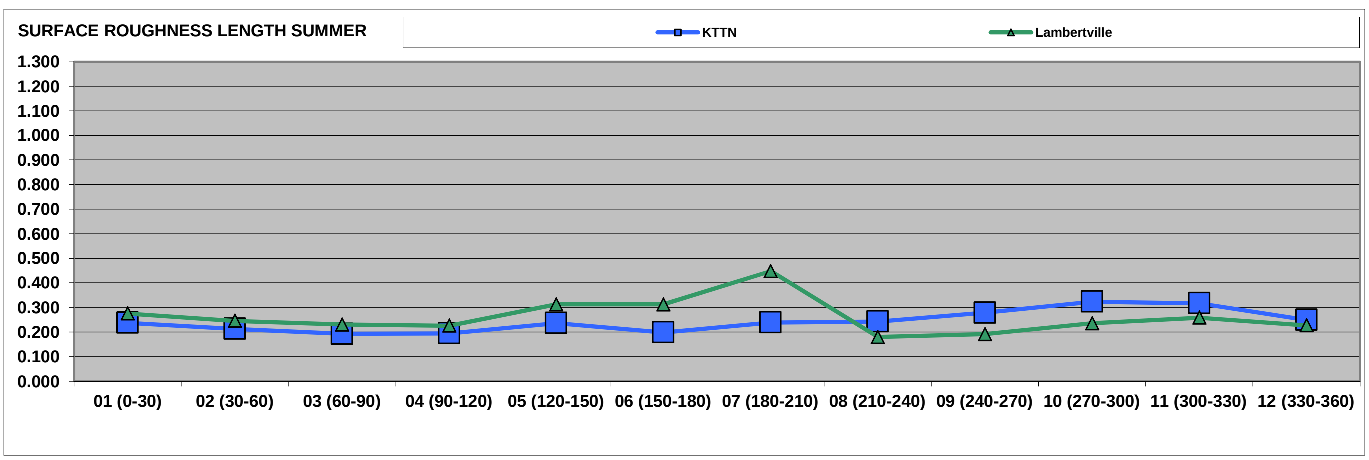


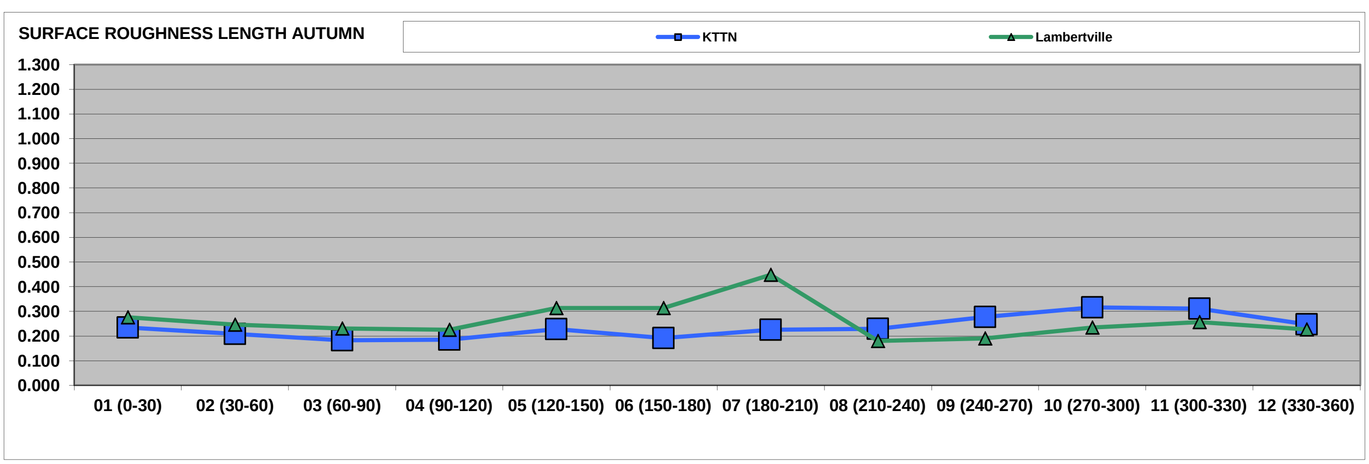


COMPARISON OF SURFACE ROUGHNESS LENGTH VALUES









APPENDIX 9B

General Conformity Analysis

Appendix 9B
General Conformity Applicability Analysis

Summary of Applicability Issues

General conformity regulations in 40 CFR Part 93, Subpart B are designed to ensure that Federal actions that occur in nonattainment and maintenance areas do not interfere with a state's ability to attain or maintain compliance with National Ambient Air Quality Standards ("NAAQS"). The general conformity regulations were revised on April 5, 2010, and the changes to the regulations became effective on July 6, 2010.

General conformity only needs to be considered for Federal actions that will be located in nonattainment or maintenance areas. A general conformity applicability analysis determines whether a Federal action will be subject to general conformity requirements. If general conformity applies, then a separate analysis, referred to as a conformity determination is required to document that a Federal action will conform to the applicable implementation plan for the nonattainment or maintenance area and meet other requirements of Subpart B of Part 93.

As part of the general conformity applicability determination process, the sum of non-exempt direct and indirect emissions of nonattainment pollutants or designated precursors associated with a federal action is compared to annual general conformity applicability emissions thresholds in 40 CFR § 93.153. The general conformity applicability thresholds are listed in 40 CFR § 93.153(b)(1) for nonattainment areas and in 40 CFR § 93.153(b)(2) for maintenance areas. If an applicability threshold is exceeded, then general conformity applies and a conformity determination is required. If emissions are below the applicability thresholds, then the emissions are considered to be *de minimis*, general conformity requirements do not apply, and a conformity determination is not required.

Under the revised general conformity regulations, emissions from stationary sources that are covered by any New Source Review ("NSR") permit (major or minor) are exempt from general conformity. Therefore, emissions covered by a NSR permit do not count towards the general conformity applicability thresholds. The emissions from other Project activities, such as emissions from construction of the compressor station, need to be considered.

Project Location

The Lambertville East Expansion Project ("Project") is considered to be a Federal action, since a Federal agency (i.e., FERC) will be licensing, permitting, or otherwise approving portions of the Project. The proposed Project activities will occur in federally designated nonattainment areas. Consequently, a general conformity applicability analysis is required to determine if general conformity will apply and if a subsequent conformity determination is required.

The Project will be located in an area that is currently part of an air quality region that is designated as non-attainment for ozone. Consequently, a general conformity applicability analysis is required to determine if a conformity determination is required. A conformity determination, if required, documents that a federal action will conform to the applicable implementation plan for the nonattainment or maintenance area and meets other requirements of Subpart B of Part 93.

Table 9B-1 summarizes the nonattainment and maintenance areas and associated general conformity applicability thresholds that need to be considered for the Project. Of note, USEPA revoked the 1997 8-hour ozone NAAQS in April of 2015 [Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan (SIP) Requirements; Final Rule (March 6, 2015)]. Furthermore, with respect to general conformity applicability, areas that were designated as nonattainment or maintenance for the revoked 1997 8-hour ozone NAAQS, are no longer nonattainment or maintenance for the purposes of general conformity with respect to this standard. The USEPA notice at 80 FR 12263 specifically indicates that when a specific NAAQS is revoked, general conformity requirements end with respect to that standard.

NO_X and VOC are the designated precursor pollutants for ozone, and the general conformity applicability thresholds in nonattainment areas are 50 tons per year (TPY) for VOC and 100 TPY for NO_X.

TABLE 9B-1

General Conformity Applicability Thresholds – Nonattainment and Maintenance Areas

Project Component	County, State	AQCR	Attainment/ Unclassifiable	Nonattainment	Maintenance	General Conformity Applicability Thresholds (tons/year)
Lambertville Compressor Station	Hunterdon County, NJ	AQCR 043 NJ-NY-CT Interstate	SO_2, CO, PM_{10}, $PM_{2.5}$, NO_2, Pb	O_3	None	NO_X – 100 VOC – 50

Project Emissions

Emissions from Project activities during construction were calculated and are presented and summarized in Resource Report 9. Construction phase emissions are detailed in the construction emission calculations along with relevant tables for the general conformity applicability assessment in Appendix 9D. The operational phase emissions will be included in the NSR air permit application to be filed with the FERC as Appendix 9A by November 2017. As indicated earlier, these emissions are exempt from general conformity requirements.

The calculated Project construction emissions are designed to be conservative estimates and likely overestimate the expected emissions for several reasons, including the following:

- Emission factors for nonroad engines made use of underlying default distributions in the NONROAD model and do not account for the greater availability of newer and lower emitting construction equipment in the Project area;
- Assumptions that likely overestimate the area that is under active, heavy disturbance at any time; and
- Use of default construction fugitive dust emission factors from the Western Regional Air Partnership Fugitive Dust Handbook is conservative, as the climates typical of western states are more arid than in the Project area (i.e., the soil moisture level is lower in the WRAP states compared to New Jersey).

The Project construction activities are summarized in Tables 9.2-8 through 9.2-12 of Resource Report 9 and documented more fully in tables in Appendix 9D.

In summary, the expected non-exempt Project emissions in Table 9B-2 include the following activities:

- Construction vehicle and equipment emissions including on-road worker commutes and material deliveries;
- Fugitive dust emissions from land clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads (including brake and tire wear), and wind erosion from exposed surfaces; and

- Gas releases due to blowdowns (i.e., evacuating) the existing compressor station equipment prior to tieing-in new equipment and purging the modified station with gas prior to start up.

The resulting summary of Project construction emissions for the construction year in the nonattainment area is summarized in Table 9B-2.

TABLE 9B-2

General Conformity Applicability Analysis

Designated Pollutant	Designated Area	Threshold (TPY)	Pollutant or Precursor	2019 Total Non-Exempt Emissions (TPY)	Ongoing Non-Exempt Operational Emissions[a]
O_3	AQCR 043 NJ-NY-CT Interstate	50	VOC	3.96	N/A
		100	NO_X	2.64	N/A

[a] Ongoing operational emissions will be included in the NSR permit application to be filed with the FERC as Appendix 9A by November 2017, and are exempt from general conformity requirements.

Conclusion

The calculated Project non-exempt emissions in federally designated nonattainment areas are below the corresponding general conformity applicability thresholds. Therefore, pursuant to 40 CFR § 93.153(c)(1), general conformity requirements do not apply to the Project and a general conformity determination is not required.

APPENDIX 9C

Dust Control Plan

Dust Control Plan for the Lambertville East Expansion Project

ENBRIDGE

October 2017

TABLE OF CONTENTS

1.0 INTRODUCTION

Texas Eastern Transmission, LP ("Texas Eastern") has developed this Dust Control Plan for the Lambertville East Expansion Project ("Project"). The purpose of the Dust Control Plan is to identify potential sources of fugitive dust emissions that may occur during construction of the Project and describe dust abatement measures to be implemented by Texas Eastern and its contractor(s) to control and suppress dust. Measures identified in this Dust Control Plan apply to work within the Project area defined as the construction right-of-way ("ROW"), access roads, additional temporary workspace ("ATWS"), and other areas used during construction of the Project.

Texas Eastern's inspection personnel and its contractor(s) will be thoroughly familiar with this Dust Control Plan and its contents prior to initiating construction on the Project.

2.0 RESPONSIBILITY

The contractor(s) will furnish, operate and maintain equipment, and employ methods to prevent migration of dust beyond the boundaries of the work site. The contractor(s) will provide a copy of the Dust Control Plan to all applicable site subcontractors. The contractor's construction manager will be responsible for implementing the Dust Control Plan, and maintaining the daily log of implemented control measures.

3.0 DUST EMISSIONS AND CONTROL MEASURES

Construction activities coupled with certain weather conditions can create conditions that promote the production and dispersal of fugitive dust from a construction area. The amount of dust generated is a function of construction activities, soil type, moisture content, wind speed, frequency of precipitation, vehicle traffic, vehicle types, and roadway characteristics. During certain weather conditions, several construction activities could generate dust.

The contractor will implement measures to reduce dust generation and employ practices to prevent excessive fugitive dust emissions (e.g., visible dust clouds). No dust control measures are generally required during precipitation events. Dust control measures are required especially during warm dry weather and those days with strong winds. A source of clean water must be made available to wet down exposed soil surfaces. Dust control measures include but are not limited to:

Unpaved areas and access roads

- Apply water when needed;
- Control track-out;
- Maintain appropriate low vehicle speeds (5 miles per hour) in unpaved areas;
- Route vehicles and equipment to covered surfaces (e.g., paved or graveled) when possible;
- Prevent motor vehicle use when unnecessary in unpaved areas; and
- Remove soil from the exteriors of vehicles and construction equipment prior to moving off of the right-of-way and other work sites.

Soil excavation and handling

- Load haul trucks such that the load is below the freeboard;
- Cover loads as necessary;
- Prevent spillage;
- Apply water when needed prior to disturbance and during disturbance to prevent dust generation;
- Maintain existing ground coverings (e.g., existing pavement) until disturbance is required for construction and stabilize exposed soil with gravel or other stabilizing material, if dust generation is observed that cannot be controlled with water; and
- Discontinue construction activities if generation of dust is observed until dust control is applied.

Dust control will be implemented by Texas Eastern and its contractor(s) in areas of active construction. The primary means of dust control for the Project will be vehicle and equipment speed control and the use of graveled construction entrances (rock access pads). If these measures do not effectively mitigate excessive dust migration, wet suppression through the application of water using water trucks will be employed. The application and quantity of water to be used for dust suppression will be commensurate with field conditions during construction. Water spray will be regulated to avoid water pooling and the generation of mud that could be tracked onto paved roadways.

Vehicular speed will be reduced for all vehicles and equipment travelling along the construction ROW. The vehicular speed limit for the Project construction area will be five miles per hour. In addition, construction gravel pad entrances will be installed at the interfaces of the ROW and each paved road intersection which will reduce the tracking of mud and soil onto the paved roadway. Excessive mud and soil tracked onto the roadway will be cleaned up by the Contractor. All cargo areas of open bodied haul trucks will be securely covered during material transport on public roadways.

In the event that fugitive dust is generated from spoil piles, wet suppression will be implemented. In addition, topsoil piles may be temporarily mulched and/or temporarily seeded in accordance with Texas Eastern's Erosion & Sediment Control Plan ("E&SCP"). Additionally, spoil piles may be temporarily mulched and/or temporarily seeded to prevent excessive dust migration. Once construction is completed, all areas of disturbance will be restored, as appropriate, to preconstruction condition and permanently seeded and mulched in accordance with Texas Eastern's E&SCP to revegetate and stabilize the ROW. Alternatively, it will be more appropriate in certain operational areas to stabilize the area with geotextile fabric and crushed stone.

4.0 DUST CONTROL INSPECTION AND COMPLIANCE

Field inspection and the need to implement dust control measures for the construction area will be assessed daily by the contractor(s) and all inspection staff members working in that construction area. The dust control assessment will be based on several criteria including: 1) the present and forecasted weather conditions; 2) the condition of previous problem areas; and 3) an assessment of existing soil conditions in the Project workspace. The contractor(s) will be responsible for implementing the appropriate measure(s). Texas Eastern's inspection personnel will have the authority to determine if/when water or a palliative needs to be used for dust control if the contractor is not meeting the intent of this Plan. If the contractor(s) does not comply with the recommended dust control measures, any one of Texas Eastern's inspection staff is authorized to stop work until the contractor implements proper dust control measures.

APPENDIX 9D

Construction Emission Calculations

Table 9D-1
Texas Eastern Transmission
Lambertville East Expansion Project
General Conformity Emissions Summary

Air Quality Region	Nonattainment/ Maintenance Pollutant	County	Estimate of Emissions (tons/year) 2019		General Conformity Applicability Thresholds (tons/year)	
			NOX	VOC	NOX	VOC
AQCR 043 NJ-NY-CT Interstate	Ozone - Nonattainment	Hunterdon, NJ	2.64	3.96	100	50
		Total	**2.64**	**3.96**		

Table 9D-2
Texas Eastern Transmission
Lambertville East Expansion Project
Construction Period Emissions Summary

		2019 Emission Totals (Tons)							
County	**Activity**	**CO_2**	**CO**	**NOx**	**PM_{10}**	**PM_{25}**	**SO_2**	**VOC**	**HAPS**
Hunterdon, NJ	Non-Road and On-Road Construction Vehicles	1,218.3	40.0	2.6	0.2	0.2	0.010	1.0	0.123
	Fugitive Dust	0.0	0.00	0.00	14.88	1.58	0.000	0.00	0.000
	Blowdown and Purge	0.0	0.00	0.00	0.00	0.00	0.000	3.0	0.000
	PROJECT TOTAL	**1,218.3**	**40.0**	**2.6**	**15.1**	**1.7**	**0.010**	**4.0**	**0.123**

Table 9D-3
Texas Eastern Transmission
Lambertville East Expansion Project
Construction Period Pollutant Emissions by Activity - 2019

Summary of Construction Activity and Material Delivery Emissions

Activity	2019 Emission Totals (Tons)							
	CO_2	CO	NOx	PM_{10}	PM_{25}	SO_2	VOC	HAPS
Lambertville East Expansion Project **TOTAL**	9.25E+02	3.75E+01	2.43E+00	1.76E-01	1.59E-01	7.59E-03	9.30E-01	6.76E-02
	9.25E+02	**3.75E+01**	**2.43E+00**	**1.76E-01**	**1.59E-01**	**7.59E-03**	**9.30E-01**	**6.76E-02**

Summary of Commuting Emissions

Activity	2019 Emission Totals (Tons)							
	CO_2	CO	NOx	PM_{10}	PM_{25}	SO_2	VOC	HAPS
Lambertville East Expansion Project **TOTAL**	2.93E+02	2.52E+00	2.18E-01	4.98E-02	9.54E-03	1.95E-03	6.26E-02	5.59E-02
	2.93E+02	**2.52E+00**	**2.18E-01**	**4.98E-02**	**9.54E-03**	**1.95E-03**	**6.26E-02**	**5.59E-02**

Summary of Fugitive Dust Emissions

Activity	2019 Emission Totals (Tons)	
	PM_{10}	PM_{25}
Lambertville East Expansion Project **TOTAL**	14.88	1.58
	14.88	**1.58**

Table 9D-4
Lambertville East Expansion Project
Blowdown and Purge Emissions - Construction Period

	Construction Year 2019						
Pipeline	**Natural Gas Loss (mmscf)**	**Natural Gas Loss[1] (lbs)**	**Total VOC[2] (lbs)**	**Total VOC (tons)**	**Total CO2 (tons)**	**Methane (tons)**	**Total CO2e (tons)**
Lambertville East Expansion Project	1.3	58,133	5,940	2.97	1.0	27.7	693.0

Notes:
1. Based upon VOC, CO2, and methane contents from a statistial analysis of gas chromatograph data from 421 GC data sites collected between 2011 and 2016 at sites in the United States and evaluated to be most representative.
2. The global warming potential of CO2 and Methane is 1 and 25, respectively

Table 9D-5

Lambertville East Expansion Project
Fugitive Dust Emissions During Construction

County	Exposed Soils (acre-months)	Total PM Emissions (tons)		2019 PM Emissions (tons)	
		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Hunterdon, NJ	236	14.88	1.58	14.88	1.58
Total	**236**	**14.88**	**1.58**	**14.88**	**1.58**

Fugitive Dust Emission Factors (Construction)

PM_{10}[2] 5.50E-02 ton/acre-month

$PM_{2.5}$[1,2] 5.50E-03 ton/acre-month

[1]WRAP Fugitive Dust Handbook, Countess Environmental, September 2006, Section 3.4.1.

[2]WRAP Fugitive Dust Handbook, Table 3-2, level 1, average conditions

Fugitive Dust Emission Factors (Wind Erosion)

PM_{10}[3] 7.92E-03 ton/acre-month

$PM_{2.5}$[3,4] 1.19E-03 ton/acre-month

3Wind erosion of exposed areas (seeded land, stripped or graded overburden) = 0.38 ton TSP/acre/yr (WRAP Fugitive Dust Handbook, Table 11-6)

4PM_{10}/TSP = 0.5, $PM_{2.5}$/PM_{10} = 0.15, (WRAP Fugitive Dust Handbook, Section 7-2)

5Water and other approved dust suppressants would be used at construction sites (50% minumum control applied per WRAP Fugitive Dust Handbook).

Table 9D-6
Texas Eastern Transmission, LLC
Lambertville East Expansion Project- Construction Equipment Air Emissions - Lambertville CS_Hunterdon

Lambertville East Expansion Project, Hunterdon County

On-site Road and Nonroad Construction Equipment	Equipment Engine HP	Fuel		Schedule		SCC	Number of Operating Hours	NONROAD2008a Emission Factor (g/hp-hr)								Engine Load Factor	2019 Emission Totals (Tons)							
		Diesel	Gasoline	days/week	hours/day		2019	CO2	CO	NOx	PM10	PM25	SO2	VOC	HAP		CO2	CO	NOx	PM10	PM25	SO2	VOC	HAPs
Nonroad construction equipment																								
Pavers (CAT AP655D Track Asphalt Paver)	173	x		3	10	2270002003	30	536.3	0.48	1.12	0.11	0.11	0.0028	0.15	0.01	0.59	1.8	0.002	0.004	0.0004	0.0004	0.00001	0.001	0.00004
Small handheld, walk-behind, or single person sized tampers or rammers (BoMag 8500 compactor)	19.4		X	3	10	2265002006	455	1046.8	277.24	2.04	0.11	0.11	0.0191	4.92	0.23	0.55	5.6	1.48	0.011	0.0006	0.0006	0.0001	0.026	0.0012
Light plants	20		x	3	10	2265002027	650	1046.4	277.95	2.04	0.12	0.12	0.0191	5.00	0.23	0.72	10.8	2.87	0.021	0.0012	0.0012	0.0002	0.052	0.0024
Crane - 50T	173	x		5	8	2270002027	867	530.2	0.75	2.81	0.18	0.18	0.0031	0.25	0.01	0.43	37.7	0.05	0.200	0.0126	0.0126	0.0002	0.018	0.0009
Excavators (CAT 336)	303	x		5	10	2270002036	2,058	536.4	0.47	1.19	0.07	0.07	0.0028	0.14	0.01	0.59	217.6	0.19	0.482	0.0285	0.0285	0.0011	0.058	0.0050
Crane - 150T	435	x		3	10	2270002036	30	536.4	0.47	1.19	0.07	0.07	0.0028	0.14	0.01	0.59	4.6	0.00	0.010	0.0006	0.0006	0.0000	0.001	0.0001
Excavators (CAT 320DL)	161	x		5	10	2270002036	1,517	536.4	0.27	0.71	0.05	0.05	0.0027	0.14	0.01	0.59	85.2	0.04	0.113	0.0076	0.0076	0.0004	0.022	0.0020
10 CY Dump Truck (6 wheel)	250	x		4	10	2270002051	520	536.4	0.13	0.36	0.01	0.01	0.0026	0.13	0.01	0.59	45.4	0.01	0.031	0.0010	0.0010	0.0002	0.011	0.0010
Water Truck	250	x		1	10	2270002051	217	536.4	0.13	0.36	0.01	0.01	0.0026	0.13	0.01	0.59	18.9	0.00	0.013	0.0004	0.0004	0.0001	0.005	0.0004
Utility Truck, 1 ton stake bed	220		x	5	5	2265002051	650	716.6	35.22	3.00	0.07	0.07	0.0131	1.12	0.23	0.47	53.1	2.61	0.222	0.0051	0.0051	0.0010	0.083	0.0170
Rough terrain forklifts (CASE 943)	111	x		5	10	2270002057	2,492	536.3	0.63	1.48	0.15	0.15	0.0030	0.17	0.01	0.59	96.5	0.11	0.266	0.0262	0.0262	0.0005	0.031	0.0022
Rubber tire front loaders (CAT 938)	188	x		3	8	2270002060	520	536.3	0.38	1.14	0.07	0.07	0.0028	0.15	0.01	0.59	34.1	0.02	0.073	0.0043	0.0043	0.0002	0.010	0.0008
Tractors, loaders, and backhoes (CAT 450F)	127	x		3	10	2270002066	455	625.0	1.80	3.05	0.37	0.37	0.0037	0.48	0.01	0.21	8.4	0.02	0.041	0.0050	0.0050	0.0000	0.006	0.0002
Dozers (CAT D4)	92	x		4	10	2270002069	40	595.7	1.04	1.08	0.11	0.11	0.0031	0.15	0.01	0.59	1.4	0.00	0.003	0.0003	0.0003	0.0000	0.000	0.0000
Nonroad Industrial Equipment																								
Aerial Lifts	75	x		5	10	2270003010	2,423	693.3	4.69	4.11	0.65	0.65	0.0042	0.83	0.01	0.21	29.2	0.20	0.173	0.0274	0.0274	0.0002	0.035	0.0005
Skid Steer Sweeper	73	x		5	8	2270003030	1,429	589.9	0.93	3.11	0.10	0.10	0.0032	0.16	0.01	0.43	29.2	0.05	0.154	0.0049	0.0049	0.0002	0.008	0.0006
Nonroad Commercial Equipment																								
Generator set (specify kW) 500 KW	250	x				2270006005	100	530.2	0.81	3.13	0.16	0.16	0.0031	0.27	0.01	0.43	6.3	0.01	0.037	0.0019	0.0019	0.0000	0.003	0.0001
Air compressors	60	x		5	4	2270006015	649	589.7	1.38	3.43	0.17	0.17	0.0034	0.21	0.01	0.43	10.9	0.03	0.063	0.0032	0.0032	0.0001	0.004	0.0002
Welders	23		x	6	9	2265006025	6,128	1046.3	278.18	2.04	0.12	0.12	0.0191	5.03	0.23	0.68	110.5	29.39	0.216	0.0124	0.0124	0.0020	0.531	0.0242
On-road construction vehicles							**Number of Vehicle Miles Traveled**	**MOVES Emission Factors (g/VMT)**																
Light duty gasoline vehicles (< 6,000 lb GVW)	200		x	6	3		20,740	445.3	3.83	0.33	0.08	0.01	0.0030	0.10	0.08		10.2	0.09	0.008	0.0017	0.00033	0.00007	0.002	0.0019
Heavy duty gasoline vehicles (>6,000 lb GVW)	275		x	6	8		49,320	445.3	3.83	0.33	0.08	0.01	0.0030	0.10	0.08		24.2	0.21	0.018	0.0041	0.00079	0.00016	0.005	0.0046
Deliveries / Removals	**Empty Vehicle Weight (tons)**	**Full Vehicle Weight (tons)**	**Round Trip Distance (miles)**				**Number of Vehicle Miles Traveled 2019**	**MOVES Emission Factors (g/VMT)**									**2019 Emission Totals (Tons)**							
								CO2	**CO**	**NOx**	**PM10**	**PM25**	**SO2**	**VOC**	**HAP**		**CO2**	**CO**	**NOx**	**PM10**	**PM25**	**SO2**	**VOC**	**HAP**
On-road delivery vehicles																								
Heavy duty diesel vehicles (>6,000 lb GVW)	10	35	30				3,870	2002.6	1.71	6.44	0.64	0.34	0.0176	0.44	0.05		8.5	0.01	0.027	0.0027	0.00144	0.00007	0.002	0.0002
On-road material removal vehicles																								
Heavy duty diesel vehicles (>6,000 lb GVW)	10	50	400				34,000	2002.6	1.71	6.44	0.64	0.34	0.0176	0.44	0.05		75.1	0.06	0.241	0.0239	0.01268	0.00066	0.016	0.0019
Construction Workers							**Number of Vehicle Miles Traveled**	**MOVES Emission Factors (g/VMT)**									**2019 Emission Totals (Tons)**							
							2019	**CO2**	**CO**	**NOx**	**PM10**	**PM25**	**SO2**	**VOC**	**HAP**		**CO2**	**CO**	**NOx**	**PM10**	**PM25**	**SO2**	**VOC**	**HAP**
Worker Commutes							597,857	445.3	3.83	0.33	0.08	0.01	0.0030	0.10	0.08		293.5	2.52	0.218	0.0498	0.00954	0.00195	0.063	0.0559

APPENDIX 9E

Radon Testing Results

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January 10, 2014

Thomas L. Stanton
Spectra Energy Corporation
890 Winter Street, Suite 300
Waltham, Massachusetts 02451

Dear Mr. Stanton:

Enclosed is a table of results of analyses of ten samples received at our laboratory in December, 2013. Six of the samples were of natural gas; four samples were travel blanks. The table shows for each sample the date of collection, location for each sample of natural gas, the date range of the analysis, the measured radon concentration with an estimate of total uncertainty at the 95% confidence level, and the Minimum Detectable Concentration (MDC) for the analysis. Details of the analyses and calculations are available upon request. Also enclosed are copies of the Chain of Custody forms. Also available, if needed, are photos of the coolers in which the samples were delivered showing that the tamper seals were not broken as received.

My ability to analyze some of the samples as quickly as I would have liked was impacted by time away from the laboratory and by the fact that the analyzers were already in use for another project and were not always available during normal work hours for these samples. I felt that it was more important to analyze the samples of natural gas as quickly as possible, and therefore by the time some of the blank samples were analyzed, their measured concentrations were below the MDCs for the analyses. Regardless, I was very pleased with the results. In particular, the agreement between the first and second analyses of each sample of natural gas was extremely good. This demonstrated that the Tedlar bags in which the samples were collected were not leaking, and also that the technique of transferring and analyzing the sample was quite reproducible.

If you have any questions, or require any further information, please call me at (937) 236-8805, ext. 248 or send e-mail to pjenkins@bowser-morner.com.

Very truly yours,

Phillip H. Jenkins, PhD, CHP
Senior Health Physicist

cc: Robert Fry, Equity Environmental Engineering

Results of Samples for Spectra Energy

Date	Location	Analyzed[1]	Rn Conc (pCi/L)[2]	MDC (pCi/L)[3]
12/3/2013	Bechtelsville	12/4 - 12/5	29.9 ± 3.2	0.1
	Bechtelsville	12/11 - 12/12	29.4 ± 3.1	0.3
12/3/2013	Blank	12/4 - 12/5	0.16 ± 0.04	0.07
	Blank	12/11 - 12/12	0.19 ± 0.04	0.27
12/12/2013	Staten Island	12/13 - 12/14	20.6 ± 2.2	0.1
	Staten Island	12/23 - 12/24	20.5 ± 2.2	0.5
12/12/2013	Jersey City	12/13 - 12/14	20.7 ± 2.2	0.1
	Jersey City	12/23 - 12/24	20.4 ± 2.2	0.5
12/12/2013	Blank	12/27 - 12/28	-0.16 ± 0.04	6.69
	Blank	12/31 - 1/1/14	1.38 ± 0.15	12.86
12/16/2013	Ramapo	12/17 - 12/18	26.1 ± 2.8	0.1
	Ramapo	12/26 - 12/27	26.4 ± 2.8	0.4
12/16/2013	Mahwah	12/17 - 12/18	23.0 ± 2.5	0.1
	Mahwah	12/17 - 12/18	23.3 ± 2.5	0.4
12/16/2013	Blank	12/27 - 12/28	-0.23 ± 0.05	0.61
	Blank	12/31 - 1/1/14	0.14 ± 0.04	1.23
12/17/2013	Line 9	12/18 - 12/19	41.6 ± 4.4	0.1
	Line 9	12/30 - 12/31	41.8 ± 4.4	0.7
12/17/2013	Blank	12/18 - 12/19	0.22 ± 0.05	0.09
	Blank	12/30 - 12/31	0.60 ± 0.07	0.76

1 Each analysis was based on twenty one-hour measurements with the exception that the first analyses of the blanks collected on 12/12 and 12/16 were based on 21 one-hour measurements.

2 The value after the "±" is the estimated total uncertainty at the 95% confidence level. The background of each scintillation cell was measured prior to each sample analysis; background values were based on counting times that varied from 15 to 96 hours depending upon availability of the analyzers. Each value of radon concentration was corrected for decay back to the date/time of sampling.

3 The Minimum Detectable Concentration (MDC) increases exponentially with the time after collection. This particularly impacted the blank samples collected on 12/12 and 12/16, as they were not analyzed right away.

Chain of Custody

Company Name: **Spectra Energy**

Address: **2601 Market Place Street, Suite 400**

City/State/Zip: **Harrisburg, PA 17110**

Project Contact: **Jeffry Snyder-Spectra Energy (717) 503-0988**

Sample #	Sample ID	Date	Time	Sampled By	Approved (initials)
1	BLANK 120313	12/3/13	1120	T. FRANCIS	TAF
2	BECHTELSVILLE 27-717	12/3/13	1135	T. FRANCIS	TAF
3					
4					
5					

[signature] 12/3/13 1221
Relinquished by sampler — Date — Time

[signature: Jeffry S. Snyder] 12-3-2013 12:21 pm
Received by courier — Date — Time

[signature] 12-3-2013 5:20 pm
Relinquished by courier — Date — Time

[signature] 12-4-2013 8:07 AM
Received by lab — Date — Time

[signature: Phillip H. Jenkins] 12-5-2013 8:07

Comments:
Requested analysis: natural gas analysis (radon) / analyze immediately
Custody Seal #: 100

Chain of Custody

Company Name: **Spectra Energy**

Address: **2601 Market Place Street, Suite 400**

City/State/Zip: **Harrisburg, PA 17110**

Project Contact: **Jeffry Snyder-Spectra Energy (717) 503-0988**

Sample #	Sample ID	Date	Time	Sampled By	Approved (initials)
1	BLANK - 121213	12/12/13	0830	T. FRANCIS	
2	STATEN ISLAND M+R #058	12/12/13	0850	T. FRANCIS	
3	JERSEY CITY M+R #1	12/12/13	1000	T. FRANCIS	
4					
5					

[signature] 12/12/13 1015
Relinquished by sampler — Date — Time

[signature] 12/12/13 1015
Received by courier — Date — Time

[signature] 12/12/13 4:15 PM
12-12-13 4:15 Pm
Relinquished by courier — Date — Time

[signature] 12-13-13 8:10 Am
Received by lab — Date — Time

Phillip H. Jenkins 12-13-13 8:10

Comments:
Requested analysis: natural gas analysis (radon) / analyze immediately
Custody Seal #: 101

Chain of Custody

Company Name: **Spectra Energy**

Address: **2601 Market Place Street, Suite 400**

City/State/Zip: **Harrisburg, PA 17110**

Project Contact: **Jeffry Snyder-Spectra Energy (717) 503-0988**

Sample #	Sample ID	Date	Time	Sampled By	Approved (initials)
1	BLANK 121613	12/16/13	0916	T. FRANCIS	TAF
2	M+R 00214 MILLENIUM-	12/16/13	0930	T. FRANCIS	TAF
3	RAMAPO, ROCKLAND NY				
4	M+R 00201 TENNESSEE-	12/16/13	1105	T. FRANCIS	TAF
5	GAS, MAHWAH, BERGEN, NJ				

[signature] 12/16/13 1220
Relinquished by sampler — Date — Time

[signature] 12/16/13 1220
Received by courier — Date — Time

[signature] 12/16/13 1712 Pm
[signature] 12-16-13 17.12 pm
Relinquished by courier — Date — Time

[signature] 12-17-13 8:05 Am
Received by lab — Date — Time

Phillip H. Jenkins 12-17-13 8:05

Comments:
Requested analysis: natural gas analysis (radon) / analyze immediately
Custody Seal #: 103

Chain of Custody

Company Name: **Spectra Energy**

Address: **2601 Market Place Street, Suite 400**

City/State/Zip: **Harrisburg, PA 17110**

Project Contact: **Jeffry Snyder-Spectra Energy (717) 503-0988**

Sample #	Sample ID	Date	Time	Sampled By	Approved (initials)
1	Blank 121713	12-17-13	0955	Robert FRY	RMF
2	78016 Line 9	12-17-13	1010	Robert FRY	RMF
3					
4					
5					

[signature] 12-17-13 1035
Relinquished by sampler Date Time

[signature] 12-17-13 10:40
Received by courier Date Time

[signature] 12-18-13 8:05
Relinquished by courier Date Time

Phillip H. Jenkins 12-18-13 8:05
Received by lab Date Time

Comments:
Requested analysis; natural gas analysis (radon) / analyze immediately
Custody Seal #: 102

APPENDIX 9F

Results of a Pre-Construction Sound Survey and an Acoustical Analysis of Station Modifications Associated with the Lambertville East Expansion Project

LAMBERTVLLE COMPRESSOR STATION

(HUNTERDON COUNTY AND
WEST AMWELL TOWNSHIP, NEW JERSEY)

RESULTS OF A PRE-CONSTRUCTION SOUND SURVEY AND

AN ACOUSTICAL ANALYSIS OF STATION MODIFICATIONS

ASSOCIATED WITH THE TEXAS EASTERN

LAMBERTVILLE EAST EXPANSION PROJECT ("PROJECT")

H&K Report No. 3569

H&K Job No. 5099

Date of Report: October 6, 2017

Prepared for: **Texas Eastern Transmission, LP** ("Texas Eastern")
A company of Enbridge

Submitted by: Paul D. Kiteck, P.E. (Primary Author)
Hoover & Keith Inc. (H&K)

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REPORT SUMMARY

This report details the results of a pre-construction sound survey and an acoustical analysis of the planned modifications at the existing **Lambertville Compressor Station** (referred to as "Station" in the report). The Station modifications are part of planned **Texas Eastern Lambertville East Expansion Project** ("Project"). The intent of the acoustical analysis is to estimate the sound level contribution of the Station at the nearby noise-sensitive areas (NSAs) resulting from the installation of the planned modification at the Station (i.e., addition of new "replacement" Solar turbine-driven compressor units, addition of gas aftercoolers and Units 5T/6T retired). The purpose of the pre-construction sound survey is to measure and document the current ("pre-existing") sound level of the Station. In addition, noise control measures and equipment sound specifications are provided to insure that the Station meets applicable sound level criteria after installation of the Project modifications.

The following table summarizes the estimated pre-existing sound level of the Station (i.e., all compressor units operating), the estimated sound contribution of the Station after installation of the Project modifications and the estimated change (i.e., increase or decrease) in the pre-existing sound levels at the closest NSAs due to the Project modifications. The results provided in this table are referred to as the "Noise Quality Analysis".

Noise Quality Analysis for the Lambertville Compressor Station related to Planned Modifications associated with the Lambertville East Expansion Project

Closest NSAs and Type of NSA	Distance an Direction of the NSA from the Station Site Center	Distance an Direction of the NSA from new Compressor Units	Pre-Existing Station Sound Level – Ldn (dBA)*	Estimated Total Sound Level (Ldn) after Installation of all Project Modifications (dBA)	Increase above (+) or Decrease below (-) Pre-Existing Sound Levels (dB)
NSA #1 (Residence)	600 ft. (SSE)	685 ft. (SSE)	59.8	56.1	-3.7
NSA #2 (Residence)	850 ft. (SSE)	900 ft. (SE)	58.5	55.1	-3.4
NSA #3 (Residences)	1,250 ft. (ENE)	1,150 ft. (ENE)	60.9	57.3	-3.6

*Pre-existing sound level at the NSAs based on the results of the recent March 2017 sound survey (i.e., only Units 5T & 6T could be operated) and Station sound data with Units 1E, 5R, 6R operating via previous sound surveys/calculations.

Based on the acoustical analysis, if the recommended noise control measures and equipment sound level specifications for new equipment are successfully implemented, the sound level attributable to the Station after installation of Project modifications should be equal to or below the pre-existing sound level at the closest NSAs in which the current sound level exceeds an L_{dn} of **55 dBA**. In addition, the sound level attributable to the Station after installation of Project modifications should be equal to or lower than **55 dBA** (L_{dn}) at those NSAs in which the current sound level is below **55 dBA** (L_{dn}).

TABLE OF CONTENTS

1.0 INTRODUCTION

In this report, **Hoover & Keith Inc.** (H&K) presents the results of a pre-construction sound survey and acoustical analysis of the planned modifications at the existing **Lambertville Compressor Station** (referred to as "Station" in the report). The Station modifications are part of planned **Texas Eastern Lambertville East Expansion Project** ("Project"). The intent of the acoustical analysis is to estimate the sound level contribution of the Station at the nearby noise-sensitive areas (NSAs), such as residences, schools and hospitals, resulting from the installation of Project modifications at the Station (i.e., addition of new "replacement" Solar turbine-driven compressor units, aftercoolers for the new units and Units 5T/6T retired). The purpose of the pre-construction sound survey is to measure and document the current ("pre-existing") sound level of the Station. In addition, noise control measures and equipment sound specifications are recommended insure that the Station meets applicable sound level criteria after installation of the Project modifications.

2.0 SOUND CRITERIA

2.1 Federal (FERC) Sound Level Requirements

Certificate conditions of the Office of Energy Projects (OEP) of the Federal Energy Regulatory Commission (FERC) will require that the sound level of the Station after installation of Project modifications, with the Station sound level at full capacity, should not exceed previously existing sound level at any nearby NSA ("pre-existing sound level") that is at or above a day-night average sound level (i.e., L_{dn}) of **55 dBA**. In addition, the Station sound level should be equal to or less than **55 dBA** (L_{dn}) at any nearby NSA in which the pre-existing sound level is equal to or lower than **55 dBA** (L_{dn}). For an essentially steady sound source that operates continuously (e.g., natural gas compressor station) over a 24-hour period and controls the environmental sound level, the L_{dn} is approximately **6.4 dB** above the measured A-weighted (A-wt.) equivalent sound level (i.e., L_{eq}). Consequently, an L_{dn} of **55 dBA** corresponds to an L_{eq} of **48.6 dBA**. If both the L_d and L_n are measured, then the L_{dn} is calculated using the following formula:

$$L_{dn} = 10\log_{10}\left(\frac{15}{24}10^{L_d/10} + \frac{9}{24}10^{(L_n+10)/10}\right)$$

2.2 State/Local Regulations

State of NJ: Provisions of the New Jersey Noise Control Act (Chapters 29, 29B) are used to regulate noise in New Jersey. In summary, the regulation states that the continuous airborne sound at the receiving residential property line not exceed **65 dBA** during the daytime (7:00 AM to 10:00 PM) and **50 dBA** during the nighttime (10:00 PM to 7:00 AM). Note that the FERC sound level requirement (i.e., L_{eq} of **48.6 dBA** at the nearby residences) is considered to be slightly more stringent than the NJ sound regulations (i.e., nighttime sound requirement of **50 dBA**) for nearby and adjacent residential properties. In addition, the continuous airborne sound at an industrial or commercial property line shall not exceed a sound level of **65 dBA** (day or night). There are also unweighted octave-band (O.B.) sound pressure levels (SPLs) that should not be exceeded. The maximum allowable unweighted O.B. SPLs that should not be exceeded on a residential property line are shown below in **Table A**.

Condition	Unweighted SPL (in dB) per Octave Band (O.B.) Center Frequency (Hz)								
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Daytime/Residential	96	82	74	67	63	60	57	55	53
Nighttime/Residential	86	71	61	53	48	45	42	40	38

Table A: Allowable Maximum O.B. SPL at Receiving Residential Property Line (State of NJ Regulations)

Local townships, such as West Amwell Township (NJ), may have applicable noise regulations, and any local noise regulations will be addressed during the local permitting process.

3.0 SITE/FACILITY DESCRIPTION

3.1 Site/Station Description

Figure 1 (**Appendix**, p. 13) shows the surrounding NSAs and other areas of interest within approximately ½ mile of the Station. **Figure 2** (**Appendix**, p. 14) shows the nearest NSAs around the Station, the chosen sound measurement positions near the closest NSAs, the reported sound measurement positions around the Station property and the anticipated location of the new compressor units associated with the Project modifications. The Lambertville Station is located off State Highway 179 in Hunterdon County, West Amwell Township, New Jersey, and 2 miles northeast of Lambertville, NJ. The closest NSA ("NSA #1") to the Station is a residence located 600 feet south-southeast ("SSE") from the Station site "acoustic center", and the next closest NSA ("NSA #2") is a residence located 850 feet SSE of the Station site center. The following **Table B** provides a brief description of the current Station compressor units, and the current total Station horsepower (HP) capacity is **26,000 HP**.

Unit No.	Driver and Model Number	Type of Compressor	HP Rating/Capacity	In-Service Date/Yr.
Unit 5T	Dresser DC-990 Turbine	Clark/Dresser Centrifugal	5800 (ISO HP)	1984
Unit 6T	Dresser DC-990 Turbine	Clark/Dresser Centrifugal	5800 (ISO HP)	1984
Unit 1E	Siemens (Electric Motor)	Solar C651 Centrifugal	10,000 HP	2003
Unit 5R	Cooper-Bessemer Model GMVS-10C3 engine	Integral Reciprocating	2,200 HP	2012
Unit 6R	Cooper-Bessemer Model GMVS-10C3 engine	Integral Reciprocating	2,200 HP	2012

Table B: Summary/Description of the Compressor Units at the Lambertville Compressor Station

3.2 Description of the Planned Station Modifications

Figure 3 (Appendix, p. 15) is a layout showing the anticipated location of the new replacement compressor units and associated equipment. The Project modifications at the Station will consist of two (2) new Solar Model Taurus 70 turbine-driven centrifugal gas compressor units and new gas aftercoolers that will serve the new Solar compressor units. In addition, the older turbine-driven compressor units (Unit 5T and Unit 6T) will be retired. Consequently, after installation of Project modifications, the Station include Unit 1E, Unit 5R, Unit 6R and the new-replacement Solar compressor units. The turbines and compressors of the new Solar compressor units will be installed inside a new building. The following describes auxiliary equipment–components for the new compressor units:

- Lube oil cooler ("LO cooler") for each new compressor unit.
- Turbine exhaust system for each new unit designed with an adequate silencer system.
- Turbine air intake filter system for each new unit designed with an in-duct silencer.
- Gas piping and piping components, noting the "direct assessment" for this Station requires that a significant part of the new outdoor gas piping to be above grade.
- Gas aftercooler (i.e., multi-fan air-cooled heat exchanger) that serves each unit.

There will also be a maintenance type of gas blowdown for each new unit that can occur when the compressor is stopped and gas between the unit valves and compressor is vented, which will be vented to atmosphere through a case vent separator–silencer. A unit blowdown event occurs infrequently (e.g., 2 to 5 times/week during initial start-up of a new unit and approximately 1 to 3 times every month after commissioning). When there is a unit blowdown event, the gas blowdown only occurs for a short time frame (e.g., persists for 1 to 5 minutes).

As related to a separate project, there are plans to install a new PennEast "West Lambertville Tie-In Facility" and a new PennEast "East Lambertville Tie-In Regulator" on the property of the Station. For the noise impact analysis of the Lambertville East Expansion Project modifications, it will be assumed that these proposed facilities will not have any significant noise impact at the identified closest NSAs (i.e., facilities will be designed with adequate noise control measures).

4.0 MEASUREMENT METHODOLOGY/LOCATIONS AND OPERATING CONDITIONS

4.1 Sound Measurement Locations

Sound level measurements were conducted near the three (3) identified closest NSAs, and sound measurement locations around the property of the Station were also performed. The following is a description of the closest NSAs and reported sound measurement positions:

Pos. 1: Near NSA #1 (closest NSA): Residence on West Side of NJ Hwy. 179, located approximately 600 feet SSE of the Station site center and approximately 685 feet south-southeast (SSE) of the anticipated location of the new compressor units.

Pos. 2: Near NSA #2: Residence on the West Side of Mt. Airy Village Road, located approximately 850 feet SSE of the Station site center and approximately 900 feet SE of the anticipated location of the new compressor units.

Pos. 3: Near NSA #3: Two (2) residences near the intersection of Hwy. 179 and Mt. Airy Village Road, located 1,250 feet east-northeast (ENE) of the Station site center and 1,150 feet east-northeast (ENE) of the anticipated location of the new compressor units.

Pos. 4: Along the south property line of the Station (i.e., near the south Station fenceline).
Pos. 5: On the northwest side of the Station property.
Pos. 6: Along the north property line of the Station, near the Station entrance gate on the North Side, 500 feet north of the Compressor Building for Units 5R & 6R.
Pos. 7: On the East Side of the Station, near the Metering Building.

4.2 Conditions during Sound Survey, Data Acquisition and Sound Measurement Equipment

Paul D. Kiteck of H&K performed the Station sound survey measurements during the daytime of March 9, 2017. During the daytime sound tests, the temperature was 48–55 deg. F, the wind from the west, with some high wind conditions (i.e., wind speeds above 8 mph, at times), and the sky was mostly clear. During the sound survey, only Unit 5T and Unit 6T could be operated due to the pipeline conditions although both units were operated at full load conditions (i.e., other Station compressor units could not be operated).

At the reported sound measurement positions, the A-wt. sound levels (L_{eq}) and unweighted O.B. sound pressure levels (i.e., L_{eq} SPLs) were measured at 5 feet above ground. Typically, if feasible, several sample periods of the noise (e.g., 5 to 10 minutes in length) were measured at the NSA sound measurement position. The sound measurements attempted to exclude "extraneous and intermittent sound" such as vehicles passing immediately by the sound measurement location although, during the sound tests, there was constant distant vehicle traffic noise from U.S. Hwy. 202. In addition, sound tests were conducted during a time frame that the wind speed was lower than 8 mph, which was difficult. The sound measurement system consisted of a Larson-Davis (LD) Model 2900 Real Time Analyzer/SLM (a Type I SLM per ANSI Standard S1.4 & S1.11) with a ½-inch microphone, as covered by a windscreen, and the analyzer/SLM was calibrated with a microphone calibrator that was calibrated within one (1) year of the test date.

5.0 MEASUREMENT RESULTS AND STATION SOUND LEVEL AT FULL LOAD

5.1 Sound Measurement Results during the Sound Survey

Table 1 (**Appendix**, p. 16) summarizes the measured A-wt. sound levels [i.e., daytime L_{eq} (i.e., L_d)] at the NSA sound measurement locations during operation of the available compressor units (Units 5T & 6T) along with the average of the measured L_d. Also included in **Table 1** is the resulting L_{dn} of the Station during operation of the available compressor units, calculated from the estimated L_d, a summary of the unit operating conditions during the sound survey and the estimated Station sound level at the NSAs if all compressor units were operated at full load. Meteorological conditions during the sound survey are summarized in **Table 2** (**Appendix**, p. 16).

The measured A-wt. sound levels (L_d) and unweighted O.B. SPLs (i.e., L_d SPLs) at all reported sound measurement positions during operation of the available compressor units (i.e., Units 5T & 6T) are provided in **Table 3** (**Appendix**, p. 17).

The following **Table C** summarizes the measured L_d during operation of Unit 5T and Unit 6T at the closest NSAs and resulting L_{dn}, noting that the L_{dn} was calculated from the measured L_d.

Meas. Pos.	Description of the Closest NSAs and Associated Sound Measurement Location	Measured Ld during Operation of Units 5T & 6T (dBA)	Resulting Ldn during Operation of Units 5T/6T, via Meas'd Ld (dBA)
Pos. 1	NSA #1: Residence 600 feet SSE of Station site center	51.9	58.3
Pos. 2	NSA #2: Residence 850 feet SSE of Station site center	50.2	56.6
Pos. 3	NSA #3: Residences 1,250 feet ENE of Station site center	52.1	58.5

Table C: Summary of the Measured Ld during Sound Survey with only Unit 5T and Unit 6T Operating at Full Load and the Resulting Ldn at the Closest NSAs.

At all of the identified closest NSAs (i.e., Pos. 1, Pos. 2 & Pos. 3), the noise contributed by the Station was audible and contributed to the measured A-wt. sound levels although the noise associated with distant vehicle traffic also contributed to the measured A-wt. sound levels. It is our opinion that the measured sound level data adequately quantifies the existing sound levels around the Station for the meteorological conditions that occurred during the sound survey.

5.2 Station Sound Level if All Compressor Units Operated at Full Load

Since the recent sound survey (March 2017) was conducted with only Unit 5T and Unit 6T operating, to estimate the current (pre-existing) Station sound level with all compressor units operating, the "total" sound contribution of Station (i.e., sound level with all certificated units operating) was estimated by logarithmically adding the Station sound level with Unit 1E, Unit 5R and Unit 6R operating (i.e., via previous sound data documented in referenced H&K Report No. 3462[2]) to the recently measured Station sound level with only Units 5T/6T operating. In our opinion, this combination of the sound levels from 2 separate estimated Station sound level contributions is representative of the "total" sound level contribution of the Station at the closest NSAs (i.e., Station sound levels if all certificated compressor units were operated at full load).

The following **Table D** summarizes the sound level (L_{dn}) during operation of Units 5T/6T at the closest NSAs based on the recent March 2017 sound survey, the sound level (L_{dn}) of other Station compressor units (i.e., Unit 1E, Unit 5R & Unit 6R) based on previous surveys-calculations, and the estimated "total" Station sound level contribution if all compressor units were operated at full load (i.e., "total" pre-existing sound level).

[2]H&K Report No. 3462, dated July 15, 2016, entitled "Acoustical Assessment of new Aboveground Facilities associated with Proposed M2M Project". Related to Texas Eastern Marcellus to Market Project (M2M Project)

Meas. Pos.	Description of the Closest NSAs and Associated Sound Measurement Location	Ldn of only Units 5T & 6T based on Recent Sound Survey (dBA)	Ldn of Unit 1E, Unit 5R and Unit 6R (dBA)	Total Sound Level if All Station Units were Operating (dBA)
Pos. 1	NSA #1: Residence 600 feet SSE of Station	58.3	54.4	59.8
Pos. 2	NSA #2: Residence 850 feet SSE of Station	56.6	54.0	58.5
Pos. 3	NSA #3: Residences 1,250 feet ENE of Station	58.5	57.0	60.9

Table D: Summary of the Sound Level (Ldn) with only Units 5T/6T operating at Full Load, Sound Level (Ldn) of other Station Units (Unit 1E, Units 5R/6R) and Total Station Sound Level (Ldn) at the Closest NSAs if all Station Compressor Units were Operating.

6.0 ACOUSTICAL ANALYSIS OF STATION MODIFICATIONS

6.1 Sound Contribution of the New Equipment and Station at the Closest NSAs

For the acoustical analysis, the sound contribution of the Station modifications was estimated for the closest NSAs (i.e., NSA #1, NSA #2 and NSA #3). Then, using the results of the recent pre-construction sound survey, the "total" sound contribution of the Station at the closest NSAs was estimated (i.e., Station sound level after installation of the Station modifications). The estimated sound level of the new compressor units assume that the noise-related recommendations will be implemented. The following sound sources of the new units were considered significant:

- Noise generated by the new turbines/compressors that penetrates the buildings.
- Noise of turbine exhaust of the new compressor units.
- Noise radiated from new outdoor aboveground gas piping and associated components.
- Noise of the outdoor LO cooler that serves the new Solar turbine-driven units.
- Noise generated by the air intake system of the new Solar turbines.
- Noise of the new gas aftercoolers.

Table 4 (**Appendix**, p. 18) shows the complete spreadsheet analysis of the estimated A-wt. sound level and the unweighted octave-band (O.B.) sound pressure levels (SPLs) at the closest NSA to the new compressor units (i.e., NSA #1) contributed by the new compressor units based on standard day conditions (i.e., no wind, 60 deg. F. and 70% R.H.). The acoustical analysis includes the effect of anticipated noise control measures for the new equipment. Also included in **Table 4** is the estimated total (cumulative) sound contribution of only the Station at NSA #1 after installation of all Project modifications (i.e., addition of new compressor units, new gas aftercoolers and Units 5T/6T retired).

Table 5 (**Appendix**, p. 19) provides the predicted A-wt. sound level and unweighted O.B. SPLs of the new compressor units at NSA #2, based on the estimated sound contribution of the new compressor units at NSA #1 (RE: results calculated in **Table 4**) along with estimated total sound level contribution of only the Station at NSA #2 after installation of all Project modifications.

Table 6 (**Appendix**, p. 19) provides the predicted A-wt. sound level and unweighted O.B. SPLs of the new compressor units at NSA #3, based on the estimated sound contribution of the new compressor units at NSA #1 (RE: results calculated in **Table 4**) along with estimated total sound level contribution of only the Station at NSA #3 after installation of all Project modifications.

The following **Table E** summarizes the estimated sound level (L_{dn}) of Unit 1E, Unit 5R and Unit 6R at the closest NSAs, the estimated sound level of only the new compressor units, and the estimated Station sound level at the closest NSAs after installation of all Project modifications (i.e., addition of new compressor units, new gas aftercoolers and Units 5T/6T retired). Note that the estimated A-wt. sound level (i.e., L_{eq}) was used to infer a representative L_{dn}.

Closest NSAs and Type of NSA	Distance an Direction of the NSA from New Units for the Project	Estimated Sound Level (Ldn) of only Unit 1E, Unit 5R and Unit 6R (dBA)	Estimated Sound Level (Ldn) of only the new Compressor Units (dBA)	Resulting Sound Level of the Station (Ldn) after Project Modifications (dBA)
NSA #1 (Residence)	685 ft. (SSE)	54.4	51.3	56.1
NSA #2 (Residence)	900 ft. (SE)	54.0	48.6	55.1
NSA #3 (Residences)	1,150 ft. (ENE)	57.0	46.1	57.3

Table E: Summary of the Estimated Sound Level of only Units 1E, 5R & 6R, Sound Level of the new Compressor Units and Estimated Total Sound Contribution of Station after Installation of all Project Modifications (assumes Units 5T & 6T Retired).

A description of the acoustical analysis methodology used to estimate the sound contribution of the compressor addition and the source of sound data for the analysis are provided at the end of the report (i.e., **Appendix**, pp. 20–21).

6.2 Sound Contribution of a Blowdown Event for the New Units

The noise of a unit blowdown event, as vented via a case vent separator system, is anticipated to meet an A-wt. sound level of **60 dBA** at a distance of 300 feet, based on sound tests of this type of blowdown event. Consequently, the noise of a blowdown event for the new compressor unit will be approximately **47 dBA** (i.e., L_{dn} of **53** to **54 dBA**) at the closest NSA(s), which would be equal to or lower than **55 dBA** (L_{dn}). Consequently, although the noise of a unit blowdown event could be audible at the nearby NSAs, it is not expected to present a noise impact, noting also that a unit blowdown event occurs infrequently for a short time frame (e.g., 1 to 5 minute period). A description of the acoustical analysis methodology and source of sound data related to blowdown noise are provided in the **Appendix** (p. 21).

6.3 Construction Noise Impact

In general, due to the distance between the Station and nearby NSAs, the noise related to the installation of Project modifications is not expected to exceed the existing sound levels and construction noise should be lower than **55 dBA** (L_{dn}). As a result, site construction noise associated with the installation of the new equipment should have a negligible impact to the nearby NSAs, noting that the construction will be primarily limited to daytime hours. The most prevalent sound source during construction will be internal combustion engines used to power construction equipment. Installation of the new compressor unit and new buildings would consist of some earth work (e.g., site grading, clearing and grubbing related to construction of the new compressor building). Construction activities will be performed with standard heavy equipment such as a track-excavator, backhoe, and minimum use of a bulldozer, dump trucks and concrete trucks. Many construction machines operate intermittently and the types of machines in use at a construction site changes with the construction phase.

7.0 NOISE CONTROL MEASURES

The following provides recommended noise control measures and equipment noise specifications for the Station modifications (i.e., new Solar turbine-driven compressor units and other new equipment) along with any other assumptions that may affect the noise of the Station after installation of the Station modifications. We understand that Texas Eastern has committed to implementing these noise mitigation measures.

7.1 Building Enclosing the Turbines/Compressors for New Compressor Units

We understand that the turbines and compressors associated with new Solar compressor units will be installed inside a new acoustically insulated metal building. The following describes any sound requirements and/or other items related to the building structure and ventilation.

- As a minimum, walls and roof of the new building should be constructed with exterior steel of 22 gauge and an interior layer of 4-inch thick unfaced mineral wool (e.g., 6.0-8.0 pcf uniform density) covered with 26-gauge perforated liner. Note that “low-density” insulation (e.g., 0.6 to 0.75 pcf density) should **not** be substituted for the high-density material.

- No windows or louvers should be installed in the building walls, and the large access door (i.e., “roll-up” door), if employed, should consist of an insulated-type door (e.g., 18-ga. exterior facing, 24-ga. backskin with insulation core). Personnel entry doors should be a **STC-36 sound rating**, even if glazing is employed, and should be self-closing and should seal well when closed.

- It is assumed that forced–air ventilation system will employ wall–mounted air–supply fans (i.e., installed on the inside of walls) and exhaust air would be vented through roof openings and/or a roof ridge vent. The sound level for each air–supply fan should not exceed **50 dBA** at **50 feet** from each supply fan hood, which will require that fans employ an exterior silencer.

7.2 Turbine Exhaust System

The turbine exhaust system should include a silencer system for each new compressor unit that provides the following dynamic sound insertion loss ("DIL") values, which should minimize perceptible increase in vibration.

DIL Values for the Exhaust Silencer System in dB per Octave-Band (O.B.) Center Freq. (Hz)

31.5	63	125	250	500	1000	2000	4000	8000
6	18	25	35	45	45	45	35	30

To meet the DIL values, it is recommended that a 2–stage silencer system be employed consisting of one (1) silencer section employed horizontally in the exhaust ducting, located inside the compressor building ("1st stage horizontal silencer"), if feasible, and another silencer section integrated into the vertical outdoor exhaust stack ("2nd stage vertical silencer"). If a CO converter is employed, which is anticipated, it is assumed that a CO converter system would be inserted upstream of the 1st stage silencer, inside the compressor building.

7.3 Aboveground Gas Piping and associated Components

The acoustical analysis indicates that noise control measures, such as acoustical pipe insulation, will be required for any new outdoor aboveground gas piping associated with each new Solar turbine-driven compressor unit. The following items associated with the gas piping and piping components should also be addressed:

- Aboveground outdoor suction and discharge piping should be covered with acoustical pipe insulation. This includes the aboveground discharge piping (i.e., above grade gas piping between the compressor building and aftercoolers), aboveground suction piping between the compressor building and grade transition, and any aboveground recycle ("surge control") piping, if located outside the compressor building. For example, the acoustical pipe insulation should consist of a minimum 3-inch thick fiberglass or mineral wool (e.g., minimum 6.0-8.0 pcf uniform density) that is covered with a mass-filled vinyl jacket (e.g., composite of 1.0 psf mass-filled vinyl laminated to 0.020-inch thick aluminum).

- All exposed metal pipe support guides for the aboveground piping that will be acoustically insulated should be covered with acoustical material (e.g., blanket-type acoustical insulation or type of acoustical box/cover); aboveground valves (e.g., unit check valves, block valves and any recycle and compressor surge valves) should be covered with any type of acoustical material (e.g., removable/reusable acoustical blanket material).

- Aboveground inlet pipe risers and inlet header (if above grade) for each unit gas aftercooler should be covered with acoustical pipe insulation; outlet pipe risers do not need to be covered with acoustical pipe insulation.

- It is also recommended that the suction pipe strainer for each new compressor unit be removed soon after the compressor unit are placed in service, if feasible.

7.4 Turbine Air Intake System

The turbine air intake system for each new compressor unit should be designed with at least one (1) in-duct silencer (e.g., 7-ft. length), and the silencer should be installed in the intake ductwork located inside the compressor building. As a minimum, the air intake silencer system should provide the following DIL values at the rated operating conditions of the turbine-driven compressor unit.

DIL Values in dB per O.B. Center Frequency for the Turbine Air Intake System

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
3	8	15	25	40	55	60	60	50

7.5 Lube Oil Cooler

LO cooler for each new compressor unit should not exceed **60 dBA** at **50 feet** from the cooler perimeter at the full rated operating conditions (i.e., equivalent to a PWL of **92–93 dBA**), and a “special/custom” Solar LO cooler will be required to meet the recommended sound requirement.

7.6 Gas Aftercooler

The sound level generated by the single multi-fan gas aftercooler that serves both new Solar compressor unit should not exceed **65 dBA** at **50 feet** at the full rated operating conditions (i.e., all fans operating at maximum design speed).

7.7 Unit Blowdown Silencer

The blowdown silencer (e.g., new case vent separator with integrated blowdown silencer) for each new compressor unit should be designed to attenuate the unsilenced blowdown noise to a noise level equal to or less than **60 dBA** at 300 feet from the outlet of the silencer, which includes the noise radiated from the shell of the silencer during the blowdown event.

8.0 SUMMARY AND FINAL COMMENT

The following **Table F** summarizes the estimated current (pre-existing) sound level at the closest NSAs assuming operation of all existing Station compressor units and the total estimated cumulative sound level at the closest NSAs (i.e., sound level after all Project modifications are employed). **Table F** also includes the estimated increase or decrease in the pre-existing Station sound levels due to the Lambertville East Expansion Project modifications. The results provided in this table are referred to as the "Noise Quality Analysis".

Closest NSAs and Type of NSA	Distance an Direction of the NSA from the Station Site Center	Distance an Direction of the NSA from new Compressor Units	Pre-Existing Station Sound Level – Ldn (dBA)	Estimated Total Sound Level (Ldn) after Installation of all Project Modifications (dBA)	Increase above (+) or Decrease below (-) Pre-Existing Sound Levels (dB)
NSA #1 (Residence)	600 ft. (SSE)	685 ft. (SSE)	59.8	56.1	-3.7
NSA #2 (Residence)	850 ft. (SSE)	900 ft. (SE)	58.5	55.1	-3.4
NSA #3 (Residences)	1,250 ft. (ENE)	1,150 ft. (ENE)	60.9	57.3	-3.6

Table F: Noise Quality Analysis for the Lambertville Station associated with the Project.

Based on the acoustical analysis, if the recommended noise control measures and equipment sound level specifications for new equipment are successfully implemented, the sound level attributable to the Station after installation of Project modifications should be equal to or below the pre-existing sound level at the closest NSAs in which the current sound level exceeds an L_{dn} of **55 dBA**. In addition, the sound level attributable to the Station after installation of Project modifications should be equal to or lower than **55 dBA** (L_{dn}) at those NSAs in which the current sound level is below **55 dBA** (L_{dn}).

APPENDIX

- **FIGURE 1: AREA LAYOUT AROUND THE STATION SHOWING THE NSAs WITHIN APPROX. ½ MILE OF THE STATION**

- **FIGURE 2: LAYOUT SHOWING CLOSEST NSAs, CHOSEN MEASUREMENT POSITIONS NEAR CLOSEST NSAs AND AROUND THE STATION PROPERTY, LOCATION OF EXISTING BUILDINGS-EQUIPMENT**
  FIGURE 2 IS PROVIDED UNDER SEPARATE COVER AND MARKED "CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION – DO NOT RELEASE" AND "CUI//CEII."

- **FIGURE 3: LAYOUT/MAP SHOWING ANTICIPATED LOCATION OF NEW COMPRESSOR UNITS AND ASSOCIATED EQUIPMENT**
  FIGURE 3 IS PROVIDED UNDER SEPARATE COVER AND MARKED "CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION – DO NOT RELEASE" AND "CUI//CEII."

- **ACOUSTICAL ANALYSIS OF NEW COMPRESSOR UNITS AND STATION AFTER INSTALLATION OF ALL PROJECT MODIFICATIONS**

- **DESCRIPTION OF THE ACOUSTICAL ANALYSIS METHODOLOGY (MODIFICATIONS), UNIT BLOWDOWN NOISE ANALYSIS AND THE SOURCE OF SOUND DATA**

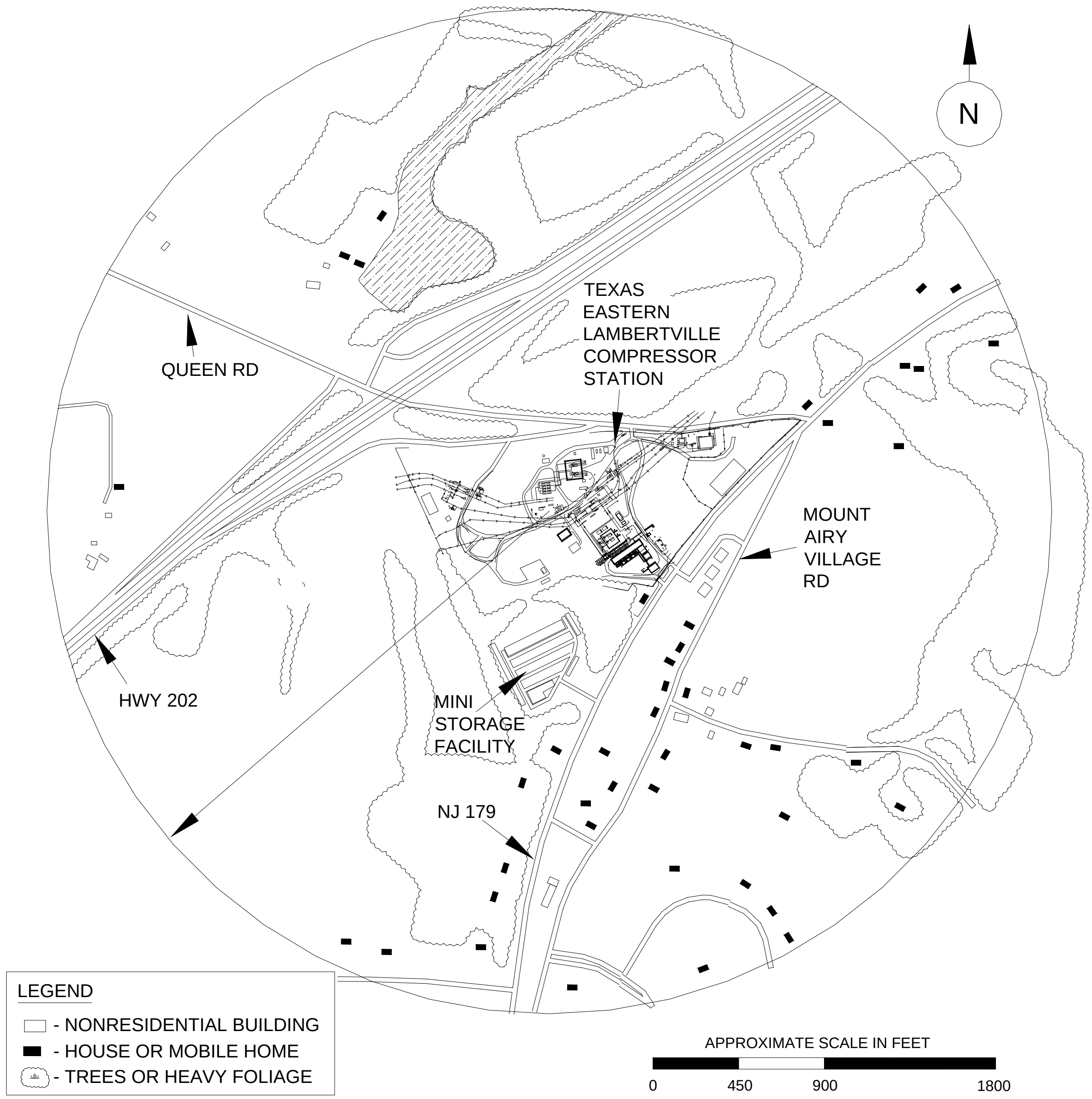

Figure 1: Texas Eastern Lambertville Station: Area Layout/Map around the Station showing the NSAs within Approximately ½ Mile of the Station along with Other Areas of Interest.

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Figure 2: Texas Eastern Lambertville Station: Area Layout/Map showing the Location of the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and around the Station Property, Existing Buildings-Equipment and anticipated Location of the New Compressor Units.

Figure 3: Texas Eastern Lambertville Station: Area Layout showing the anticipated Location of the New Replacement Compressor Units and associated Equipment.

Measurement Set		Measured A-Wt. Sound Levels (dBA) and Resulting/Calc'd Ldn (dBA)				Est'd Ldn Units 1E, 5R & 6R	Est'd Total Ldn of Station	Notes and Observations during Sound Tests on Mar. 9 (2017)
Position	Time of Test	D-time Leq(Ld)	Avg'd Ld	N-time Leq(Ln)	Calc'd Ldn	Note (2)		
Pos. 1 (NSA #1) Residence located 600 ft. SSE of Station Site Center	7:45 AM 7:55 AM 8:05 AM 8:25 AM	51.8 53.5 51.8 50.9	**51.9**	Not Meas'd	**58.3** Note (1)	**54.4** Note (2)	**59.8** Note (3)	Noise of Station units audible & contributed to meas'd A-wt. levels. Also, distant vehicle traffic noise & wind-related sound. Test taken during min. traffic along Hwy. 179.
Pos. 2 (NSA #2) Residence located 850 ft. SSE of Station Site Center	8:40 AM 8:50 AM 9:00 AM	50.4 50.2 50.1	**50.2**	Not Meas'd	**56.6** Note (1)	**54.0** Note (2)	**58.5** Note (3)	Noise of Station units barely audible (did not contribute significantly to meas'd A-wt. levels). Mostly distant traffic & wind-related sound. Tests during min. traffic along Hwy. 179.
Pos. 3 (NSA #3) Residences located 1,250 ft. ENE of Station Site Center	9:08 AM 9:15 AM 9:22 AM	51.2 53.4 52.0	**52.1**	Not Meas'd	**58.5** Note (1)	**57.0** Note (2)	**60.9** Note (3)	Noise of Station units audible and may have contributed to meas'd A-wt. sound levels. Mostly distant traffic & wind-related sound. Tests during min. traffic along Hwy. 179.

Table 1: **Texas Eastern Lambertville Station: Measured Daytime Leq (i.e., Ld) at the Nearby NSAs During Full Load Operation of Both Turbine-Driven Compressor Units (i.e., Unit 5T & Unit 6T), as Measured on March 9, 2017, along with the Resulting Ldn. In addition, the Estimated "Total" Station Sound Level if All Station Compressor Units were Operated Simultaneously.**

Note (1): Ldn calculated by adding 6.4 dB to the measured A-wt. sound level (Ld) since nighttime levels not measured. For reference, If both Ld and Ln are measured and/or estimated, Ldn is calculated using the following formula:

$$L_{dn} = 10\log_{10}\left(\frac{15}{24}10^{L_d/10} + \frac{9}{24}10^{(L_n+10)/10}\right)$$

Note (2): Sound level contribution of other Station compressor units (i.e., Units 1E, 5R & 6R) is based on previous sound surveys, as documented in H&K Report No. 3462, as related to the previous M2M Project. Note that estimated sound level at Pos. 3 (NSA #3) assumes sound level includes some noise of distant vehicle traffic.

Note (3): Resulting "total" sound contribution of Station (i.e., all compressor units operating) estimated by logarithmically adding sound level with only Units 5T/6T operating to the previously-documented sound level with other Station units operating (i.e., Units 1E, 5R & 6R). Consequently, in our opinion, the combination of measured level of only Units 5T & 6T and other Station units is representative of total Station sound level if all compressor units were operated simultaneously.

Operating Conditions of the Station and Compressor Units during the Sound Survey:
> During operation of Unit 5T and Unit 6T: suction pressure at 858 psig; discharge pressure: 967 psig.
> Unit 5T operating at full load (NGG @ 17,844 rpm; NPT @ 5756 rpm).
> Unit 6T operating at full load (NGG @ 17,025 rpm; NPT @ 5522 rpm).

Measurement Set		Temp.	R.H.	Wind	Wind	Peak	
Position	Time Frame of Testing	(°F)	(%)	Direction	Speed	Wind	Sky Conditions
Pos. 1 - 7	7:45 AM to 11:00 AM	48 - 55	35 - 40	Wind primarily from the west	4 - 8 mph	8 - 15 mph	Mostly clear with periods of gusty winds

Table 2: **Texas Eastern Lambertville Station: Summary of Meteorological Conditions during the Sound Survey Measurements on March 9, 2017.**

Measurement Set		Unweighted Sound Pressure Level (SPL) in dB per O.B. Frequency (in Hz)									A-Wt.
Position	**Time of Test**	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Level**
Pos. 1 (NSA #1)	7:45 AM	66.0	67.0	61.4	47.0	46.4	47.5	41.0	33.4	24.0	51.8
Residence located	7:55 AM	65.0	66.3	61.0	49.0	49.0	50.0	43.3	33.0	26.0	53.5
600 ft. SSE of	8:05 AM	63.0	66.0	60.0	48.4	48.0	47.8	40.3	31.4	24.0	51.8
Station Site Center	8:25 AM	67.0	63.4	58.3	48.4	47.2	47.0	40.0	30.0	26.0	50.9
	Avg. A-Wt. & SPL	**65.3**	**65.7**	**60.2**	**48.2**	**47.7**	**48.1**	**41.2**	**32.0**	**25.0**	**51.9**
Pos. 2 (NSA #2)	8:40 AM	58.0	62.0	56.3	47.0	48.3	46.0	40.0	34.0	26.0	50.4
Residence located	8:50 AM	61.0	61.0	56.0	48.0	47.6	46.2	39.0	31.0	25.0	50.2
850 ft. SSE of	9:00 AM	59.0	61.0	56.0	46.7	47.0	46.5	40.0	30.6	25.4	50.1
Station Site Center											
	Avg. A-Wt. & SPL	**59.3**	**61.3**	**56.1**	**47.2**	**47.6**	**46.2**	**39.7**	**31.9**	**25.5**	**50.2**
Pos. 3 (NSA #3)	9:08 AM	64.0	64.5	58.0	51.0	47.0	47.0	41.0	31.0	28.0	51.2
Residences located	9:15 AM	65.0	62.4	58.0	51.2	49.8	50.0	44.0	34.0	30.0	53.4
1,250 ft. ENE of	9:22 AM	62.5	64.5	59.0	50.5	48.0	48.5	40.0	28.0	23.0	52.0
Station Site Center											
	Avg. A-Wt. & SPL	**63.8**	**63.8**	**58.3**	**50.9**	**48.3**	**48.5**	**41.7**	**31.0**	**27.0**	**52.1**
Pos. 4: West Side	10:10 AM	69.0	71.0	65.0	54.7	54.0	50.0	44.0	39.0	33.0	56.2
of the Station	10:15 AM	68.6	71.2	62.5	51.4	54.0	49.8	43.2	37.0	28.0	55.4
	Avg. A-Wt. & SPL	**68.8**	**71.1**	**63.8**	**53.1**	**54.0**	**49.9**	**43.6**	**38.0**	**30.5**	**55.8**
Pos. 5: North Side of	10:00 AM	71.0	74.0	67.0	57.2	55.0	50.0	46.2	50.0	36.0	58.4
Station, 700 ft. NW	10:05 AM	72.0	74.2	66.5	55.0	51.0	49.7	44.0	50.8	37.0	57.5
from Units 5T & 6T	**Avg. A-Wt. & SPL**	**71.5**	**74.1**	**66.8**	**56.1**	**53.0**	**49.9**	**45.1**	**50.4**	**36.5**	**57.9**
Pos. 6: North Side of	10:17 AM	70.0	71.3	63.0	50.4	51.0	47.2	42.4	36.0	28.0	53.8
Station, 500 ft. north	10:20 AM	65.0	69.0	61.6	51.0	44.0	44.0	39.2	34.0	24.0	50.9
from Units 5R & 6R	**Avg. A-Wt. & SPL**	**67.5**	**70.2**	**62.3**	**50.7**	**47.5**	**45.6**	**40.8**	**35.0**	**26.0**	**52.3**
Pos. 7: NE Side of	10:30 AM	68.4	65.3	59.0	48.5	44.5	45.2	40.0	34.3	31.0	50.1
Station, near the	10:35 AM	64.0	64.4	59.3	46.5	42.0	42.0	35.4	34.0	31.0	48.2
Metering Building	**Avg. A-Wt. & SPL**	**66.2**	**64.9**	**59.2**	**47.5**	**43.3**	**43.6**	**37.7**	**34.2**	**31.0**	**49.1**

Table 3: **Texas Eastern Lambertville Station: Meas'd A-Wt. Sound Levels (Ld) and Unweighted Octave-Band (O.B.) SPLs, as measured on March 8, 2017, at All of the Reported Sound Measurement Positions wth Unit 5T and Unit 6T operating at Full Load.**

Source No. & Dist (Ft)	Noise Sources and Other Conditions/Factors associated with Acoustical Analysis	Unweighted PWL or SPL in dB per O.B. Center Freq. (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	Calc'd Ldn
1)	PWL of Turbines/Compressors inside Building	110	110	112	112	110	110	112	118	112	121	
	Attenuation of the New Building	-8	-12	-18	-26	-32	-38	-40	-42	-42		
	Misc. Atten. (Shielding and/or Topography)	0	0	-1	-1	-2	-4	-5	-6	-6		
685	Hemispherical Radiation	-54	-54	-54	-54	-54	-54	-54	-54	-54		
685	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-9		
685	Source Sound Level Contribution	48	44	38	30	21	13	11	10	0	27	
2)	PWL of Unsilenced Turbine Exhaust (Both Units)	126	129	126	130	132	128	122	115	102	133	
	Atten. of Noise Control (Silencer System)	-6	-18	-26	-38	-45	-45	-45	-35	-25		
	Misc. Atten. (Shielding and/or Topography)	0	0	0	0	-1	-1	-2	-3	-3		
700	Hemispherical Radiation	-55	-55	-55	-55	-55	-55	-55	-55	-55		
700	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-10		
700	Source Sound Level Contribution	65	56	45	37	31	26	18	17	10	36	
3)	PWL of Aboveground Piping (Both Units)	92	92	95	92	98	108	114	110	106	117	
	Atten. of Noise Control (Acoustical Pipe Insulation)	4	4	0	-4	-6	-12	-15	-16	-16		
	Misc. Atten. (Shielding and/or Topography)	0	0	-1	-1	-2	-4	-5	-6	-6		
700	Hemispherical Radiation	-55	-55	-55	-55	-55	-55	-55	-55	-55		
700	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-10		
700	Source Sound Level Contribution	41	41	39	32	35	36	37	28	20	41	
4)	PWL of LO Cooler (Both Units)	108	103	98	95	93	91	88	85	83	96	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Misc. Atten. (Shielding and/or Topography)	0	0	-1	-1	-2	-4	-5	-6	-6		
700	Hemispherical Radiation	-55	-55	-55	-55	-55	-55	-55	-55	-55		
700	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	-2	0	-1	-2	-5	-10		
700	Source Sound Level Contribution	53	48	42	37	36	31	26	19	13	37	
5)	PWL of Unsilenced Turbine Intake (Both Units)	114	120	126	127	128	130	133	161	153	162	
	Attenuation of Intake Silencer(s)	-2	-6	-15	-20	-30	-40	-50	-60	-55		
	Attenuation of Air Intake Filter	-1	-5	-8	-15	-18	-20	-20	-20	-15		
	Misc. Atten. (Shielding and/or Topography)	0	0	-1	-1	-2	-4	-5	-6	-6		
700	Hemispherical Radiation	-55	-55	-55	-55	-55	-55	-55	-55	-55		
700	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-2	-5	-10		
700	Source Sound Level Contribution	56	54	47	36	23	10	1	15	13	34	
6)	PWL of the New Gas Aftercooler	115	110	96	95	92	90	88	85	82	96	
	NR of Noise Control	0	0	0	0	0	0	0	0	0		
	Misc. Atten. (Shielding and/or Topography)	0	0	-1	-1	-2	-4	-5	-6	-6		
750	Hemispherical Radiation	-55	-55	-55	-55	-55	-55	-55	-55	-55		
750	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	-1	-1	-2	-6	-10		
750	Source Sound Level Contribution	60	55	40	38	34	30	26	18	11	37	
Est'd Total Sound Contribution of New Equipment at NSA #1		**67**	**60**	**51**	**44**	**41**	**38**	**38**	**29**	**22**	**44.9**	**51.3**

Est'd Sound Level (Ldn) of Station (Units 5T/6T Retired): Note (1)	54.4
Est'd Sound Level of Station after Project Modifications (dBA)	**56.1**
Pre-Existing Station Sound Level (Ldn) at NSA (dBA): Note (2)	59.8
Est'd Decrease (-) or Increase (+) in Station Sound Level (dB)	**-3.7**

Table 4: Texas Eastern Lambertville Station (Lambertville East Expansion Project): Estimated Sound Contribution of the Proposed Project Modifications [i.e., Installation of Two (2) new Solar Taurus 70 Compressor Units and Gas Aftercoolers along with Retirement of Unit 5T and Unit 6T) at NSA #1 (i.e., Residence located 685 Ft. SSE of the New Compressor Bldg.) and Estimated "Total" Station Sound Level after Installation of Project Modifications.

Note (1): Est'd sound level of Station without Units 5T/6T since these units to be retired (i.e., sound level of only Units 1E, 5R & 6R).
Note (2): Pre-existing sound level during established via a March 2017 sound survey and other previous data calculations.

Dist (Ft)	Noise Sources and Other Conditions/Factors associated with Acoustical Analysis	Unweighted SPL in dB per O.B. Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	Calc'd Ldn
	Est'd Level of New Units at 685 Ft. (RE: Table 4)	67	60	51	44	41	38	38	29	22	44.9	
900	Hemisph Radiation [20*log(900/685) = 2.4 dB]	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4		
900	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	0	-1	-2	-3		
Est'd Total Sound Contribution of New Equipment at NSA #2		**65**	**58**	**49**	**41**	**38**	**36**	**34**	**25**	**17**	**42.2**	**48.6**

Est'd Sound Level (Ldn) of Station (Units 5T/6T Retired): Note (1)	54.0
Est'd Sound Level of Station after Project Modifications (dBA)	**55.1**
Pre-Existing Station Sound Level (Ldn) at NSA (dBA): Note (2)	58.5
Est'd Decrease (-) or Increase (+) in Station Sound Level (dB)	**-3.4**

Table 5: Texas Eastern Lambertville Station (Lambertville East Expansion Project): Estimated Sound Contribution of the Proposed Project Modifications [i.e., Installation of Two (2) new Solar Taurus 70 Compressor Units and Gas Aftercoolers along with Retirement of Unit 5T and Unit 6T) at NSA #2 (i.e., Residence located 900 Ft. SE of the New Compressor Bldg.) and Estimated "Total" Station Sound Level after Installation of Project Modifications.

Source No. & Dist (Ft)	Noise Sources and Other Conditions/Factors associated with Acoustical Analysis	Unweighted SPL in dB per O.B. Center Frequency (Hz) 31.5	63	125	250	500	1000	2000	4000	8000	A-Wt. Level	Calc'd Ldn
	Est'd Level of New Units at 685 Ft. (RE: Table 4)	67	60	51	44	41	38	38	29	22	44.9	
1150	Hemisph Radiation [20*log(1150/685) = 4.5 dB]	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5		
1150	Atm. Absorption (70% R.H., 60 deg F)	0	0	0	0	0	-1	-1	-4	-6		
Est'd Total Sound Contribution of New Equipment at NSA #3		**63**	**56**	**46**	**39**	**36**	**33**	**32**	**21**	**11**	**39.7**	**46.1**

Est'd Sound Level (Ldn) of Station (Units 5T/6T Retired): Note (1)	57.0
Est'd Sound Level of Station after Project Modifications (dBA)	**57.3**
Pre-Existing Station Sound Level (Ldn) at NSA (dBA): Note (2)	60.9
Est'd Decrease (-) or Increase (+) in Station Sound Level (dB)	**-3.6**

Table 6: Texas Eastern Lambertville Station (Lambertville East Expansion Project): Estimated Sound Contribution of the Proposed Project Modifications [i.e., Installation of Two (2) new Solar Taurus 70 Compressor Units and Gas Aftercoolers along with Retirement of Unit 5T and Unit 6T) at NSA #3 (i.e., Residences located 1,150 Ft. ENE of New Compressor Bldg.) and Estimated "Total" Station Sound Level after Installation of Project Modifications.

DESCRIPTION OF THE ACOUSTICAL ANALYSIS METHODOLOGY; SOURCE OF SOUND DATA

In general, the sound level contributed by the Station modifications was calculated as a function of frequency from estimated unweighted octave-band (O.B.) sound power levels (PWLs) for each significant sound source of Project modifications. The following summarizes the analysis procedure:

ACOUSTICAL ANALYSIS METHODOLOGY

In general, the predicted sound level contributed by the Station modifications was calculated as a function of frequency from estimated unweighted O.B. PWLs and A-wt. PWL for each significant sound source associated with the new compressor units and other new sound sources. The following summarizes the acoustical analysis procedure:

- Initially, A-wt. PWL and unweighted O.B. PWLs of the significant noise sources were determined from actual sound level measurements performed by H&K at similar type of gas compressor facilities and/or available equipment manufacturer's sound data.

- Then, expected noise reduction ("NR") or attenuation in dB per O.B. frequency due to any noise control measures, hemispherical sound propagation (discussed in more detail below*) and atmospheric sound absorption (discussed in more detail below**) were subtracted from the unweighted O.B. PWLs to obtain the unweighted O.B. SPLs of each noise source. Since sound attenuation by foliage/trees can influence the sound level contributed at the NSAs, we <u>also</u> included the sound shielding due to foliage, if appropriate.

- Finally, the resulting estimated O.B. SPLs for all noise sources associated with the Station modifications (with noise control and other sound attenuation effects) were logarithmically summed, and the total O.B. SPLs for all noise sources were corrected for A-weighting to provide the estimated overall A-wt. sound level contributed by the Station modifications at the closest NSA. The predicted sound contribution at the closest NSA was utilized to estimate the noise contribution of Station modifications at the other nearby NSAs more distant that the closest NSA.

*<u>Attenuation due to hemispherical sound propagation</u>: Sound propagates outwards in all directions (i.e., length, width, height) from a point source, and the sound energy of a noise source decreases with increasing distance from the source. In the case of hemispherical sound propagation, the source is located on a flat continuous plane/surface (e.g., ground), and the sound radiates hemispherically (i.e., outward, over and above the surface) from the source. The following equation is the theoretical decrease of sound energy when determining the resulting sound pressure level (SPL) of a noise source at a specific distance ("r") of a receiver from a source PWL:

> Decrease in SPL ("hemispherical propagation") from a noise source = **20*log(r) – 2.3 dB**
> where "r" is distance of the receiver from the noise source.

<u>Attenuation due to air absorption</u>: Air absorbs sound energy, and the amount of absorption ("attenuation") is dependent on the temperature and relative humidity (R.H.) of air and frequency of sound. For example, the attenuation due to air absorption for 1000 Hz octave band SPL is approximately **1.5 dB per 1,000 feet for standard day conditions (i.e., no wind, 60 deg. F. and 70% R.H.).

ANALYSIS & METHODOLOGY (NOISE ATTRIBUTABLE TO A BLOWDOWN EVENT)

The noise resulting from a blowdown event was estimated by using the "inverse-square law" and included some attenuation due to miscellaneous sound attenuation (e.g., sound attenuation due to atmospheric sound absorption and foliage/topography). Consequently, the estimated noise of a blowdown event at the receptor (i.e., closest NSA) was calculated as follows:

SPL (receptor) = (Blowdown SPL at R1) – 20*log(R2/R1) – Misc. Atten. = **60 dBA** – 20*log(900/300) – 3 dB = **47 dBA**

Where: R1 = Distance of Specified Blowdown Noise Level Requirement (i.e., 300 ft.)
R2 = Distance of the Closest Receptor (NSA #1) from the Blowdown Silencer (900 ft.)

SOURCE OF SOUND DATA

The following describes the source of sound data for estimating the source sound levels and source PWLs used in the acoustical analysis. Note that equipment noise levels utilized in the acoustical analysis (i.e., spreadsheet analysis) are generally higher than the sound level requirement for the equipment to insure that the design incorporates an acoustical "margin of safety."

(1) The estimated PWL values of equipment inside the building (i.e., turbines & compressors) were calculated from sound data measured by H&K on a similar type of compressor installations;

(2) Turbine exhaust PWL values for the Solar turbine were calculated from sound data provided by Solar (i.e., sound data from Solar Noise Prediction Booklet);

(3) The noise radiated from aboveground gas piping is primarily a result the noise generated by the gas compressors. Consequently, measurement of both near field and far field sound data on gas piping is presumed to be an accurate method of quantifying the noise associated with the new gas piping, and the estimated PWL values for gas piping used in the analysis were determined from near field and far field sound data by H&K on a similar type of compressor to that of the planned compressor unit;

(4) The estimated PWL values for the turbine LO cooler and gas aftercooler were designated to meet the design noise goal. Note that the estimated PWL for the coolers utilized in the acoustical analysis assumes some noise associated with piping associated with the coolers. The noise level for the gas cooler and LO cooler used in the analysis is generally higher than the sound level requirement in order that the analysis incorporates an acoustical "margin of safety";

(5) The estimated PWL values for the turbine air intake were calculated from sound data provided by Solar (i.e., sound data from the Solar Noise Prediction Booklet), although the low-frequency SPLs were modified as a result of field acoustical tests by H&K.

(6) The estimated A-wt. sound level of a unit gas blowdown event was calculated from sound data measured on similar type of gas blowdown event.

End of Report

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