Case No. 9482

Revised Appendix C, Air Construction Permit Application

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CP Crane Station Combustion Turbine Repowering Project

Air Construction Permit Application

CP CRANE, LLC
Baltimore, Maryland

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ECT No. 170604-0700

Document Review

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List of Acronyms and Abbreviations

°F	degree Fahrenheit
$\mu g/m^3$	microgram per cubic meter
ACFM	actual cubic feet per minute
AERMAP	AERMOD terrain preprocessor program
AERMET	AERMOD meteorological preprocessor program
AERMIC	AMS/EPA Regulatory Improvement Committee
AERMOD	AERMIC model
AMS	American Meteorological Society
BEEST	Providence Engineering and Environmental Group, LLC, BEEST Suite
BPIP	Building Profile Input Program
BPIPPRM	BPIP for PRIME
BWI	Baltimore/Washington International Thurgood Marshall Airport
CAA	Clean Air Act
CBL	convectively generated boundary layer
CEMS	continuous emissions monitoring system
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
COMAR	Code of Maryland Regulations
CP Crane, LLC	CP Crane
CPCN	Certificate of Public Convenience and Necessity
Crane Station	Charles P. Crane Generating Station
CT	combustion turbine
ECT	Environmental Consulting & Technology, Inc.
EPA	U.S. Environmental Protection Agency
ERD	environmental review document
fps	foot per second
ft-agl	foot above ground level
ft-msl	foot above mean sea level
g/kW-hr	gram per kilowatt-hour
GAQM	Guideline on Air Quality Models
GE	General Electric
GeoTIFF	georeferenced tagged image file format

List of Acronyms and Abbreviations (Continued, Page 2 of 3)

GEP	good engineering practice
GHG	greenhouse gas
gr/100 scf	grain per 100 standard cubic feet
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HHV	high heating value
hr/yr	hour per year
ISO	International Organization for Standardization
km	kilometer
kW	kilowatt
lb	pound
lb/hr	pound per hour
lb/MMBtu	pound per million British thermal units
lb/MWh	pound per megawatt-hour
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MMBtu	million British thermal units
MMBtu/hr	million British thermal units per hour
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NED	National Elevation Dataset
NESHAP	National Emission Standards for Hazardous Air Pollutants
ng/J	nanogram per joule
NLCD	National Land Cover Database
NNSR	nonattainment new source review
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NSPS	new source performance standards
NSR	new source review
NWS	National Weather Service
PM	particulate matter
PM_{10}	particulate matter with diameter less than 10 microns in diameter
$PM_{2.5}$	particulate matter with diameter less than 2.5 microns in diameter

List of Acronyms and Abbreviations (Continued, Page 3 of 3)

ppm	part per million
ppmvd	parts per million by volume dry
PPRP	Power Plant Research Program
PRIME	Plume Rise Model Enhancement
Project	CP Crane CT Repowering Project
PSC	Public Service Commission
PSD	prevention of significant deterioration
PTE	potential to emit
Repowering Project	CP Crane CT Repowering Project
SBL	stable boundary layer
SER	significant emissions rate
SO_2	sulfur dioxide
TBACT	best available control technology for toxics
tpy	ton per year
ULSD	ultra-low-sulfur diesel
USGS	U.S. Geological Survey
VOC	volatile organic compounds
WBAN	Weather Bureau Army Navy

1.0 Introduction and Summary

1.1 Introduction

CP Crane, LLC (CP Crane), is proposing a modification to the Charles P. Crane Generating Station (Crane Station) located in Baltimore County, Maryland. CP Crane proposes to repower Crane Station by retiring its existing coal-fired units (Units 1 and 2) and adding three General Electric (GE) LM6000 combustion turbines (CTs) fired primarily with natural gas: the CP Crane CT Repowering Project (hereinafter referred to as the Repowering Project or Project).

The Repowering Project at Crane Station will involve installation of three CTs, of the aero-derivative type, and associated ancillary equipment. The proposed CTs will fire natural gas as their primary fuel and will also be capable of firing ultra-low-sulfur distillate (ULSD) fuel oil when natural gas is not available in sufficient quantities. The CTs are expected to serve as peaking units and operate at a capacity factor of up to 27 percent. The CTs' design will allow them to start up and shut down quickly and at multiple times per day if circumstances warrant.

This report is organized as follows:

- Section 1.0 provides the introduction and summary of the proposed modifications and conclusions.
- Section 2.0 describes the proposed facility and emissions sources.
- Section 3.0 describes new source review (NSR) applicability determination and proposed emissions.
- Section 4.0 provides a summary of the applicable federal and state emissions standards.
- Section 5.0 describes the modeling approach for source impact analyses.
- Section 6.0 presents the results of source impact analyses.
- Appendix A provides the requisite Maryland Department of the Environment (MDE) air quality permit application forms.

- Appendix B provides air pollutant emissions calculations and NSR applicability analysis.
- Appendix C includes a copy of the modeling protocol dated February 2018, which outlines CP Crane's methodology in demonstrating compliance with the air quality impact analyses, and any Maryland Department of Natural Resources (MDNR) Power Plant Research Program (PPRP) and MDE comments.
- Appendix D provides modeling input and output files on compact disc.
- Appendix E provides the acid rain permit application.

1.2 Summary

The proposed modification, which includes installation of three CTs and a newly installed black-start generator, will result in potential emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter (PM), particulate matter with diameter less than 10 microns in diameter (PM_{10}), particulate matter with diameter less than 2.5 microns in diameter ($PM_{2.5}$), carbon monoxide (CO), carbon dioxide equivalent (CO_2e), ozone (as volatile organic compounds [VOC]), lead, sulfuric acid (H_2SO_4), and greenhouse gases (GHGs).

Potential annual emissions of hazardous air pollutants (HAPs) were also calculated based on the proposed modification to Crane Station. These estimates were compared to major source thresholds found in Section 112(a)(1) of the Clean Air Act (CAA). The major source thresholds for HAPs are 10 tons per year (tpy) for any individual HAP and 25 tpy for total HAPs. Potential annual HAP emissions post-Project for Crane Station were below major source thresholds; therefore, this facility is an area source of HAPs.

Table 1-1 provides a summary of the worst-case emissions of proposed CTs when running on natural gas and ULSD fuel and the proposed newly installed black-start generator. Based on the NSR applicability analysis, the Repowering Project will not result in a significant increase in emissions of any NSR pollutant. Therefore, the Project is expected to be a minor source modification with regards the federal NSR regulations.

Table 1-1. Summary of NSR Applicability Analysis

Pollutant	Repowering Project Emissions (tpy)†	Baseline Actual Emissions (tpy)‡	Net Emissions Increases/Decreases (tpy)	SER (tpy)	Major Modification (Yes/No)
NO_x	171.45	1,235.03	-1,063.57	25	No
CO	128.96	131.83	-2.87	100	No
PM	21.91	NA	NA	25	No
PM_{10}	21.91	82.87	-60.95	15	No
$PM_{2.5}$	21.91	35.87	-13.95	10	No
VOC	13.59	NA	NA	25	No
SO_2	2.44	NA	NA	40	No
Lead*	3.23E-03	NA	NA	0.6	No
H_2SO_4	3.73E-01	NA	NA	7	No
CO_2e	200,175	776,674	-576,499	75,000	No
Total HAP	2.04	—	—	25§	No
Maximum individual HAP	1.28 (formaldehyde)	—	—	10§	No

Note: NA = proposed emissions below respective SERs; netting analysis is not required.

*Lead emissions are calculated based on AP-42 factors.
†Includes emissions from the three CTs and newly installed black-start generator.
‡Proposed emissions decreases from shutdown of coal Units 1 and 2.
§Major source thresholds for HAPs. Netting analysis is not conducted for HAPs.

Sources: ProEnergy, Performance Data, 2018.
ECT, 2018.

The Repowering Project is located in an area classified as nonattainment for 8-hour ozone (2008) and SO_2 (2010). NO_x and VOCs are regulated as nonattainment in the ozone nonattainment areas, as they are classified as precursors to ozone formation in ambient air.

Under prevention of significant deterioration (PSD), if the Project's emissions increase and net emissions increase are both significant for any regulated air pollutant, then PSD permitting is required. Similarly, under nonattainment new source review (NNSR), if the Project's net emissions increase is significant for any NNSR-regulated air pollutant, applicable NNSR permitting is required. The Project will be considered a minor source with respect to NSR permitting requirements at Title 26, Subtitle 11, Chapter 17, of the Code of Maryland Regulations (COMAR) and Title V major source permitting requirements at COMAR 26.11.03. The Repowering Project does not result in significant net emissions increase of any NSR pollutant and is not subject to PSD or NNSR applicability, as described further in Section 3.0.

Per MDE request, in support of the Crane Station CT Repowering Project Maryland Certificate of Public Convenience and Necessity (CPCN) and Permit-to-construct applications, an air quality impact modeling, facility-only National Ambient Air Quality Standards (NAAQS) analysis will be provided in the Crane Project Environmental Review Document (ERD). This application provides a demonstration through air dispersion modeling using agency-approved meteorological data that the ambient air impacts from post-Project emissions rates for criteria air pollutants comply with NAAQS. Specifically, the NAAQS modeling analysis will consist of the existing sources remaining in operation, the proposed new emissions sources, and a representative, agency-approved ambient background concentration. Nearby, offsite emissions sources are not proposed for this analysis. The results of the multisource modeling analyses demonstrate ambient air impacts from the Project will not cause or contribute to a violation of any applicable NAAQS, as described further in Section 6.0.

2.0 Project Description

2.1 Project Location

The Crane Station facility is located in eastern Baltimore County along the Chesapeake Bay approximately 20 kilometers (km) east of Baltimore. Figure 2-1 illustrates the location of the Project within the state of Maryland and within Baltimore County. Figure 2-2 provides an aerial photograph showing the location of the Project. Figure 2-3 presents the map showing facility site boundaries and nearby prominent geographical, topographical, and land use features.

2.2 Major Facility Components

The primary sources of air pollutants associated with the proposed modification are the three GE LM6000 CTs and the newly installed black-start generator. Other sources of pollutants from the existing sources at Crane Station include a CT, an emergency generator, and a fire water pump. The following subsections provide brief descriptions of the major components of Crane Station.

2.2.1 Proposed CTs

As stated previously, CP Crane plans to construct three GE LM6000 CTs in Baltimore County, Maryland. The proposed Project will have an approximate generating capacity of 150 megawatts (MW)-electric (nominally) at International Organization for Standardization (ISO) conditions.

CTs are heat engines that convert latent fuel energy into work using compressed hot gas as the working medium. CTs deliver mechanical output by means of a rotating shaft used to drive an electrical generator, thereby converting a portion of the engine's mechanical output to electrical energy. Ambient air is first filtered and then compressed by the CT compressor, which then increases the pressure of the combustion air stream and also raises its temperature. During warm days (typically 60 degrees Fahrenheit [°F] or greater), the CT inlet ambient air can be cooled by evaporative cooling, thus providing denser air for combustion and improving power output. The compressed combustion air is then combined with the natural gas fuel and burned in the CT's

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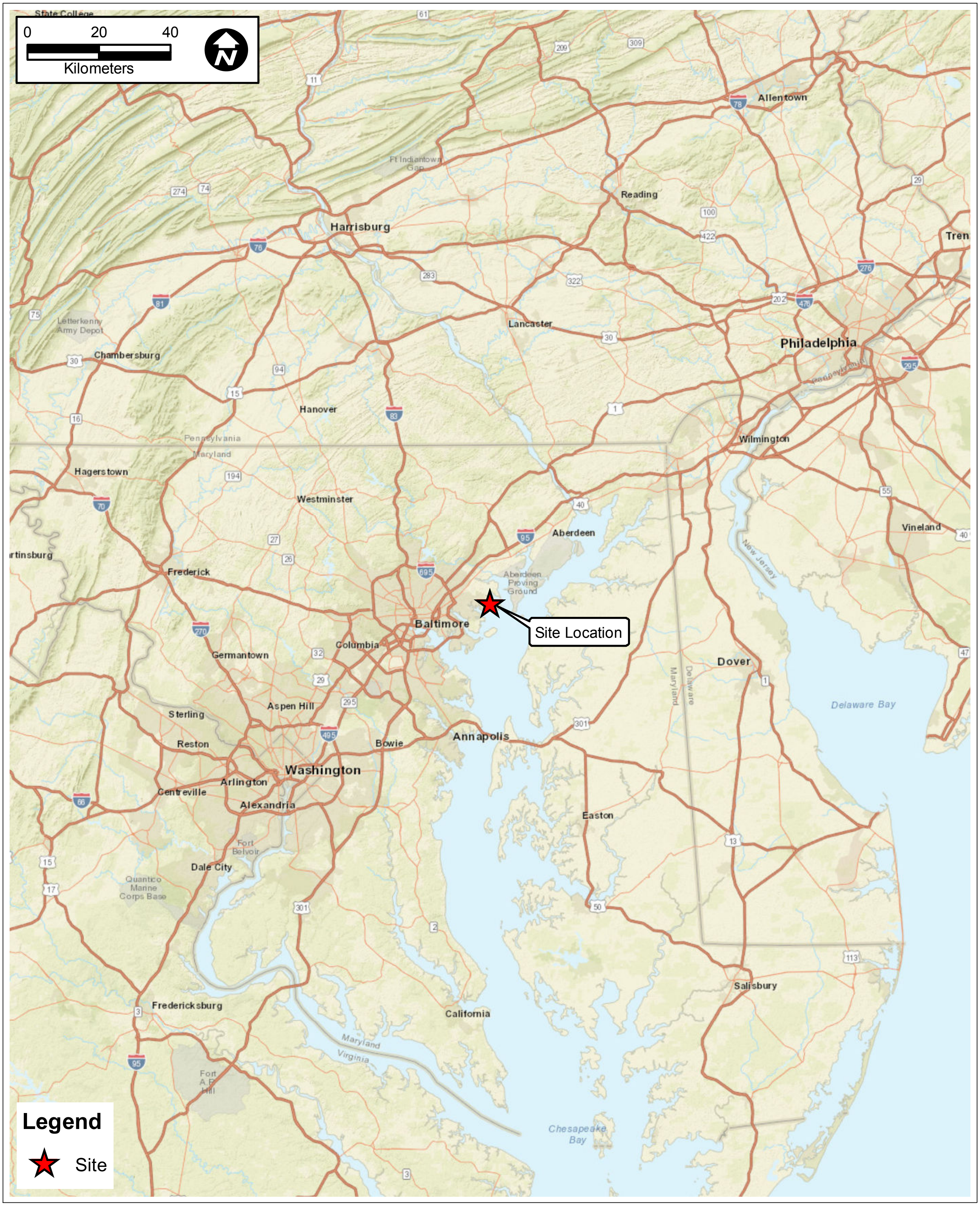

FIGURE 2-1.

GENERAL SITE LOCATION MAP

Sources: Esri Basemap, ECT 2018.

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FIGURE 2-2.

AERIAL IMAGERY OF PROJECT SITE AND VICINITY

Sources: Esri Basemap Imagery, ECT 2018.

ECT Environmental Consulting & Technology, Inc.

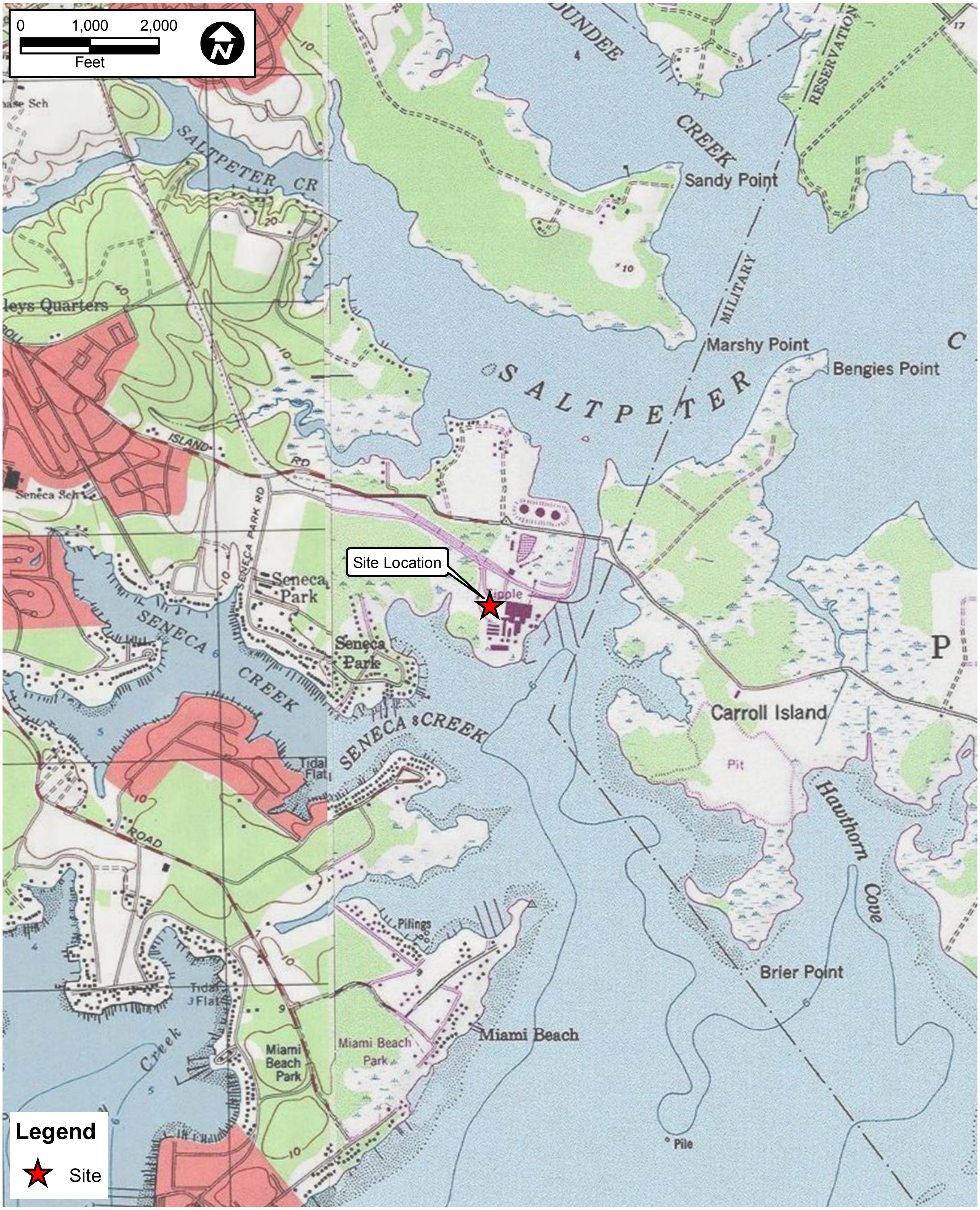


FIGURE 2-3.

TOPOGRAPHIC MAP OF PROJECT SITE AND VICINITY

Sources: Esri Basemap USGS Topographic Quadrangles, ECT 2018.

Environmental Consulting & Technology, Inc.

High-pressure combustor to produce hot exhaust gases. These high-pressure, hot gases next expand and turn the CT to produce rotary shaft power, which is used to drive an electric generator as well as the CT air compressor. CT exhaust gases will be discharged to the atmosphere after passing through the CT.

The conceptual design of the Repowering Project incorporates state-of-the-art technology at every step. The CTs' high efficiency will reduce emissions per unit of output by producing each MW-hour of electricity with less fuel. The use of low-sulfur fuels for the CTs also has the benefit of producing lower emissions relative to most other potential fuels. Each CT will be capable of firing pipeline-quality natural gas containing no more than 0.5 grain per 100 standard cubic feet (gr/100 scf) (annual average) and ULSD fuel oil having a sulfur content of no more than 0.0015 percent by weight.

For purposes of developing worst-case Project emissions rates and stack parameters and conducting required regulatory compliance demonstrations and air quality impact analyses for this application, CP Crane obtained performance and emissions data for the GE LM6000 CT in simple-cycle configuration. The required demonstrations were performed using worst-case emissions and other specifications from the CT model.

2.2.2 Proposed Black-start Generator

A 1,500-kilowatt (kW), newly installed black-start generator will be used to start the proposed CTs when there is no electricity on the grid and will not be used to produce electricity for the grid. The unit will be limited to 100 hours per year (hr/yr) for routine testing and maintenance.

2.2.3 Existing Sources

Existing sources of emissions include a CT, emergency generator, and fire water pump. The existing CT is rated at 14 MW (summer capability) fired by No. 2 fuel oil. The fire water pump is used for emergency purposes in case of a fire and for routine operations and testing as required by the National Fire Prevention Association Code. The emergency diesel fire water pump is rated at a maximum 399 horsepower. The unit will be limited to 100 hr/yr for routine testing and maintenance. The emergency diesel engine-powered standby generator, rated at 600 horsepower, allows maintenance of vital plant loads during power outages or switchyard maintenance. The

emergency diesel generator is not intended to provide sufficient power for a black-start, peak shaving, or nonemergency power. The emergency generator will be operated up to 100 hr/yr for maintenance checks and readiness testing.

3.0 NSR Applicability Determination and Proposed Emissions

This section provides detailed description of the steps involved in an NSR netting analysis. A summary of the NSR applicability determination for the proposed Project is provided first, followed by the basis and methodology for the calculation of air pollutant emissions increases from the Repowering Project. Following the emissions increases section, contemporaneous emissions decreases are explained. Finally, netting analysis is presented, and the result of this analysis were used to determine whether pollutants were potentially subject to NSR applicability. Appendix B presents detailed emissions calculation methodologies for emissions increases and a summary of the results of the NSR applicability determination.

3.1 NSR Applicability Determination

NSR requires preconstruction review and permitting of stationary sources. A source may be subject to one or more of the NSR programs depending on the facility's emissions and NAAQS attainment status of the area. There are three categories of NSR permitting:

- PSD—applies to new major sources and major modifications in attainment areas
- NNSR—applies to new major sources and major modifications in nonattainment areas
- Minor NSR—applies to pollutants that do not trigger PSD or NNSR requirements

When a physical change or change in the method of operation is proposed for an existing major stationary source, these permitting programs are required to be evaluated. As a result of the CAA, the U.S. Environmental Protection Agency (EPA) enacted primary and secondary NAAQS for criteria air pollutants. Primary NAAQS are intended to protect the public health, and secondary NAAQS are intended to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in ambient air. Areas of the country in violation of NAAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements. Maryland has also

adopted NAAQS in COMAR 26.11.04. Section 5.0 provides a further discussion on the federally promulgated NAAQS standards adopted by MDE as state standards.

The determination of whether PSD/NNSR/minor NSR regulations are applicable to a specific project must be conducted in two parts: the air quality status of the location of the project must be determined and the type and quantity of PSD-regulated pollutants that will be emitted must be evaluated. First, it must be determined whether the proposed project is located in an attainment or nonattainment area. Then, it must be determined whether the proposed project is a major or minor modification. If the results indicate a major modification, any pollutants subject to PSD and/or NNSR permitting requirements must be identified. MDE has adopted the federal PSD permitting program in COMAR 26.11.06.14 and the NNSR permitting program in COMAR 26.11.17. Table 3-1 lists the current federal air quality classifications for each criteria pollutant for the Repowering Project area in Baltimore County. The Project is located in an area classified as attainment for all criteria pollutants except for 8-hour ozone (2008) and SO_2 (2010). NO_x and VOCs are regulated in the ozone nonattainment areas, as they are classified as precursors to ozone formation in ambient air.

Table 3-1. Classification of Baltimore County, Maryland, for Each Criteria Pollutant

Pollutant	Attainment Status
CO	Unclassifiable/attainment
NO_2	Unclassifiable/attainment
$PM_{2.5}$	Unclassifiable/attainment
PM_{10}	Unclassifiable/attainment
SO_2	Nonattainment
Ozone (8-hour)	Nonattainment
Lead	Unclassifiable/attainment

Note: NO_2 = nitrogen dioxide.

Source: 40 CFR 81.321.

An NSR applicability determination was prepared for each applicable NSR pollutant specified in the Code of Federal Regulations (CFR), Title 40, Part 51.166. These pollutants include NO_x, SO_2, PM, PM_{10}, $PM_{2.5}$, CO, ozone (as VOC), lead, H_2SO_4, and GHGs. The Repowering Project is deemed subject to PSD or NNSR, if there is a "significant emissions increase" for a pollutant,

as defined in 40 CFR 51.165 and 51.166, if the sum of the increases and decreases associated with the Project exceeds the pollutant-specific thresholds or significant emissions rate (SER). SERs used are as defined in COMAR 26.11.17.01 and shown in Table 3-2. The Project is a minor source modification with regard to federal NSR regulations, with all NSR pollutants falling below the SERs, explained in detail in the following subsections.

Table 3-2. PSD and NNSR SERs

Pollutant	SER (tpy)
CO	100
NO_x	25
VOC	25
PM	25
PM_{10}	15
$PM_{2.5}$	10
SO_2	40
H_2SO_4	7
Lead	0.6
GHGs CO_2e	75,000

Source: COMAR 26.11.17.01
40 CFR 51.166

3.2 Proposed Project Emissions

This section presents a summary of Project emissions and the methodology used to calculate these emissions increases. Emissions calculation procedures used in determining potential Project emissions are based on information provided by the manufacturer, other equipment vendor data, and emissions factors documented in EPA's Compilation of Air Pollution Emissions Factors, AP-42. Annual operational limitations have been accounted for while estimating potential annual emissions. Data presented in the following subsections are based on the information provided by CP Crane for the GE LM6000PC CT.

The following subsections present maximum hourly and annual emissions for the simple-cycle CT during normal operations and startup/shutdown using both natural gas and ULSD fuel oil and the newly installed black-start generator.

CP Crane is proposing to construct three CTs; the emissions presented in the following sections are per turbine unless specified. Appendix B provides additional details of CT emissions calculations at various loads.

The Project's proposed units are new and do not have 24 consecutive months of operating data; therefore, baseline actual emissions will equal to zero. The emissions increase equals the potential to emit (PTE) of the proposed CTs.

3.2.1 Continuous Operations Scenario

Normal operation of a CT is characterized as continuous operation from minimum compliance load to 100 percent. The three CTs are proposed to operate at a 27-percent capacity factor, which is equivalent to 2,365 hr/yr (excluding startup/shutdown), of which approximately 10 percent, or 237 hr/yr, may be with ULSD fuel oil. Maximum emissions for all load types (100, 75, 60, and 50 percent) for both natural gas and ULSD fuel oil were calculated based on the performance data provided by ProEnergy. Emissions for the duel-fuel scenario were based on burning natural gas 90 percent of the time and ULSD fuel 10 percent of the time. Lead emissions were calculated based on the AP-42 factor, Section 1.4, Table 1.4-2, for natural gas and Section 3.1, Table 3.1-5, for ULSD fuel. Table 3-3 provides CT pound per hour (lb/hr) emissions (excluding startup/shutdown) for natural gas and ULSD fuel oil scenarios.

Table 3-3. GE LM6000 Emissions Rates per CT

Pollutant	Maximum Emissions Rate (lb/hr)	
	Natural Gas	ULSD Fuel Oil
NO_x	44.73	75.07
CO	35.15	41.19
VOC	3.46	6.43
PM	5.10	15.51
PM_{10}	5.10	15.51
$PM_{2.5}$	5.10	15.51
SO_2	0.68	0.72
Lead	0.0002*	0.0067†
H_2SO_4	0.10	0.11
CO_2e	54,224	74,930

*Based on AP-42 Table 1.4-2 (EPA, 1998).
†Based on AP-42 Table 3.1-5 (EPA, 2000).

Sources: ProEnergy, Performance Data, 2018.
ECT, 2018.

3.2.2 Startup and Shutdown

CP Crane proposes the following definitions for startup and shutdown events:

- Startup—From first flame until minimum emissions compliance is reached
- Shutdown—From minimum emissions compliance until the time flame-out is reached

The design of the CTs will allow them to start up and reach full load in 10 minutes or less and shut down quickly multiple times per day if circumstances warrant. Annual emissions resulting from startup/shutdown operations for the proposed CTs are based on 250 startups per year, of which 25 startups could be with ULSD fuel oil.

Table 3-4 summarizes emissions during each event of startup and shutdown operations (in pounds [lb] per event) and the duration of the startup and shutdown event.

Table 3-4. Startup and Shutdown Operations per CT

Scenario	NO_x (lb per event)	CO (lb per event)	VOC (lb per event)	Duration (minutes)
Natural Gas				
Startup	3.6	3.2	0.5	10
Shutdown	3.1	2.5	0.33	8
ULSD Fuel Oil				
Startup	12.8	11.6	0.4	10
Shutdown	10.9	9.9	0.4	8

Sources: ProEnergy, 2018.
ECT, 2018.

3.2.3 Maximum Annual Emissions

CT fuel firing rates and emissions rates vary as a function of operating load and ambient temperature. In addition, emissions rates of some pollutants are greatest during startups and shutdowns, while emissions of other pollutants are greatest during normal full-power operation. Annual emissions for the CTs were calculated based on the maximum of either normal operation or emissions that include the maximum number of startup/shutdown events, depending on which operational scenario resulted in worst-case emissions. Potential emissions of HAPs from the CTs

were estimated using AP-42 Table 3.1-3 for natural gas and Tables 3.1-4 and 3.1-5 for distillate oil emissions factors.

Table 3-5 presents the PTE of the Project, the worst-case annual emissions (tpy), including startup and shutdown emissions of PSD/NNSR pollutants for the two fuel options, and a comparison to the respective SER.

Table 3-5. Proposed Project Maximum Annual Emissions and Comparison to the SER

Pollutant	Percent Load	Emissions for Three Turbines (tpy)	Black-start Generator (tpy)	Project Total (tpy)	SER (tpy)	Netting Required
NO_x	100%	169.93	1.52	171.45	25	Yes
CO	75%	127.08	1.88	128.96	100	Yes
VOC	50%	13.38	0.21	13.59	25	No
PM	100%	21.82	0.09	21.91	25	No
PM_{10}	100%	21.82	0.09	21.91	15	Yes
$PM_{2.5}$	100%	21.82	0.09	21.91	10	Yes
SO_2	100%	2.44	1.22E-03	2.44	40	No
H_2SO_4	100%	3.73E-01	9.34E-05	3.73E-01	7	No
Lead	100%	3.23E-03	—	3.23E-03	0.6	No
CO_2e	100%	200,060	115.16	200,175	75,000	Yes

Note: All pollutants at normal operation, burning natural gas at 90 percent and ULSD fuel oil at 10 percent, with startup/shutdown.

Sources: ProEnergy, 2018.
CP Crane, 2018.
ECT, 2018.

Once the emissions increases were calculated for the Repowering Project, they were compared to the pollutant-specific SERs listed in Table 3-2. Results show emissions increases for NO_x, CO, PM_{10}, $PM_{2.5}$, and GHG (CO_2e) are above their respective SER; hence, netting analysis is required. For all other pollutants, the emissions increase is not significant, so NSR is not applicable.

3.3 Baseline Actual Emissions

Per COMAR 26.11.17.01, for an existing electric utility steam generating unit, baseline actual emissions are determined by the average rate, in tons per year, at which the unit actually emitted

the pollutant during any consecutive 24-month period selected by the owner or operator within the 5-year period immediately preceding the date on which a complete application was submitted. In addition, the average rate must be adjusted downward to exclude emissions that exceeded any emissions limitation during the 24-month baseline period. Table 3-6 summarizes the baseline actual emissions based on the data provided by CP Crane for the pollutants that have proposed Project emissions above the SER.

Table 3-6. Baseline Actual Emissions

Parameter	NO_x	CO	PM_{10}	$PM_{2.5}$	CO_2e
Baseline actual emissions, Units 1 and 2 (tpy)	1,235.03	131.83	82.87	35.87	776,674
24-month period	September 2013 through August 2015	September 2013 through August 2015	September 2013 through August 2015	September 2013 through August 2015	September 2013 through August 2015

Source: CP Crane, 2018.
ECT, 2018.

Creditable means the increase or decrease has not been relied on in a previous permit action. Contemporaneous project emissions include the creditable emissions decreases that have occurred at the facility, which include the shutdown of existing coal-fired Unit 1 (MDE No. 3-0108) and Unit 2 (MDE No. 3-01109). Baseline actual emissions were based on a 24-month average annual emissions within the 5-year look-back period of September 2013 to August 2018. NO_x, CO, and GHG (CO_2e) emissions data for these years was provided by CP Crane. PM emissions were calculated based on the pound-per-million-British-thermal-units (lb/MMBtu) values from the stack test data provided by CP Crane and the actual monthly heat input (million British thermal units [MMBtu] per month) for Units 1 and 2. Per AP-42, particulate size fractions of 67 percent for PM_{10} and 29 percent for $PM_{2.5}$ were applied to total PM emissions. This results in a conservative netting analysis for PM_{10} and $PM_{2.5}$, as potential PM_{10} and $PM_{2.5}$ emissions from the three proposed CTs were not reduced based on these particulate size fractions.

Appendix B provides this information in more detail.

3.4 Netting Analysis

The final step of NSR applicability is netting analysis to determine a significant net emissions increase/decrease for those pollutants that caused a significant increase based on the Project. For NSR to apply, there has to be significant net emissions increase as well as significant emissions increase from the proposed Project. A significant net emissions increase is the sum of the emissions increases from the Project (Section 3.2), baseline actual emissions (Section 3.3), and any other increases and decreases at the entire facility that are contemporaneous and creditable during the contemporaneous period. There have been no permitting actions during the contemporaneous period (defined as 5 years prior to submittal of a complete application to the actual date when emissions occur).

As shown in Table 3-7 the Repowering Project does not result in a significant net emissions increase of any NSR pollutant.

Table 3-7. Netting Analysis

Description	NO_x	CO	PM_{10}	$PM_{2.5}$	CO_2e
Repowering Project (proposed increases) (tpy)	171.45	128.96	21.91	21.91	200,175
Baseline actual emissions (Units 1 and 2) (proposed decreases) (tpy)	1,235.03	131.83	82.87	35.87	776,674
Other contemporaneous emissions (tpy)	0.00	0.00	0.00	0.00	0.00
Net emissions increases/ decreases (tpy)	-1,063.57	-2.87	-60.95	-13.95	-576,499
NSR SERs (tpy)	25	100	15	10	75,000
Major modification (Yes/No)	No	No	No	No	No

Sources: CP Crane, 2018.
ECT, 2018.

4.0 State and Federal Emissions Standards

The regulatory mechanism for the Maryland Public Service Commission's (PSC's) review and approval process that applies to both construction and modification of an electrical generating station is contained in the PSC Law and corresponding regulations. The applicable regulations are found at COMAR 20.79, Applications Concerning the Construction or Modification of Generating Stations and Overhead Transmission Lines by a Nonutility Generator. COMAR 20.79.03.02 lists the specific environmental information required in a CPCN application. The CPCN functions as the PSD permit, NNSR authorization, and state air quality construction permit to construct. In accordance with COMAR 26.11.02.10, the Repowering Project is otherwise exempt from the need to apply for and obtain a permit to construct and approvals from MDE. In accordance with COMAR 20.79.01.06, a person may not commence a modification to the facilities at a power plant without receiving prior approval from the PSC.

MDE has adopted the federal EPA rules pertaining to PSD as contained in 40 CFR 52.21 (COMAR 26.11.06.14).

This section presents a review of the air quality regulations that will govern permitting and operation of the Repowering Project, which includes analysis of the applicability of federal and state air quality regulations.

4.1 Federal Regulatory Review

Federal regulatory programs, as administered and delegated by EPA, have been developed under the authority of the CAA and its amendments. The following subsections review the key elements of the federal regulatory program and the impact they have on the permitting and operation of the Project.

4.1.1 40 CFR 60—New Source Performance Standards

New source performance standards (NSPS) are technology-based standards applicable to new and modified stationary sources. The standards relevant to the Repowering Project are discussed in the following subsections.

4.1.1.1 NSPS Subpart A—General Provisions

NSPS Subpart A contains general requirements for notifications, recordkeeping, and performance testing and applies to stationary sources subject to NSPS. Any source subject to provisions under an NSPS subpart is also subject to the general provisions of NSPS Subpart A, except as noted in the applicable subpart. The proposed CTs are subject to the general provisions for NSPS units in 40 CFR 60, Subpart A, as they are subject to another NSPS as described in the following subsections.

4.1.1.2 NSPS Subpart Da—Standards of Performance for Electric Utility Steam-generating Units

Per 40 CFR 60.40Da(e)(l), "Affected facilities associated with a stationary CT that are capable of combusting more than 73 MW (250 million British thermal units per hour [MMBtu/hr]) heat input of fossil fuel are subject to this subpart except in cases when the affected facility meets the applicability requirements of and is subject to Subpart KKKK of this part." NSPS Subpart Da does not apply to the proposed CTs, since the simple-cycle CTs are not steam-generating units and are subject to Subpart KKKK.

4.1.1.3 NSPS Subpart Db—Standards of Performance for Industrial-Commercial-Institutional Steam-generating Units

NSPS Subpart Db applies to steam-generating units constructed after June 19, 1989, with a maximum design heat input capacity greater than 100 MMBtu/hr except in cases when the affected facility meets the applicability requirements of and is subject to Subpart KKKK of this part. NSPS Subpart Db does not apply to the Project CTs, since the simple-cycle CTs are not steam-generating units and are subject to Subpart KKKK.

4.1.1.4 NSPS Subpart Dc—Standards of Performance for Small Industrial Commercial Institutional Steam-generating Units

NSPS Subpart Dc applies to steam-generating units that commenced construction after June 9, 1989, and have a maximum design heat input capacity between 10 and 100 MMBtu/hr except in

cases when the affected facility meets the applicability requirements of and is subject to Subpart KKKK of this part. NSPS Subpart Dc does not apply to the Project CTs, since the simple-cycle CTs are not steam-generating units and are subject to Subpart KKKK.

4.1.1.5 NSPS 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

Per 40 CFR 60.110(a), the affected facility to which this subpart applies is each storage vessel with a capacity greater than 75 cubic meters (19,813 gallons) used to store volatile organic liquid for which construction, reconstruction, or modification is commenced after July 23, 1984. There are no storage tanks proposed as part of this Project, so NSPS Subpart Kb does not apply.

4.1.1.6 NSPS Subpart GG—Standards of Performance for Stationary Gas Turbines

NSPS Subpart GG applies to stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10 MMBtu/hr) based on the lower heating value of the fuel fired. Per 40 CFR 60.4305(b), turbines subject to the requirements of NSPS Subpart KKKK are exempt from NSPS Subpart GG. NSPS Subpart GG does not apply to the Repowering Project, because the proposed CTs will be subject to NSPS Subpart KKKK.

4.1.1.7 NSPS Subpart IIII—Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

NSPS Subpart IIII applies to the proposed newly installed black-start generator. Per 40 CFR 60.4200(a)(2), the provisions of this subpart are applicable to, "Owners and operators of stationary compression ignition internal combustion engines that commence construction after July 11, 2005, where the stationary compression ignition internal combustion engines are:

(i) Manufactured after April 1, 2006, and are not fire pump engines, or

(ii) Manufactured as a certified National Fire Protection Association fire pump engine after July 1, 2006."

The newly installed black-start generator will commence construction (be ordered) after July 11, 2005, and will be manufactured after April 1, 2006; therefore, the newly installed black-start generator is subject to Subpart IIII. Per 40 CFR 60.4205(a), owners and operators of pre-2007 model year emergency stationary compression ignition internal combustion engines with a

displacement of less than 10 liters per cylinder that are not fire pump engines must comply with the emissions standards in Table 1, 40 CFR 60, Subpart IIII. Per this Table 1, the applicable certification standards for units greater than 560 kW are 9.2 grams per kilowatt-hour (g/kW-hr) NO_x, 11.4 g/kW-hr CO, 1.3 g/kW-hr VOC, and 0.54 g/kW-hr PM. CP Crane will purchase a generator with limits equal to or more stringent than these limits.

4.1.1.8 NSPS Subpart KKKK—Standards of Performance for Stationary CTs

Per 40 CFR 60.4305, this subpart applies to stationary CTs with a heat input at peak load equal to or greater than 10 MMBtu/hr based on the high heating value (HHV) of the fuel and which commenced construction after February 18, 2005. The Project CTs commenced construction after February 18, 2005, and have an HHV input greater than 10 MMBtu/hr, so NSPS Subpart KKKK does apply to the Project CTs. Applicable requirements from this subpart include emissions limitations; testing, reporting, and recordkeeping requirements; and work practice standards. Since the Project CTs are subject to Subpart KKKK, they are exempt from the requirements of Subparts GG, Da, Db, and Dc.

Per 40 CFR 60.4333(a), CP Crane will operate and maintain the CTs, air pollution control equipment, and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times, including during startup, shutdown, and malfunction.

The peak load heat input rate of each of the simple-cycle CTs is 488 MMBtu/hr (HHV) firing natural gas and 476 MMBtu/hr (HHV) firing ULSD fuel oil. Therefore, the Repowering Project CTs are subject to this rule and subject to NO_x and SO_2 emissions limits in NSPS KKKK.

Emissions Limits for NO_x

As natural gas-fired CTs with a heat input at peak load greater than 50 MMBtu/hr and less than 850 MMBtu/hr, NO_x emissions from the turbines must be limited to 25 parts per million (ppm) at 15-percent oxygen gas or 150 nanograms per joule (ng/J) (1.2 pounds per megawatt-hour [lb/MWh]) of useful output. In addition, NO_x emissions from the CTs combusting ULSD fuel oil must be limited to 74 ppm at 15-percent oxygen gas or 460 ng/J (3.6 lb/MWh) of useful output. The proposed simple-cycle NO_x emissions from the CTs will not exceed 25 parts per million by

volume dry (ppmvd) at 15-percent oxygen gas when operating on natural gas and 42 ppmvd at 15-percent oxygen gas when operating on ULSD fuel oil. When the CTs are operating at loads less than 75 percent of peak load, NO_x emissions will not exceed 96 ppm at 15-percent oxygen gas.

To demonstrate compliance with NO_x emissions limits, CP Crane will install continuous emissions monitoring systems (CEMS) for NO_x, thereby satisfying the requirements specified in 40 CFR 60.4340(b)(l). CP Crane will comply with CEMS requirements specified in 40 CFR 60.4345 and excess emissions requirements specified in 40 CFR 60.4350.

Emissions Limits for SO_2

Per 40 CFR 60.4330(a)(2), for SO_2 emissions, each CT must comply with either limiting emissions to less than 110 ng/J (0.90 lb/MWh) gross output or burning fuel that contains total potential sulfur equal or less than 26 ng/J (0.060 lb/MMBtu) heat input. CP Crane will comply with SO_2 emissions limitations by combusting pipeline-quality natural gas with sulfur content less than 0.5 gr/100 scf based an annual averaging period and ULSD fuel oil with a sulfur content of 0.0015 percent by weight.

4.1.1.9 NSPS Subpart TTTT—Standards of Performance for GHG Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units

NSPS Subpart TTTT was finalized on October 23, 2015, and is applicable to fossil fuel-fired power plants that commenced construction on or after January 8, 2014; therefore, Subpart TTTT is applicable to the Repowering Project. CP Crane will comply with applicable monitoring, reporting, and performance test requirements of the rule.

4.1.2 40 CFR 61, Subpart M—National Emissions Standards for Asbestos

CP Crane will comply with 40 CFR 61, Subpart M, when conducting renovation or demolition activities at the facility.

4.1.3 40 CFR 63—National Emissions Standards for Hazardous Air Pollutants

National Emission Standards for Hazardous Air Pollutants (NESHAP) are emissions standards for HAPs emitted from stationary sources. A major source of HAPs is any stationary source with

a PTE of 10 tpy or more of a single HAP or 25 tpy of combined HAPs. Recent NESHAP promulgated under 40 CFR 63 reflect retracting the "once in, always in" policy for major sources of HAPs, meaning facilities that are currently a major source of HAP may switch to area source status if facilities take measures to bring HAP emissions below applicable thresholds.

CP Crane is currently a major source of HAP, and the proposed post-Project will not have emissions greater than 10 tpy of any one HAP or a total of 25 tpy of all HAPs combined. Therefore, for NESHAP applicability, post-Project is considered an area source of HAP emissions.

4.1.3.1 NESHAP Subpart YYYY—Stationary CTs

Subpart YYYY applies to stationary CTs at major sources of HAPs. Emissions and operating limitations under Subpart YYYY apply to new and reconstructed stationary CTs. Crane Station is an area source (i.e., not major source) of HAPs. Therefore, this subpart will not apply, because it only applies to major sources.

4.1.3.2 NESHAP Subpart ZZZZ—Stationary Reciprocating Internal Combustion Engine

NESHAP Subpart ZZZZ applies to new and existing internal combustion engines located at major and area sources. Subpart ZZZZ contains emissions and operating limits for HAPs emitted from stationary reciprocating internal combustion engines. Per 40 CFR 63.6590(c), the requirements of Subpart ZZZZ are met via compliance with 40 CFR 60, Subpart IIII.

4.1.4 40 CFR 68—CAA Section 112(r)

Title III of the 1990 CAA Amendments contains requirements for subject facilities that store and/or process certain hazardous substances for their safe use and storage. Under these requirements, facilities must identify and assess their hazards and carry out certain activities designed to reduce the likelihood and severity of accidental chemical releases. Section 112(r) of the CAA, codified in 40 CFR 68, mandates EPA publish rules to develop and implement risk management plans for sources with more than the threshold quantity of a listed regulated substance to identify, prevent, and minimize the consequences of accidental releases. There will be no change to the applicability of this rule due to the Project.

4.1.5 40 CFR 72 and 75—Acid Rain Program

Proposed CT units will be subject to EPA's Acid Rain Program, and CP Crane will comply with the requirements of an acid rain permit. Appendix E contains a completed acid rain permit application form.

4.1.6 40 CFR 97—Cross-State Air Pollution Rule

The Cross-State Air Pollution Rule was finalized on July 6, 2011, and requires states to improve air quality by reducing power plant emissions that contribute to ozone and/or fine particulate pollution in other states. Reduction will be achieved by means of a regional cap-and-trade program for SO_2 and NO_x emissions. After a number of delays due to court actions, the Cross-State Air Pollution Rule took effect January 1, 2015, and is applicable to the Repowering Project. CP Crane will comply with the requirements of 40 CFR 97.

4.1.7 40 CFR 98—Mandatory GHG Reporting

The Mandatory GHG Reporting Rule requires facilities that emit greater than 25,000 metric tpy of CO_2e to report their GHG emissions. As the Project will exceed this threshold, reporting under 40 CFR 98 will be required. The requirements for the electricity generation category are outlined in 40 CFR 98, Subpart D. The Project will install CO_2 CEMS or use Equation G-4 in 40 CFR 75, Appendix G, to monitor CO_2 emissions. Methane and nitrous oxide emissions will be calculated based on the methodologies specified in 40 CFR 98, Subpart C.

4.2 State Regulatory Review

Crane Station's air emissions sources are subject to various MDE general emissions standards for stationary sources contained in COMAR 26.11.06, General Emissions Standards, Prohibitions, and Restrictions. Baltimore County is included in Area III for MDE air regulatory purposes as specified in COMAR 26.11.01.03. Potentially applicable regulations from COMAR 26.11 are identified in the subsections.

4.2.1 COMAR 26.11.01—General Administrative Provisions

COMAR 26.11.01 contains general administrative provisions applicable to the Crane Station Repowering Project, including requirements for testing, monitoring, recordkeeping, an emissions

certification report, and malfunctions. CP Crane will comply with the applicable provisions of COMAR 26.11.01.

4.2.2 COMAR 26.11.03—Permits, Approvals, and Registrations: Title V Permits

COMAR 26.11.03 requires CP Crane to complete and submit a Title V Part 70 application no later than 12 months after the date the emissions units commence operation.

4.2.3 COMAR 26.11.04—Ambient Air Quality Standards

COMAR 26.11.04 adopts the federal NAAQS and establishes a state ambient air quality for fluorides. The state ambient air quality standard for fluorides established in COMAR 26.11.04.01 does not apply to the Project, as no emissions of fluorides are expected from the proposed emissions units. The Repowering Project will comply with the federal NAAQS provisions incorporated into COMAR 26.11.04.02.

4.2.4 COMAR 26.11.05—Air Pollution Episode System

COMAR 26.11.05 establishes the requirements for development and operation under an air pollution episode system, which is designed to provide standards and procedures to be followed whenever pollution of the air has the potential of reaching an emergency condition if allowed to go unchecked. COMAR 26.11.05 is applicable at MDE’s discretion. If requested by MDE, CP Crane will prepare in writing standby emissions reduction plans, consistent with good industrial practice and safe operating procedures, for reducing emissions creating air pollution during periods of alert, warning, or emergency of an air pollution episode.

4.2.5 COMAR 26.11.06—General Emissions Standards, Prohibitions, and Restrictions

COMAR 26.11.06 establishes emissions standards for various pollutants from certain source types. Subsections of COMAR 26.11.06 potentially applicable to the Repowering Project are discussed in the following paragraphs.

4.2.5.1 COMAR 26.11.06.02—Visible Emissions

COMAR 26.11.06.02 establishes visible emissions limits for emissions sources. Per COMAR 26.11.09.02(A), the emissions sources required to comply with COMAR 26.11.09.05

take precedence over the requirements under this rule. Proposed sources are subject to COMAR 26.11.09.05 and, therefore, are not applicable to this rule. The visible emissions limitation specific to the Crane Station Repowering Project is explained under COMAR 26.11.09.05.

4.2.5.2 COMAR 26.11.06.03—PM

COMAR 26.11.06.03 establishes PM emissions limits for confined and unconfined sources and materials handling and construction operations. To minimize fugitive PM emissions from construction, the Project will comply with work practice standards in COMAR 26.11.06.03(D).

4.2.5.3 COMAR 26.11.06.04—CO in Areas III and IV

COMAR 26.11.06.04 is applicable only in Areas III and IV, and Baltimore County is under Area III. COMAR 26.11.06.04.A(2) applies to any installation that discharges CO at a rate exceeding 500 lb per day and at a concentration exceeding 12 percent by volume.

As per COMAR 26.11.06.04.A(4), a facility is not subject to this rule if the CO emissions will not violate NAAQS standards and the gas mixture containing CO will not support combustion due to the presence of noncombustible gases. The Repowering Project will not violate NAAQS and will demonstrate to MDE that the gas mixture containing CO will not support combustion; hence, this rule is not applicable.

4.2.5.4 COMAR 26.11.06.06—VOCs

The provisions of this regulation do not apply to the operations subject to the provisions of COMAR 26.11.09. The proposed CTs are subject to COMAR 26.11.09, and the subsections of that rule may be potentially applicable; hence, COMAR 26.11.06.06 is not applicable.

4.2.5.5 COMAR 26.11.06.08 and .09—Nuisance and Odors

COMAR 26.11.06.08 and .09 establish general provisions for control of nuisances and odor, respectively. The Repowering Project will be subject to these general requirements and will comply with the applicable requirements.

4.2.5.6 COMAR 26.11.06.12—Control of NSPS Sources

COMAR 26.11.06.12 adopts the federal NSPS regulations codified in 40 CFR 60. Applicability of NSPS regulations is discussed in Section 4.1.1.

4.2.5.7 COMAR 26.11.06.14—Control of PSD Sources

COMAR 26.11.06.14 incorporates by reference the federal PSD permitting regulations codified in 40 CFR 52.21. Nonapplicability of PSD permitting is discussed in Section 3.0.

4.2.6 COMAR 26.11.07—Open Fires

COMAR 26.11.07 prohibits open fires except as provided in COMAR 26.11.07.03 through .05. The Repowering Project will comply with the open fire prohibition and requirements.

4.2.7 COMAR 26.11.09—Control of Fuel-burning Equipment, Stationary Internal Combustion Engines, and Certain Fuel-burning Installations

COMAR 26.11.09 applies to fuel-burning units and establishes emissions standards for various pollutants from certain source types of fuel-burning units. The Project CTs meet the definition of fuel-burning equipment, and subsections of COMAR 26.11.09 potentially applicable to the Repowering Project are discussed in the following paragraphs.

4.2.7.1 COMAR 26.11.09.05—Visible Emissions

COMAR 26.11.09.05 establishes visible emissions limits for fuel burning equipment. The CTs for the Repowering Project will need to comply visible emissions limits under this regulation. Per COMAR 26.11.09.05(A)(2), proposed sources should not discharge emissions, other than water in an uncombined form, which is visible to human observers (i.e., to comply with a visible emissions limit of 10-percent opacity), except during startup and process modification or adjustments or occasional cleaning of control equipment if the visible emissions will not exceed 40-percent opacity and the visible emissions do not occur for more than 6 consecutive minutes in any 60-minute period. The Project will comply with COMAR 26.11.09.05.

4.2.7.2 COMAR 26.11.09.06—Control of PM

COMAR 26.11.09.06 limits emissions of PM from fuel-burning equipment. The requirements in this chapter do not apply to natural gas-burning or distillate oil-burning equipment. Since natural

gas and distillate oil is proposed to be the sole sources of fuel for the CTs being installed for this Project, these requirements do not apply to the Repowering Project.

4.2.7.3 COMAR 26.11.09.07—Control of Sulfur Oxides from Fuel-burning Equipment

COMAR 26.11.09.07 establishes limits for sulfur oxides emissions from fuel-burning equipment. The Repowering Project is in Area III and will comply with a limit of 0.3-percent sulfur content in ULSD fuel oil burned in the CTs per COMAR 26.11.09.07(A)(2)(b).

4.2.7.4 COMAR 26.11.09.08—Control of NO_X Emissions for Major Stationary Sources

COMAR 26.11.09.08 applies to installations that cause emissions of NO_x located at a facility that has a PTE for NO_x of 25 tpy or more located in Baltimore County.

The Project CTs emit NO_x emissions greater than 25 tpy; therefore, this rule is applicable. To demonstrate compliance with NO_x emissions limits, CP Crane will install CEMS for NO_x (as mentioned under NSPS Subpart KKKK), thereby satisfying the requirements specified in COMAR 26.11.09.08 B.2. CP Crane will comply with applicable provisions for CTs under this rule.

This rule does not apply to the proposed newly installed black-start generator, because the PTE emissions are less than 25 tpy, and the generator is not considered a major stationary source.

4.2.8 COMAR 26.11.15—Toxic Air Pollutants

COMAR 26.11.15.03 exempts fuel-burning equipment other than equipment burning refuse-derived fuel from conducting an analysis of best available control technology for toxics (TBACT). Per COMAR 26.11.15.03(B), the CTs and newly installed black-start generator are exempt from TBACT requirements. Hence, the Project CTs are not subject to this requirement.

4.2.9 COMAR 26.11.17—Nonattainment Provisions for Major New Sources and Major Modifications

COMAR 26.11.17 establishes Maryland's NNSR permitting program for major sources and major modifications. The Repowering Project is not a major modification, and the nonapplicability of NNSR permitting is demonstrated in Section 3.0.

4.2.10 COMAR 26.11.26—Conformity

COMAR 26.11.26 implements the conformity required of the CAA. CP Crane will comply with the general conformity requirements of 40 CFR 93, Subpart B, and COMAR 26.11.26.09.

4.2.11 COMAR 26.11.27—Emissions Limitations for Power Plants

COMAR 26.11.27 establishes emissions limitations for facilities listed in COMAR 26.11.27.01(B)(1). Crane Station is in the list of affected facilities. But CP Crane is proposing to shut down the existing coal-fired Units 1 and 2; therefore, COMAR 26.11.27 is not applicable.

4.3 COMAR 26.09—Maryland CO_2 Budget Trading Program

Crane Station is subject to the Maryland CO_2 Budget Trading Program outlined in COMAR 26.09. The Repowering Project is subject to the requirements of CO_2 reporting and the emissions reduction program. CP Crane will comply with the applicable requirements under this rule.

5.0 Air Quality Impact Analysis Methodology

5.1 General Approach

At the federal level, because the emissions increases from the Crane Station equipment are less than applicable major source thresholds, Crane Station will not trigger federal NSR requirements for any regulated air pollutant under either PSD or NNSR permitting programs. At the state level, the Repowering Project triggers air permitting through MDE as a minor source of air emissions subject to state permit-to-construct-and-operate permitting. If the agency considers any project triggering minor NSR permitting could threaten attainment with NAAQS, MDE can require air dispersion modeling for that project. A sitewide modeling analysis for criteria pollutants has been performed to demonstrate the Project will comply with NAAQS. This section details the NAAQS modeling assessment for the Repowering Project.

5.2 Pollutants Evaluated

NAAQS analysis was performed for NO_x, CO, PM_{10}, $PM_{2.5}$, SO_2, and lead (Table 5-1). An air quality impact analysis is not required for VOC or GHG, as EPA has not established NAAQS for these pollutants.

5.3 Model Selection

The most recent versions of the American Meteorological Society (AMS)/EPA Regulatory Model Improvement Committee (AERMIC) model (AERMOD) system components were used. These include the existing regulatory components (AERMOD, AERMOD meteorological preprocessor program [AERMET], AERMOD terrain preprocessor program [AERMAP], and Building Profile Input Program [BPIP] for Plume Rise Model Enhancement [PRIME] [BPIPPRM]), AERSURFACE, and AERMINUTE.

Table 5-1. Summary of Applicable NAAQS

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)
SO_2	1- hour*	196
	3-hour†	1,300
PM_{10}	24-hour§	150
$PM_{2.5}$	24-hour¥	35
	Annualψ	12
NO_2	1-hour	188Δ
	Annual‡	100
CO	1-hour†	40,000
	8-hour†	10,000
Lead	Rolling 3-month	0.15

Note: $\mu g/m^3$ = microgram per cubic meter.
NO_2 = nitrogen dioxide.

*Standard based on 3-year average of the 99th percentile of the annual distribution of 1-hour daily maximum SO_2 concentrations.
†Not to be exceeded more than once per calendar year.
‡Arithmetic mean.
§Standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$, as determined in accordance with 40 CFR 50, Appendix K, is equal to or less than 1 day.
¥98th percentile concentration, as determined in accordance with 40 CFR 50, Appendix N.
ψArithmetic mean concentration, as determined in accordance with 40 CFR 50, Appendix N.
ΔStandard based on 3-year average of the 98th percentile of the annual distribution of 1-hour daily maximum NO_2 concentrations.

Source: ECT, 2018.

AERMOD (Version 18081) was used in the refined modeling analyses for flat, elevated, and complex terrain. AERMOD was run using the most recent version of the Providence Engineering and Environmental Group, LLC, BEEST Suite (BEEST), currently Version 11.12, an interface for EPA's AERMOD. AERMOD is an EPA-approved refined dispersion model for evaluating impacts of land-based stationary sources. AERMOD is one of the listed refined dispersion models in EPA's Guideline on Air Quality Models (GAQM) (40 CFR 51, Appendix W), which are required to be used for state implementation plan revisions for existing sources and NSR and PSD programs. An equivalency demonstration using EPA's standard version of the AERMOD code and the BEEST version of the AERMOD code was provided by Providence Engineering and Environmental Group, LLC, and is included with the air dispersion modeling data in Appendix D.

AERMOD with PRIME includes building downwash algorithms capable of modeling receptors in both the near-building wake (cavity) and far-building wake regions. The PRIME algorithm takes into account the distance from each building or structure to potentially affected sources in that building's region of influence. The inclusion of the cavity predictions within AERMOD removes a modeling discontinuity that existed with AERMOD without using the PRIME algorithm and removes the need for additional cavity impact analysis using the SCREEN3/ AERSCREEN model or other calculation procedures.

5.4 Model Options

5.4.1 Regulatory Default Options

Default AERMOD control options were used in the refined modeling analysis consistent with EPA recommendations, including:

- Stack-tip downwash.
- Incorporation of effects of elevated terrain.
- Calm wind processing routine.
- Missing data processing routine.
- Default wind profile exponents.
- Default vertical potential temperature gradients.

5.4.2 Averaging Periods

Table 5-1 provides the applicable pollutants and applicable form of the averaging period for determination of ambient background design values and NAAQS.

5.4.3 Urban/Rural Dispersion Coefficients Determination

The selection of urban or rural designation for refined modeling input is based on the Auer land use classification procedure. The area, circumscribed by a 3-km radius circle centered about the Project CT stacks, is depicted on a U.S. Geological Survey (USGS) topographical map on Figure 2-3, Section 2.0. In making the urban/rural determinations, areas on the topographic map shaded pink and purple are considered urban, and areas shaded green are considered rural. National Land Cover Database (NLCD) Code 23 (developed, medium intensity) and Code 24 (developed, high intensity) are considered equivalent to Auer land use types recommended to be urban, according to land use procedures in Subsection 7.2.3(c) of EPA's GAQM. As shown in Figure 5-1, land use is predominantly rural classifications. Therefore, rural dispersion coefficients were used in the dispersion modeling analysis.

5.4.4 NO_2 Ambient Impact Analysis

For 1-hour nitrogen dioxide (NO_2) impacts, the default Tier 2/ambient ratio method NO_x conversion option was used in accordance with 40 CFR 51, Appendix W, EPA guidance revised in 2017. The national default for the default Tier 2/ambient ratio method has a minimum ambient NO_2/NO_x ratio of 0.5 and a maximum ambient ratio of 0.9, which was used as discussed in EPA NO_2 modeling guidance.

The Tier 3 NO_x conversion option was not necessary (e.g., plume volume molar ratio method) for this modeling analysis. Therefore, additional documentation in support of its use is not provided in this application. Additionally, as identified in EPA's revised Appendix W, emissions sources that operate intermittently were not included in the modeling analysis.

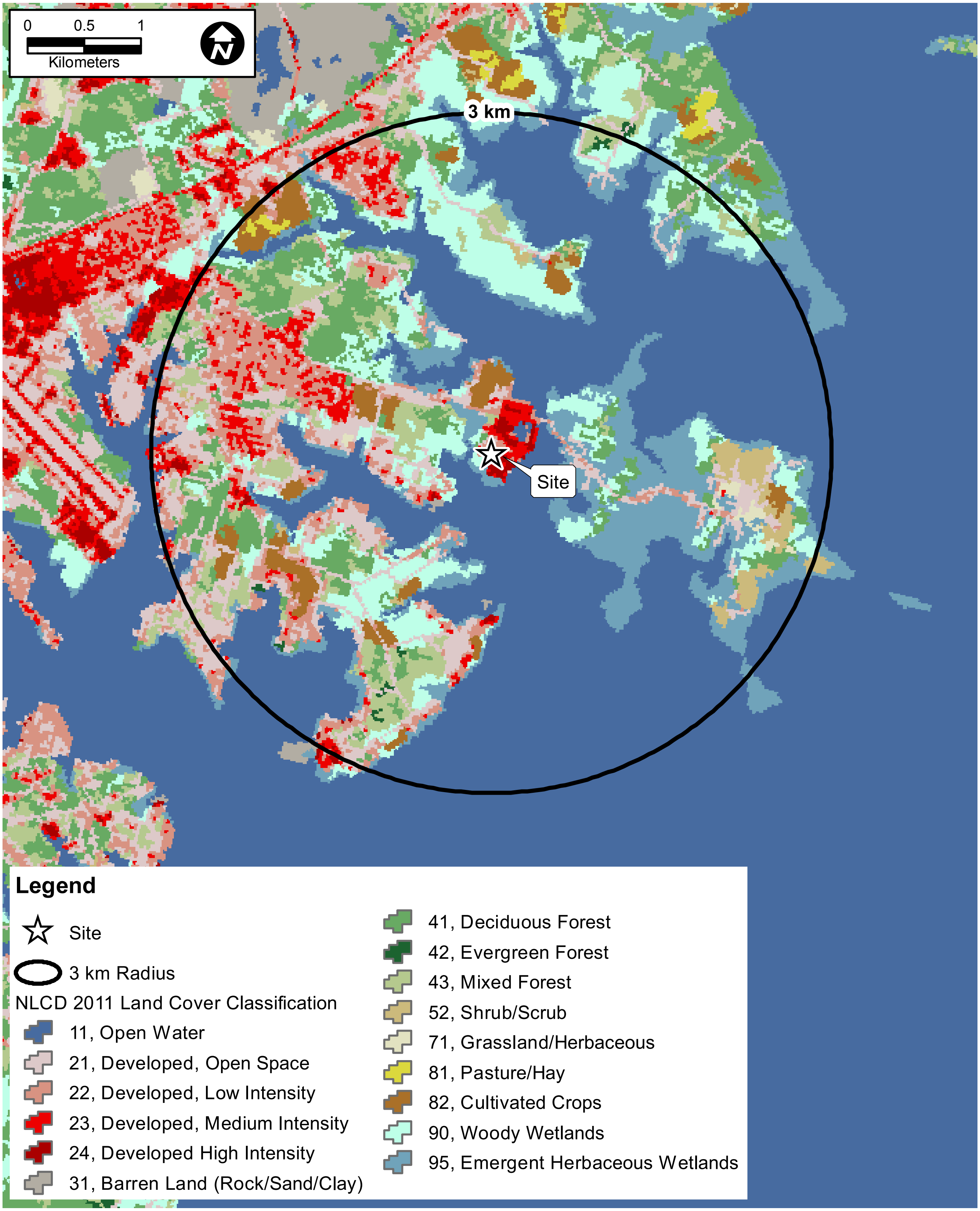


FIGURE 5-1.

PROJECT SITE LAND COVER (NLCD 2011)

Sources: Esri Basemap Imagery, ECT 2018.

ECT Environmental Consulting & Technology, Inc.

5.5 Terrain Consideration

The GAQM defines flat terrain as terrain equal to the elevation of the stack base, simple terrain as terrain lower than the height of the stack top, and complex terrain as terrain exceeding the height of the stack being modeled.

The site elevation for the Project site is approximately 5 feet above mean sea level (ft-msl). The Project CT stacks will each have a height of 150 feet above ground level (ft-agl). Accordingly, terrain elevations above approximately 155 ft-msl (for the CT) are classified as complex terrain. USGS National Elevation Dataset (NED) terrain data in georeferenced tagged image file format (GeoTIFF) were examined for terrain features within the expected Project impact area. Crane Station occupies the end of a small peninsula into Gunpowder River and Chesapeake Bay. Saltpeter Creek lies to the north, while Seneca Creek is to the south. The topography near the Project site is mostly flat with elevations gradually increasing as you move out from the Project site in all directions. The maximum elevation within 10 km of the Project site is 375 ft-msl. Based on this examination, terrain near the Project site is classified as ranging from flat to complex terrain.

In accordance with the GAQM recommendations for AERMOD, each modeled receptor was assigned a terrain elevation based on USGS NED data and use of AERMAP, the AERMOD terrain preprocessing program. AERMAP was used in accordance with the latest version of the AERMAP User's Guide (March 2011) (EPA, 2011) and EPA's GAQM.

5.6 Good Engineering Practice Stack Height and Building Downwash Evaluation

The CAA Amendments of 1990 require the degree of emissions limitation required for control of any pollutant not be affected by a stack height that exceeds good engineering practice (GEP) or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations (40 CFR 51). GEP stack heights for the facility emissions sources will comply with EPA promulgated final stack height regulations. GEP stack height is defined as the highest of 65 meters, or a height established by applying the formula:

$$Hg = H + 1.5L$$

where: Hg = GEP stack height.

H = height of the structure or nearby structure.

L = lesser dimension (height or projected width) of the nearby structure.

Nearby is defined as a distance up to five times the lesser of the height or width dimension of a structure or terrain feature but not greater than 800 meters. While GEP stack height regulations require stack height used in modeling for determining compliance with NAAQS and PSD increments not exceed GEP stack height, the actual stack height may be greater.

Heights proposed for the CT stacks (150 ft-agl) are less than the GEP stack height calculated by BPIPPRM as well as the default GEP height of 213 ft (65 meters). Since the stack heights for the Project emissions sources will comply with EPA promulgated final stack height regulations, the proposed Project stack heights were used in the modeling analyses.

While GEP stack height rules address the maximum stack height that can be employed in a dispersion model analysis, stacks having heights lower than GEP stack height can potentially result in higher downwind concentrations due to building downwash effects. AERMOD evaluates the effects of building downwash based on PRIME building downwash algorithms. For the ambient impact analysis, the complex downwash analysis implemented by AERMOD was performed using the current version of EPA's BPIPPRM (Version 04274 September 30, 2004). The EPA BPIP program was used to determine the area of influence for each building, whether a particular stack is subject to building downwash, the area of influence for directionally dependent building downwash, and finally to generate the specific building dimension data required by the model. BPIP output consists of an array of 36 direction-specific (10 to 360 degrees) building heights (BUILDHGT keyword), lengths (BUILDLEN keyword), widths (BUILDWID keyword), along-flow (XBADJ keyword), and across-flow (YBADJ keyword) distances for each stack suitable for use as input to AERMOD. Downwash was computed for the Project's source stacks. The building/structure dimensions were determined from engineering layouts and specifications. Figure 5-2 shows the buildings/structures source locations considered in the modeling analysis and the fence line.

FIGURE 5-2.

SOURCE LOCATIONS, FENCE LINE, AND MAIN BUILDING STRUCTURES INCLUDED IN GEP ANALYSIS

Sources: Esri Basemap Imagery, ECT 2018.

ECT Environmental Consulting & Technology, Inc.

5.7 Receptor Grids

Receptors were placed at locations considered ambient air, defined as "that portion of the atmosphere, external to buildings, to which the general public has access." The nearest locations of general public access will be at the existing fence line and the waterfront boundary.

The ambient impact analysis used the following receptor grids:

- Fence Line Receptors—Receptors placed along the existing fence line and waterfront boundary spaced 25 meters apart
- Fine Grid Receptors—Receptors at 100-meter spacings starting at the fence line and extending to approximately 10,000 meters

Per the AERMAP User's Guide, the domain was considered sufficiently large to accommodate the significant nodes such that all terrain features that exceed a 10-percent elevation slope from any given receptor were considered. The "calculate domain" feature of BEEST was used to determine the domain and quads required so the terrain that exceeds the 10-percent slope was included.

Terrain elevations at each of the receptor points was specified by importing NED GeoTIFF terrain data files covering the modeling domain into the BEEST interface. The 0.33-arc-second (10-meter spatial resolution) NED elevation GeoTiff files were obtained for the modeling domain from the Multi-Resolution Land Characteristics Consortium website (http://www.mrlc.gov/). The receptor grid used in the modeling analysis was based on North American Datum of 1983 datum and in Zone 18. Figures 5-3 and 5-4 show the far-field and near-field Cartesian receptor grid, respectively, considered for the modeling analysis.

5.8 Meteorological Data

EPA AERMET and AERSURFACE meteorological data preprocessing programs were used to generate the meteorological data required by AERMOD. The AERMET meteorological preprocessing program creates two files used by AERMOD: surface and profile. The surface file contains boundary layer parameters, including friction velocity, Monin-Obukhov length, convective velocity scale, temperature scale, convectively generated boundary layer (CBL)

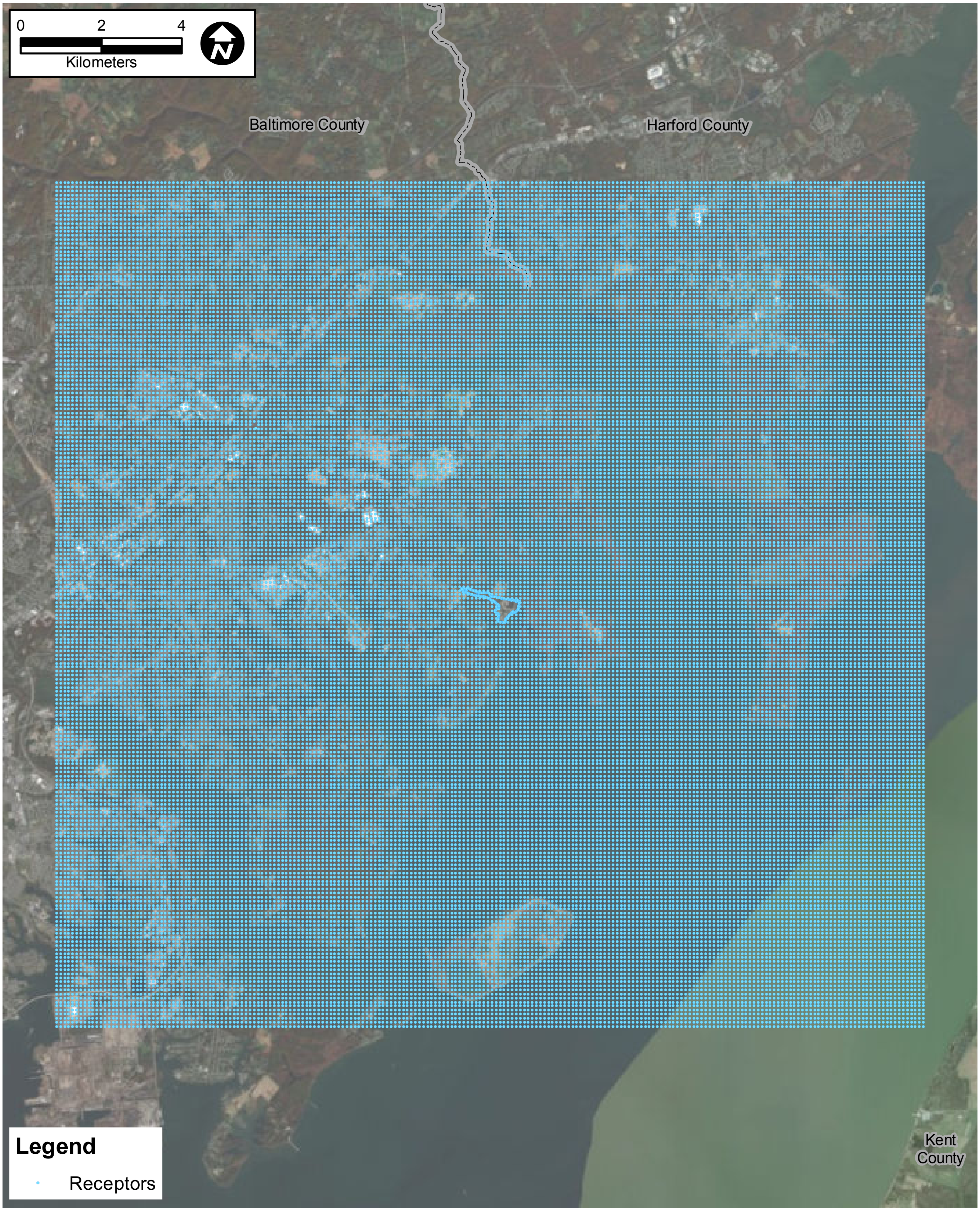


FIGURE 5-3.

10-km RECEPTOR GRID FOR NAAQS MODELING ANALYSIS

Sources: Esri Basemap Imagery, ECT 2018.

Environmental Consulting & Technology, Inc.

FIGURE 5-4.

NEAR-FIELD RECEPTOR GRID FOR NAAQS MODELING ANALYSIS

Sources: Esri Basemap Imagery, ECT 2018.

ECT Environmental Consulting & Technology, Inc.

height, stable boundary layer (SBL) height, and surface heat flux. The profile file contains multilevel data of windspeed, wind direction, and temperature.

AERMET calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, temperature scale, CBL and SBL heights, and surface heat flux. In addition, AERMET passes the observed meteorological parameters to AERMOD, including wind direction and speed (at multiple heights, if available), temperature, and, if available, measured turbulence. AERMOD uses this information to calculate concentrations in a manner that accounts for a dispersion rate that is a continuous function of meteorology.

The AERMET meteorological processor requires the determination of three surface characteristics: surface roughness length (zo), albedo (r), and Bowen ratio (Bo). Surface roughness length is related to the height of obstacles to the wind flow and is the height at which the mean horizontal wind speed is zero based on a logarithmic profile. Surface roughness length influences the surface shear stress and is an important factor in determining the magnitude of mechanical turbulence and stability of the boundary layer. Albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio, an indicator of surface moisture, is the ratio of sensible heat flux to latent heat flux and, together with albedo and other meteorological observations, is used for determining planetary boundary layer parameters for convective conditions driven by the surface sensible heat flux. The EPA AERSURFACE program was developed to aid users in obtaining realistic and reproducible surface characteristic values, including albedo, Bowen ratio, and surface roughness length, for input to AERMET. The program uses publicly available national land cover datasets and look-up tables of surface characteristics that vary by land cover type and season.

The meteorological data used in the air quality modeling consists of the most recent 5 years (2012 to 2016) of National Weather Service (NWS) data from the Baltimore/Washington International Thurgood Marshall Airport (BWI) surface meteorological station and the Sterling, Virginia, upper air station. The surface meteorological NWS site (Weather Bureau Army Navy [WBAN] Station No. 93721) is located at BWI approximately 32 km southeast of the Project site. MDE provided the meteorological data on March 27, 2018.

Table 5-2 summarizes identifying and location information for the BWI and Sterling, Virginia, stations. Figure 5-5 shows the relative locations of the meteorological sites and Repowering Project site. Figure 5-6 presents a wind rose for BWI from the 10-meter level. The wind rose was generated using the AERMET surface file (which included the 1-minute automated surface observing system data). As shown in the wind rose, the predominant wind direction for the site is from the west, although winds out of the southwest are also common.

Table 5-2. Meteorological Data Used in Running AERMET

Meteorological Site	Latitude	Longitude	Base Elevation (meters)
BWI	39.183	76.667	47.0
Sterling, Virginia	38.974	77.468	82.0

Source: ECT, 2018.

5.9 Representative Background Ambient Concentrations

Background concentrations representative of the Project's modeling domain were obtained from the most recent years of certified monitoring data (2014 through 2016) from the EPA Air Data website (https://www.epa.gov/outdoor-air-quality-data). Background concentrations of NO_2, SO_2, CO, and $PM_{2.5}$ are based on data from the Essex monitor (Site ID 24-005-3001), whereas background concentrations of PM_{10} are based on data from the Glen Burnie monitor (Site ID 24-003-1003) and lead from the Beltsville monitor (Site ID 24-033-0030). The CO 1- and 8-hour background concentrations are the highest concentrations from the 3 years of monitor values. The NO_2 1-hour background concentration is the average of the 3-year 98th percentile monitor value. The NO_2 annual background concentration is the highest concentration from the 3 years of monitor values. The SO_2 1-hour background concentration is the average of the 3-year 99th percentile monitor value. The SO_2 3-hour background concentration is the highest concentration from the 3 years of monitor values. The PM_{10} 24-hour background concentration is the highest concentration from the 3 years of monitor values. The $PM_{2.5}$ 24-hour background concentration is the 3-year average of the 98th percentile. The $PM_{2.5}$ annual background concentration value is the 3-year average of the weighted arithmetic mean monitor value. For

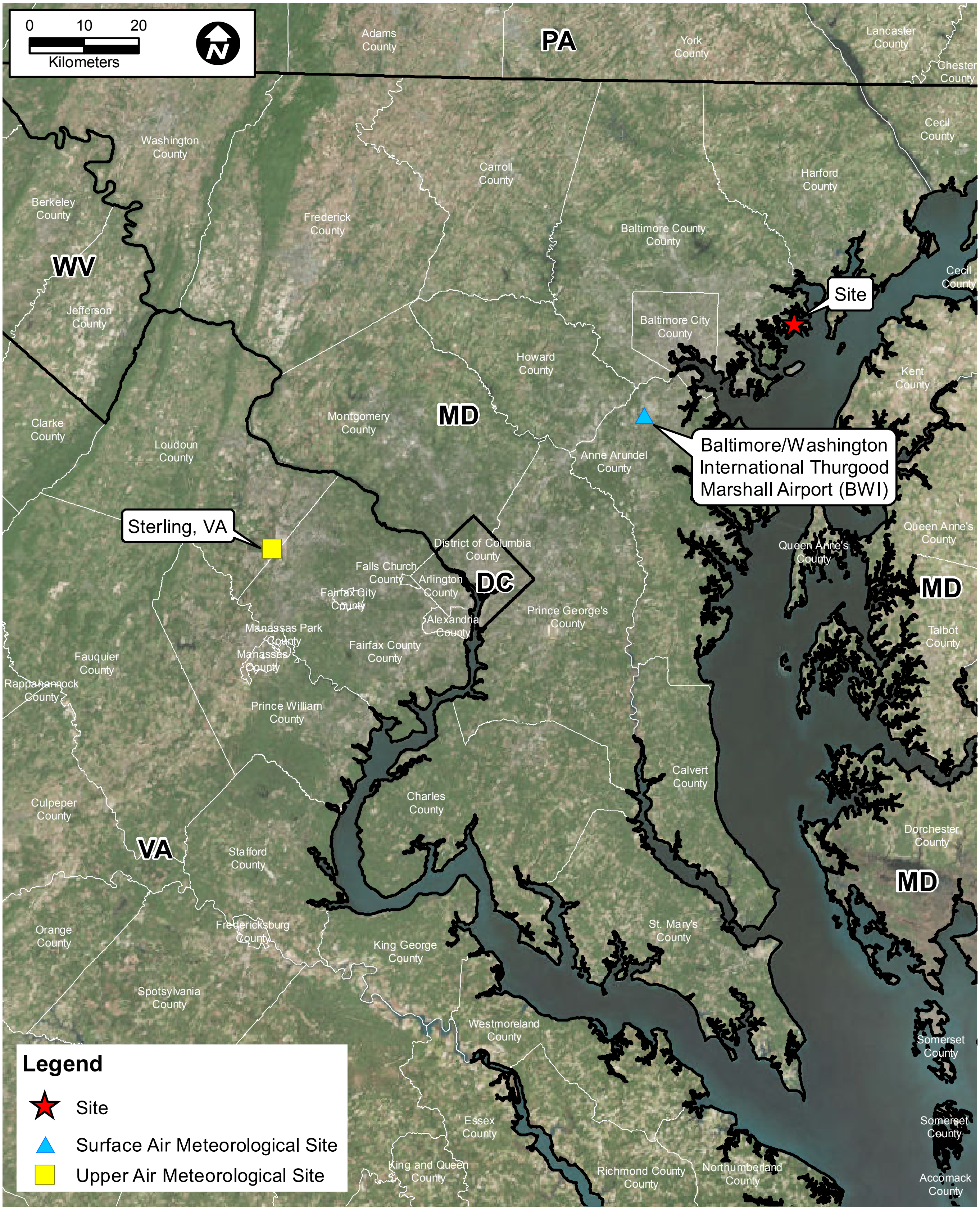
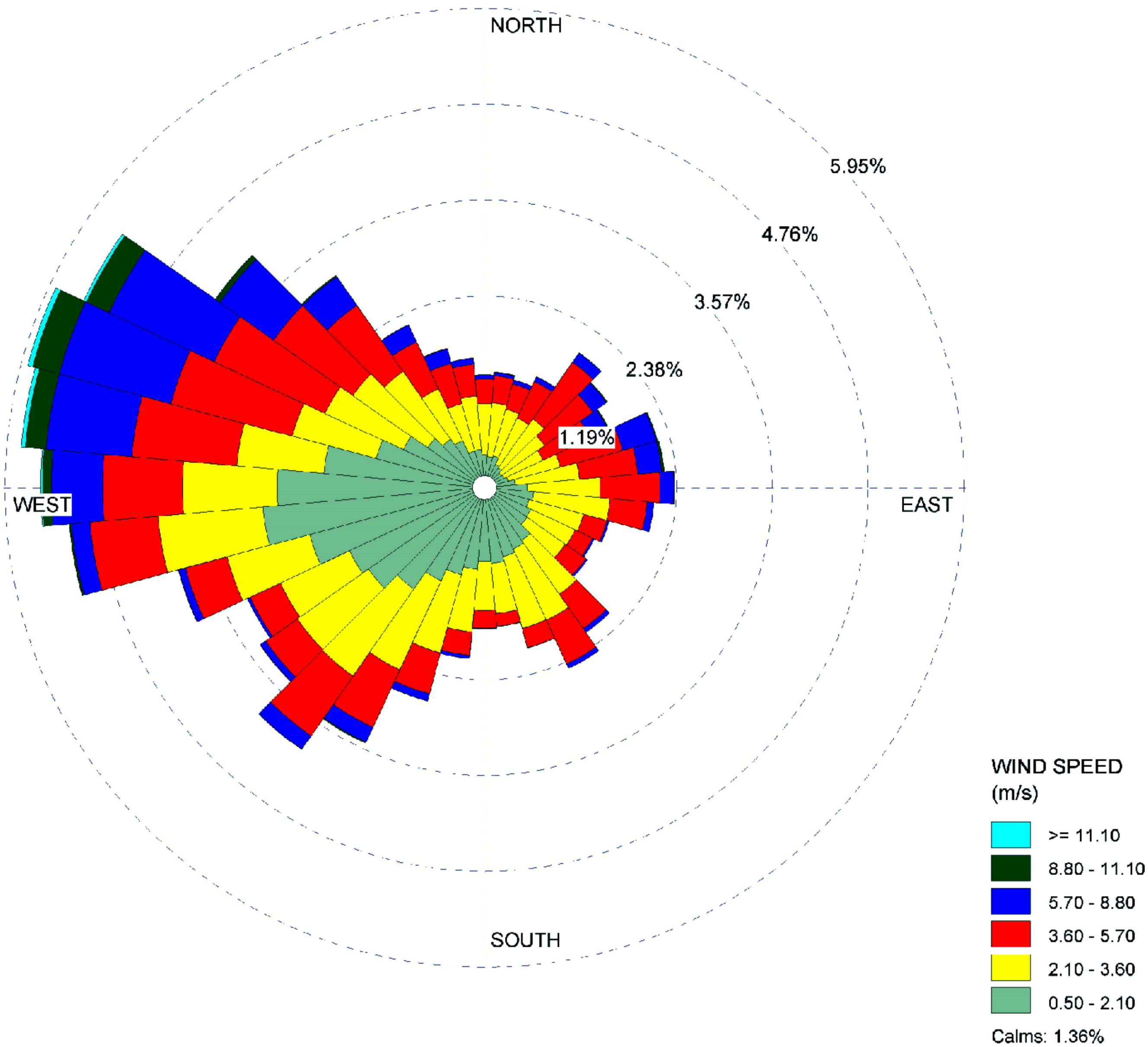


FIGURE 5-5.

LOCATIONS OF METEOROLOGICAL SITES

Sources: Esri Basemap Imagery, ECT 2018.

ECT Environmental Consulting & Technology, Inc.



Note: Wind Direction (Blowing From)

FIGURE 5-6.

BWI AIRPORT WIND ROSE (2012-2016)

Sources: MDE Provided Met Data.

ECT Environmental Consulting & Technology, Inc.

lead, since the only Maryland monitor was reporting 0.0 for the maximum 3-month average, the average of the fourth maximum monitor value is being conservatively used. Table 5-3 provides a summary of the ambient background concentrations to be used in the NAAQS compliance assessment.

Table 5-3. Proposed Background Concentrations

Pollutant	Averaging Period	Proposed Background Concentration (µg/m^3)
NO_2	1 hour	90.24
	Annual	29.92
$PM_{2.5}$	24-hour	22.67
	Annual	9.47
PM_{10}	24-hour	35.00
CO	1 hour	5,257.14
	8-hour	1,888.89
SO_2	1-hour	49.65
	3-hour	114.92
Lead	Rolling 3-month	0.004

Sources: EPA Air Data Website (https://www.epa.gov/outdoor-air-quality-data).
ECT, 2018.

5.10 Modeled Emissions Inventory

The dispersion modeling analyses conducted for the Repowering Project adheres to EPA's revised GAQM (40 CFR 51, Appendix W) (EPA, 2017). Based on the current Project design, the CTs are the primary sources of pollutant emissions at Crane Station. Significantly smaller quantities of criteria pollutants are emitted from the newly installed black-start generator, existing CT, existing emergency generator, and existing fire water pump. Modeling of facility sources was performed using appropriate emissions rates and stack parameters for each individual pollutant and averaging time.

As will be discussed in the following sections, dispersion modeling for the Repowering Project was conducted in a manner that used the CTs' worst-case operating conditions associated with the ambient temperature range that emissions were evaluated, in an effort to predict the highest

impact for each pollutant and averaging period. Maximum predicted impacts from the worst-case scenarios were analyzed for comparison to federal NAAQS.

5.10.1 Simple-cycle Turbine—Normal Operation

Based on current Project design parameters, CP Crane intends to apply for a permit that will allow annual operation of 2,365 hours, of which 237 hours may be burning ULSD fuel (excluding startup and shutdown). Since emissions rates and flue gas characteristics for a given CT load vary as a function of ambient temperature, data was derived for both natural gas and ULSD fuel oil for four operating loads (100, 75, 60, and 50 percent) and three ambient temperatures (95, 59, and 0°F) each.

The proposed GE CT is rated at a maximum capacity of 488 MMBtu/hr (HHV) when operating on natural gas and 476 MMBtu/hr (HHV) when operating on ULSD fuel.

To conservatively calculate ground-level concentrations, a composite worst-case set of emissions parameters were used in the modeling in an initial approach. For each CT load in the initial modeling, the highest pollutant-specific emissions rate coupled with the lowest exhaust temperature and exhaust flow rate was selected. Table 5-4 summarizes worst-case emissions parameters for the CTs over the proposed operating loads.

Table 5-4. Worst-case Data* for Proposed GE LM6000PC Simple-cycle Turbine Operation

Parameter		100%	75%	60%	50%
Stack height (ft)		150	150	150	150
Stack diameter (ft)		9	9	9	9
Natural Gas-fired					
Exit temperature (°F)		815	741	729	699
Exit velocity (fps)		121.43	127.12	124.20	106.97
Pollutant emissions per CT (lb/hr)	PM_{10}	5.10	4.07	3.45	3.01
	$PM_{2.5}$	5.10	4.07	3.45	3.01
	NO_x	44.73	41.24	37.89	35.56
	CO	32.67	35.15	35.05	34.64
	SO_2	0.68	0.55	0.46	0.40
	Lead	2.39E-04	2.39E-04	2.39E-04	2.39E-04
ULSD Fuel Oil-fired					
Exit temperature (°F)		828	761	740	711
Exit velocity (fps)		122.72	128.72	123.62	108.24
Pollutant emissions per CT (lb/hr)	PM_{10}	15.51	12.37	10.56	9.37
	$PM_{2.5}$	15.51	12.37	10.56	9.37
	NO_x	75.07	68.45	63.16	59.70
	CO	39.17	40.67	41.19	40.66
	SO_2	0.72	0.57	0.49	0.43
	Lead	6.66E-03	6.66E-03	6.66E-03	6.66E-03

Note: °F = degree Fahrenheit.
fps = foot per second.
ft = foot.
lb/hr = pound per hour.

*Table values represent per turbine worst-case parameters and emissions rates for each of the four operating loads enveloped across ambient temperatures.

Source: ECT, 2018.

5.10.2 Simple-cycle Turbine—Startup/Shutdown Operation

Startup/shutdown modeling was conducted for the short-term pollutants and averaging periods that had the potential for elevated emissions combined with lower plume rise during startup/shutdown conditions. Since emissions are higher for startup operations than shutdown, the more conservative startup emissions were modeled. Also, only NO_x and CO emissions were modeled during startup, since emissions of SO_2, PM_{10}, and $PM_{2.5}$ are higher during normal operation. Therefore, the pollutants and averaging periods evaluated included 1-hour NO_2, 1-hour CO, and 8-hour CO.

For purposes of modeling ambient impacts from startups, short-term emissions rates developed for startup operations for the proposed CTs take into account the time from ignition to compliance. The startup of the CTs has a duration of approximately 10 minutes. Emissions were calculated per startup event. Therefore, to conservatively quantify short-term average emissions rates for startup events, it was assumed the CTs were at 100-percent load for the balance of the averaging period when it is not in startup mode. The startup event and balance of the averaging period at 100 percent were modeled as separate stacks and were source-grouped together to get the overall concentration. Table 5-5 shows a summary of the startup emissions and pollutants for which startup modeling was conducted.

Table 5-5. Summary of Short-term Average Emissions Rates for CT Startups

Scenario	Units	Startup			100% Load	
		One Unit (per event)	Per Hour		Per Hour	
			1-hour Average	8-hour Average	1-hour Average	8-hour Average
Natural Gas						
Time from ignition until compliance	minutes	10				
Estimated exit velocity	fps		106.97	106.97	121.43	121.43
Estimated stack temperature	ºF		699	699	815	815
NO_x	lb		3.60	N/A	37.28	N/A
CO	lb		3.20	0.80	27.23	31.31
ULSD Fuel Oil						
Time from ignition until compliance	minutes	10				
Estimated exit velocity	fps		108.24	108.24	122.72	122.72
Estimated stack temperature	ºF		711	711	828	828
NO_x	lb		12.80	N/A	62.56	N/A
CO	lb		11.60	2.90	32.64	37.54

Note: ACFM = actual cubic feet per minute.
°F = degree Fahrenheit.
lb = pound.

Source: ECT, 2018.

5.10.3 Black-start Generator

The newly installed black-start generator will be tested once per year for 1 hour. Therefore, the modeled short-term emissions (24 hours or less) were normalized to operate 1 hour within the averaging period for the assessment of short-term modeled averaging periods. The newly installed black-start generator is only expected to operate when there is no electricity on the grid; however, 100 hours of annual operation was conservatively assumed for assessment of annual

modeled averaging periods. Table 5-6 provides stack parameters and criteria pollutant emissions rates for the newly installed black-start generator.

Table 5-6. Source Parameters and Criteria Pollutant Emissions Rates for the Black-start Generator

Stack Height (ft)	Stack Diameter (ft)	Exit Temperature (°F)	Exit Velocity (fps)	Hourly Emissions (lb/hr)					
				NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	Lead
9.33	0.7	750	147.34	*	37.70	0.0744	0.0744	0.0244	—

Note: °F = degree Fahrenheit.
fps = foot per second.
ft = foot.
lb/hr = pound per hour.

*Not included; intermittent source.

Source: ECT, 2018.

5.10.4 Ancillary Sources

Since the performance data for the auxiliary equipment are not affected by ambient conditions, only one set of parameters were modeled (e.g., stack parameters and emissions rates associated with 100-percent load). Table 5-7 provides stack parameters and criteria pollutant emissions rates for the existing CT.

Table 5-7. Source Parameters and Criteria Pollutant Emissions Rates for the Existing CT

Stack Height (ft)	Stack Diameter (ft)	Exit Temperature (°F)	Exit Velocity (fps)	Hourly Emissions (lb/hr)					
				NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	Lead
32	7.5	900	151.08	*	0.90	1.13	1.04	28.06	3.67E-03

Note: °F = degree Fahrenheit.
fps = foot per second.
ft = foot.
lb/hr = pound per hour.

*Not included; intermittent source.

Source: ECT, 2018.

The emergency diesel generator is tested for 30 minutes every month while the fire water pump is tested for 30 minutes every week. Therefore, the modeled short-term emissions (24 hours or less) were normalized to operate 30 minutes within the averaging period for the assessment of

short-term modeled averaging periods. Testing scenarios are assumed to not occur during startup or shutdown scenarios and therefore are only included during the normal operation scenarios. Additionally, for 1-hour NO_2 modeling, these units were not included in the modeling because of their intermittent operations.

The emergency generator and fire water pump are expected to operate no more than 10 and 50 hr/yr, respectively. However, the modeled annual emissions rates were conservatively based on 100 hours of annual operation for the assessment of annual modeled averaging periods.

Table 5-8 provides stack parameters and criteria pollutant emissions rates for the existing emergency diesel generator and existing fire water pump.

Table 5-8. Source Parameters and Criteria Pollutant Emissions Rates for Emergency Equipment, ULSD Fuel Oil-fired

Stack Height (ft)	Stack Diameter (ft)	Exit Temperature (°F)	Exit Velocity (fps)	Emissions									
				NO_x		CO		PM_{10}	$PM_{2.5}$		SO_2		Lead
				Annual (tpy)	1-hour (lb/hr)	1-hour (lb/hr)	8-hour (lb/hr)	24-hour (lb/hr)	24-hour (lb/hr)	Annual (tpy)	1-hour (lb/hr)	3-hour (lb/hr)	Monthly (lb.hr)
Emergency generator													
10	0.75	695	95.79	0.93	*	2.004	0.251	0.0275	0.0275	0.066	0.62	0.205	—
Firewater pump engine													
8	0.5	853	194.98	0.618	*	1.333	0.167	0.0183	0.0183	0.044	0.41	0.136	—

Note: °F = degree Fahrenheit.
fps = foot per second.
ft = foot.
lb/hr = pound per hour.

*Not included; intermittent source

Source: ECT, 2018.

6.0 Results of Class II Air Quality Impact Analyses

Table 6-1 presents the maximum modeled ambient air impacts from post-Project emissions from Crane Station calculated by AERMOD. As shown in the table, the maximum modeled concentrations when combined with a representative background concentration are less than applicable NAAQS for all pollutants.

Table 6-1. Facility Maximum Modeled Concentrations Compared to NAAQS

Pollutant	Averaging Period	Maximum Modeled Concentration* (µg/m³)	Monitored Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Complies? (Yes/No)
CO	1-hour†	5,291.21	5,257.14	10,548.35	40,000	Yes
	8-hour†	262.19	1,888.89	2,151.08	10,000	Yes
NO_2	1-hour‡	45.76	90.24	136.00	188	Yes
	Annual§	3.01	29.92	32.93	100	Yes
PM_{10}	24-hour¥	6.22	35.00	41.22	150	Yes
$PM_{2.5}$	24-hour‡	2.12	22.67	24.79	35	Yes
	Annualψ	0.18	9.47	9.65	12	Yes
SO_2	1-hourΔ	116.04	49.65	165.69	196	Yes
	3-hour†	68.39	114.92	183.31	1,300	Yes
Lead	Calendar quarter arithmetic mean	0.0007	0.004	0.005	0.15	Yes

*Maximum modeled concentration across all fuels and operating loads.
†Not to be exceeded more than once per calendar year.
‡98th percentile averaged over 3 years.
§Annual mean.
¥Not to be exceeded more than once per year on an average over 3 years.
ψAnnual arithmetic mean concentration averaged over 3 years.
Δ99th percentile of 1-hour daily maximum concentrations averaged over 3 years.

Source: ECT, 2018.

Appendix A

MDE Air Permitting Forms

AIR QUALITY PERMIT TO CONSTRUCT APPLICATION CHECKLIST

OWNER OF EQUIPMENT/PROCESS	
COMPANY NAME:	C.P. Crane, LLC
COMPANY ADDRESS:	200 West Madison Street, Suite 3810, Chicago, Illinois 60606
LOCATION OF EQUIPMENT/PROCESS	
PREMISES NAME:	C.P. Crane, LLC
PREMISES ADDRESS:	1001 Carroll Island Road, Chase, Maryland 21220
CONTACT INFORMATION FOR THIS PERMIT APPLICATION	
CONTACT NAME:	David R. Dunbar
JOB TITLE:	VP Operations & Development
PHONE NUMBER:	(404) 229-1069
EMAIL ADDRESS:	ddunbar@mrpgenco.com
DESCRIPTION OF EQUIPMENT OR PROCESS	
Three simple-cycle combustion turbines and one black start generator	

Application is hereby made to the Department of the Environment for a Permit to Construct for the following equipment or process as required by the State of Maryland Air Quality Regulation, COMAR 26.11.02.09.

Check each item that you have submitted as part of your application package.

☒ Application package cover letter describing the proposed project

☒ Complete application forms (Note the number of forms included or NA if not applicable.)

No. NA Form 5
No. NA Form 5T
No. NA Form 5EP
No. 1 Form 6
No. NA Form 10
No. 1 Form 11
No. NA Form 41
No. 1 Form 42
No. NA Form 44

☒ Vendor/manufacturer specifications/guarantees

☒ Evidence of Workman's Compensation Insurance

☐ Process flow diagrams with emission points

☒ Site plan including the location of the proposed source and property boundary

☒ Material balance data and all emissions calculations

☐ Material Safety Data Sheets (MSDS) or equivalent information for materials processed and manufactured.

☐ Certificate of Public Convenience and Necessity (CPCN) waiver documentation from the Public Service Commission [1]

☐ Documentation that the proposed installation complies with local zoning and land use requirements [2]

(1) Required for emergency and non-emergency generators installed on or after October 1, 2001 and rated at 2001 kW or more.

(2) Required for applications subject to Expanded Public Participation Requirements.

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Blvd ▪ Baltimore, Maryland 21230
(410) 537-3230 ▪ 1-800-633-6101 ▪ www.mde.state.md.us

Air and Radiation Management Administration ▪ Air Quality Permits Program

APPLICATION FOR FUEL BURNING EQUIPMENT

Permit to Construct ✓ Registration Update ☐ Initial Registration ☐

1A. Owner of Equipment/Company Name
C.P. Crane, LLC

Mailing Address/Street
200 W. Madison St. Suite 3810

City: Chicago State: IL Zip Code: 60606

Telephone Number: 404-229-1069

Print Name/Title
David R. Dunbar / VP Operations & Development

Signature: [signature] Date: August 30, 2018

DO NOT WRITE IN THIS BOX
2. Registration Number
County No. ☐☐ 1-2 Premises No. ☐☐☐☐ 3-6
Registration Class ☐ 7 Equipment No. ☐☐☐☐ 6-11
Data Year ☐☐ 12-13
Application Date

1B. Equipment Location (if different from above give Street Number and Name, City, State, Zip and Telephone Number):
1001 Carroll Island Road, Chase, Maryland, 21220

Premises Name (if different from above):

3. Status
A= New Equipment
B= Modification to Existing Equipment
C= Existing Equipment

Status	New Construction Began (MM/YY)	New Construction Completed (MM/YY)	Existing Initial Operation (MM/YY)
A			
15	16-19	20-23	20-23

4. Describe this Equipment (Make, Model, Features, Manufacturer, etc.):
General Electric LM6000 Combustion Turbine

5. Workmen's Compensation Coverage: Binder/Policy Number: 7839-09-30

Company Name: Federal Insurance Company Expiration Date April 7, 2019

NOTE: Before a Permit to Construct may be issued by the Department, the applicant must provide the Department with proof of worker's compensation coverage as required under Section 1-202 of the Worker's Compensation Act.

6. Number of Pieces of Identical Equipment to be Registered/Permitted at this Time: 3

7. Person Installing this Equipment (if different from above give Name/Title, Company Name, Mailing Address and Telephone Number):

8. Major Activity, Product or Service of Company at this Location:
Electric Utility Generation

9. Control Devices Associated with this Equipment

- None ☐ 24-0
- Simple/Multiple Cyclones ☐ 24-1
- Spray/Adsorb Tower ☐ 24-2
- Venturi Scrubber ☐ 24-3
- Carbon Adsorber ☐ 24-4
- Electrostatic Precipitator ☐ 24-5
- Bag-house ☐ 24-6
- Thermal/Catalytic Afterburner ☐ 24-7
- Dry Scrubber ☐ 24-8
- Other X 24-9 Describe Water Injection

10. Annual Fuel Consumption for this Equipment Only

Field	Value	Columns
OIL-1000 GALLONS	806	26-31
SULFUR %		32-33
GRADE		34
NATURAL GAS-1000 FT^3	1135200	35-41
LP GAS-100 GALLONS		42-45
GRADE		
COAL- TONS		46-52
SULFUR %		53-55
ASH%		56-58
WOOD-TONS		59-63
MOISTURE %		64-65

OTHER FUELS ______ (Specify Type) [ ] 66-1 ANNUAL AMOUNT CONSUMED ______ (Specify Units of Measure)

OTHER FUEL ______ (Specify Type) [ ] 66-2 ANNUAL AMOUNT CONSUMED ______ (Specify Units of Measure)

1= Coke 2= COG 3=BFG 4=Other

11. Operating Schedule (for this equipment)

Field	Value	Columns
Comfort/Space Heating Only		67-1
Process Heat Only	✓	67-2
Percent Process Heat		68-69
Oil Burner Type (1=Pressure Gun, 2=Air Atomizer, 3=Steam Atomizer, 4=Rotary Cup)		70
Coal Burner Type (1=Cyclone, 2=Stoker, 3=Pulverized, 4=Hand Fired)		71
Days Per Week	7	72
Days Per Year	365	73-75

SEASONAL VARIATION IN OPERATION (PERCENT):

None	Winter	Spring	Summer	Fall
✓ (76)	(77-78)	(79-80)	(81-82)	(83-84)

12. Exhaust Stack Information * Stack information provided below is for the primary fuel (natural gas) at 100% load at 59 degrees

Height Above Ground (ft)	Inside Diameter at Top (inches)	Exit Temperature (°F)	Exit Velocity (ft/sec)
150 (86-88)	108 (89-91)	816 (92-95)	146 (96-98)

13. Total Stack Emissions (for this equipment only) in Pounds Per Operating Day * Emission rates provided below are for the primary fuel (natural gas)

Pollutant	Value	Columns
Particulate Matter	122	99-104
Oxides of Sulfur	16	105-110
Oxides of Nitrogen	1074	111-116
Carbon Monoxide	844	117-122
Volatile Organic Compounds	83	123-128
PM-10	122	129-134

14. Method Used to Determine Emissions (1=Estimate, 2=AP42, 3=Stack Test, 4=Other Emission Factor)

TSP	SOx	NOx	CO	VOC	PM10
4 (165)	4 (166)	4 (167)	4 (168)	4 (169)	4 (170)

15. What is the Maximum Rated Heat Input of this Unit (Million Btu/hr)? 488 MMBtu/hr (Natural Gas) & 476 MMBtu/hr ULSD

Air and Radiation Management Administration Use Only

16. Date Rec'd Local__________ Date Rec'd State__________

Return to Local Jurisdiction Date __________ By __________

Rev'd by Local Jurisdiction: Date ______ By __________ Rev'd by State: Date______ By __________

Acknowledgement Sent by State: Date ______ By __________

17. Inventory Date (MM/YY) [ ] 171-174 SCC Code [ ] 178-185

18. Annual Operating Rate [ ] 186-192 Maximum Design Hourly Rate [ ] 193-199

Permit to Operate Month [ ] 200-201 Transaction Date [ ] 202-207 Staff Code [ ] 208-210 VOC [ ] 211 212 SIP Code [ ] 213 214

Regulation Code [ ] 215-218 Confidentiality [ ] 219

Point Description [ ] 220-238 Action [ ] 239 A: Add C: Change

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Blvd ▪ Baltimore, Maryland 21230
(410) 537-3230 ▪ 1-800-633-6101 ▪ www.mde.state.md.us

Air and Radiation Management Administration ▪ Air Quality Permits Program

APPLICATION FOR PERMIT TO CONSTRUCT
GAS CLEANING OR EMISSION CONTROL EQUIPMENT

1. Owner of Installation C.P. Crane, LLC	**Telephone No.** 312-766-4499		**Date of Application** August 30, 2018
2. Mailing Address 200 W. Madison Street, Suite 3810	**City** Chicago	**Zip Code** 60606	**County**
3. Equipment Location 1001 Carroll Island Road	**City/Town or P.O.** Chase		**County** Baltimore
4. Signature of Owner or Operator [signature]	**Title** VP Operations & Development		**Print or Type Name** David R. Dunbar

5. Application Type: **Alteration** ☐ **New Construction** ☒

6. Date Construction is to Start: March 2019 **Completion Date (Estimate):** December 2019

7. Type of Gas Cleaning or Emission Control Equipment:

Simple Cyclone ☐ **Multiple Cyclone** ☐ **Afterburner** ☐ **Electrostatic Precipitator** ☐

Scrubber ☐ ______________ (type) **Other** ☒ Water Injection (type)

8. Gas Cleaning Equipment Manufacturer **Model No.** **Collection Efficiency (Design Criteria)**

9. Type of Equipment which Control Equipment is to Service:

Combustion Turbine

10. Stack Test to be Conducted:

Yes ☒ **No** ☐ TBD (Stack Test to be Conducted By) ______ (Date)

11. Cost of Equipment TBD

Estimated Erection Cost TBD

Form number: 6
Revision date: 0/2000
TTY Users 1-800-735-2258

Recycled Paper

12. The Following Shall Be Design Criteria: * Design Criteria below is for ULSD at 100% load at 59 degrees

	INLET		OUTLET	
Gas Flow Rate	563,814	ACFM*	563,814	ACFM*
Gas Temperature	830	°F	830	°F
Gas Pressure	TBD	INCHES W.G.	TBD	INCHES W.G.

PRESSURE DROP ____________________

Dust Loading	N/A	GRAINS/ACFD**	N/A	GRAINS/ACFD**
Moisture Content OR	TBD	%		%
Wet Bulb Temperature		°F		°F
Liquid Flow Rate (Wet Scrubber)	N/A	GALLONS/MINUTE		

(WHEN SCRUBBER LIQUID OTHER THAN WATER INDICATE COMPOSITION OF SCRUBBING MEDIUM IN WEIGHT %)

*= ACTUAL CUBIC FEET PER MINUTE **= ACTUAL CUBIC FEET DRY

WHEN APPLICATION INVOLVES THE REDUCTION OF GASEOUS POLLUTANTS, PROVIDE THE CONCENTRATION OF EACH POLLUTANT IN THE GAS STREAM IN VOLUME PERCENT. INCLUDE THE COMPOSITION OF THE GASES ENTERING THE CLEANING DEVICE AND THE COMPOSITION OF EXHAUSTED GASES BEING DISCHARGED INTO THE ATMOSPHERE. USE AVAILABLE SPACE IN ITEM 15 ON PAGE 3.

13. Particle Size Analysis

Size of Dust Particles Entering Cleaning Unit	% of Total Dust	% to be Collected
0 to 10 Microns	N/A	N/A
10 to 44 Microns	N/A	N/A
Larger than 44 Microns	N/A	N/A

14. For Afterburner Construction Only:

Volume of Contaminated Air ______________________ CFM (DO NOT INCLUDE COMBUSTION AIR)

Gas Inlet Temperature ______________________ °F

Capacity of Afterburner ______________________ BTU/HR

Diameter (or area) of Afterburner Throat ______________

Combustion Chamber ______________ (diameter) ______________ (length) Operating Temperature at Afterburner ______ °F

Retention Time of Gases ______________________

15. Show Location of Dust Cleaning Equipment in the System. Draw or Sketch Flow Diagram Showing Emission Path from Source to Exhaust Point to Atmosphere.

The CTs will be equipped with a demineralized water injection system to reduce NOx emission to 42 ppmvd @ 15% oxygen during fuel oil operation.

Date Received: Local ______________________________ **State** ______________________________

Acknowledgement Date: ____________________

By ____

Reviewed By:

Local ____

State ____

Returned to Local:

Date ________________

By ____

Application Returned to Applicant:

Date _________________

By ____

REGISTRATION NUMBER OF ASSOCIATED EQUIPMENT: ☐ ☐☐☐☐

PREMISES NUMBER: ☐☐ ☐☐☐☐

Emission Calculations Revised By ____ **Date** _____________

MARYLAND DEPARTMENT OF THE ENVIRONMENT
Air and Radiation Management Administration ● Air Quality Permits Program
1800 Washington Boulevard ● Baltimore, Maryland 21230
(410)537-3230 ● 1-800-633-6101● www.mde.state.md.us

Mail application to

MDE/ARMA
1800 Washington Blvd, Suite 720
Baltimore, MD 21230-1720

Air Quality Permit to Construct & Registration Application for
EMERGENCY GENERATOR

You must check off all of the following items to be able to use this application form

☒ This generator is a dedicated emergency backup generator, and will not be used for peak or load shaving.
☒ This generator is powered by an internal combustion engine, not a turbine
☒ This generator's engine is at least 500 brake horsepower (373 kilowatts)
(Smaller emergency engines do not need a permit)

AND

You must check off one of the following items to be able to use this application form

☒ I do not need a CPCN Exemption because the generator is rated at 2000 kW or less
☐ I do not need a CPCN Exemption because the generator was installed before October 1, 2001
☐ I have a CPCN Exemption from the Public Service Commission for this generator
(Contact the Public Service Commission at 410.767.8131)

1) Business/Institution/Facility where the equipment will be located ☐ **Check if this is a federal facility**

Business/Institution/Facility Name: C.P. Crane, LLC
Phone: 410-682-9703
Mobile: 410-599-5953

Contact Person's Name: Kenneth Mcgreevy
Email Address: kmcgreevy@cpcranepower.com

Street Address: 1001 Carroll Island Road

City: Chase | State: Maryland | Zip Code: 21220 | County: Baltimore

2) Owner ☒ **Check if different from above. If checked, complete the following:**
Name: C.P. Crane, LLC
Phone: 404-229-1069

Mailing Address: 200 W. Madison St. Suite 3810

City: Chicago | State: IL | Zip Code: 60606

3) Installer ☐ **Check if different from above. If checked, complete the following:**
Contact Name: | Contact Company: | Phone:

4) Equipment Information

Manufacturer / Model: GN1500HSPCON, G19 | Installation Date: TBD

☐ Yes ☒ No — This generator will be operated as part of an emergency demand response program.

Number Installed: 1	Number Removed:	Stack Height (feet, estimated): 9.33	Stack Diameter (inches, estimated): 8.52	
Engine Make / Model: Cummins KTA50G9	EPA Tier Certified: Tier 1	Engine Horsepower : 2011.53	Engine Manufacture Date: TBD	Fuel Type: ULSD

5) Required Attachments (check that you've included them)

☒ Vendor literature

☐ CPCN Exemption from the Public Service Commission (not needed for generators installed before October 1, 2001, or rated at 1500 kW or less)

6) Workers Compensation Information (Environmental Article §1-202)

Workers insurance policy or binder number: 7839-09-30

☐ Check if self-employed or otherwise exempt from this requirement

"I CERTIFY UNDER PENALTY OF LAW THAT THE INFORMATION SUBMITTED IN THIS REQUEST FOR COVERAGE IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS."

[signature]	David R. Dunbar / VP Operations & Development	August 30, 2018
Owners Signature	**Printed Name and Title**	**Date**

LEAVE BLANK
MDE USE ONLY

☐ Permit
☐ Registration (Less than 1,000 brake horsepower & installed prior to 11/24/03)

Permit/Registration Number: _______ - _______ - _______ - _______

AI: _______

Emissions

	Sox	Nox	CO	VOC	PM	PM-10
Stack						
Fugitive						

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 04/06/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Marsh USA, Inc.
1166 Avenue of the Americas
New York, NY 10036

119-042-100--GAWU-18-19

CONTACT NAME:
PHONE (A/C, No, Ext): | **FAX (A/C, No):**
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Federal Insurance Company	20281
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Middle River Power, LLC
570 Lake Cook Road, Suite 126
Deerfield, IL 60015

COVERAGES **CERTIFICATE NUMBER:** NYC-010054692-04 **REVISION NUMBER:** 3

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY			3711-46-68	04/07/2018	04/07/2019	EACH OCCURRENCE	$ 1,000,000
	CLAIMS-MADE / X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
							MED EXP (Any one person)	$ 10,000
							PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	X POLICY / PRO-JECT / LOC						PRODUCTS - COMP/OP AGG	$ 1,000,000
	OTHER:							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
	UMBRELLA LIAB / OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB / CLAIMS-MADE						AGGREGATE	$
	DED / RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						PER STATUTE / OTH-ER	
	ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)	N / A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Re: 9460 Double R Blvd., Suite 104, Reno NV 89521

Brusco Trust c/o Hallmark Investments & Management LLC is included as additional insured where required by written contract. Waiver of subrogation is applicable where required by written contract and subject to policy terms and conditions.

CERTIFICATE HOLDER

Brusco Trust
c/o Hallmark Investments & Management LLC
3100 Mill #204
Reno, NV 89502

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
of Marsh USA Inc.
Manashi Mukherjee

CERTIFICATE OF LIABILITY INSURANCE

ACORD®

DATE (MM/DD/YYYY): 04/06/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

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PRODUCER Marsh USA, Inc. 1166 Avenue of the Americas New York, NY 10036 119-042-100--GAWU-18-19	**CONTACT NAME:** **PHONE (A/C, No, Ext):** **FAX (A/C, No):** **E-MAIL ADDRESS:**

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Federal Insurance Company	20281
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Middle River Power, LLC
570 Lake Cook Road, Suite 126
Deerfield, IL 60015

COVERAGES **CERTIFICATE NUMBER:** NYC-010053536-04 **REVISION NUMBER:** 1

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE / X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY / PRO-JECT / LOC OTHER:			3711-46-68	04/07/2018	04/07/2019	EACH OCCURRENCE	$ 1,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
							MED EXP (Any one person)	$ 10,000
							PERSONAL & ADV INJURY	$ 1,000,000
							GENERAL AGGREGATE	$ 2,000,000
							PRODUCTS - COMP/OP AGG	$ 1,000,000
								$
A	AUTOMOBILE LIABILITY ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS X HIRED AUTOS ONLY / X NON-OWNED AUTOS ONLY			7359-74-75	04/07/2018	04/07/2019	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
							BODILY INJURY (Per person)	$
							BODILY INJURY (Per accident)	$
							PROPERTY DAMAGE (Per accident)	$
								$
A	X UMBRELLA LIAB / X OCCUR EXCESS LIAB / CLAIMS-MADE DED / RETENTION $			7986-80-45	04/07/2018	04/07/2019	EACH OCCURRENCE	$ 5,000,000
							AGGREGATE	$ 5,000,000
								$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		7839-09-30	04/07/2018	04/07/2019	X PER STATUTE / OTH-ER	
							E.L. EACH ACCIDENT	$ 1,000,000
							E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

When Federal Insurance Company cancels this policy for any reason, other than non-payment of premium, Federal Insurance Company will notify Deerbrook Center, LLC c/o Transwestern (Address: 570 Lake Cook Road, Suite 110, Deerfield, IL 60015, Attn: Linda Lee) at least 30 days in advance of the cancellation date. Any failure by Federal Insurance Company to notify such person(s) or organization(s) will not: impose any liability or obligation of any kind upon Federal Insurance Company; or invalidate such cancellation.

CERTIFICATE HOLDER	CANCELLATION
Deerbrook Center L.L.C. c/o Transwestern Attn: Linda Lee 570 Lake Cook Road, Suite 110 Deerfield, IL 60015	**SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.** **AUTHORIZED REPRESENTATIVE of Marsh USA Inc.** Manashi Mukherjee *Manashi Mukherjee*

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 04/06/2018

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Marsh USA, Inc.
1166 Avenue of the Americas
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119-042-100--GAWU-18-19

CONTACT NAME:
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INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Middle River Power, LLC
570 Lake Cook Road, Suite 126
Deerfield, IL 60015

COVERAGES **CERTIFICATE NUMBER:** NYC-010066257-04 **REVISION NUMBER:** 6

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INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY CLAIMS-MADE / OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY / PRO-JECT / LOC OTHER:						EACH OCCURRENCE	$
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$
							MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
							GENERAL AGGREGATE	$
							PRODUCTS - COMP/OP AGG	$
								$
	AUTOMOBILE LIABILITY ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						COMBINED SINGLE LIMIT (Ea accident)	$
							BODILY INJURY (Per person)	$
							BODILY INJURY (Per accident)	$
							PROPERTY DAMAGE (Per accident)	$
								$
	UMBRELLA LIAB / OCCUR **EXCESS LIAB** / CLAIMS-MADE DED / RETENTION $						EACH OCCURRENCE	$
							AGGREGATE	$
								$
A	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** Y / N ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		7839-09-30	04/07/2018	04/07/2019	X PER STATUTE / OTH-ER	
							E.L. EACH ACCIDENT	$ 1,000,000
							E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

EmPower
1821 Walden Office Square, Suite 300
Schaumburg, IL 60173

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE of Marsh USA Inc.
Manashi Mukherjee

aggreko

ProEnergy Services — Document Control — Mar 10,2017

EQUIPMENT DATA SHEET

Generator

1500kW Generator GEMPAC 40ft. Container - Prime

Document No G0811054

Date 06-Aug-07

MODEL

Model reference	GN1500HSPCON, G19
Model size and rating	1500 kW
Bill of Material reference number	B0111896A

PERFORMANCE DATA

Design Rating	kW 1500
Maximum Ambient	°F 115

ELECTRICAL DATA

Continuous Power (COP)	kW 1250
Power/Standby	kW 1500
Voltage Capability	277/480V 3 Phase

ENGINE

Make/Type	Cummins KTA50G9
Cylinders and Form (V)	16
Aspiration	Turbocharged & Aftercooled (16cyl)
Fuel Pump	Cummins PT
Governor Make/Type	Cummins EFC
Steady State Frequency	+/- 0.05hz
Battery Voltage (VDC)	V 24

CIRCUIT BREAKER

Make/Type	ABB/SACE58
Number of Poles	3
Rating	Amp 2500

ALTERNATOR

Class F Temp Rise (105°C)-3ph	kW 1500
Ends Out	4
AVR	DVR2000
Make	Marathon 743RSL4050
Regulation	2%

LOAD TERMINALS

Type	Busbar with lugs

FUEL CONSUMPTION

Standby/Fuel Stop	US gal 103
100% Prime Power	US gal 87
75% Prime Power	US gal 68

Technical Information contained herein is subject to change without notice. Some data may vary on machines.

www.aggreko.com

Aggreko LLC
North America
National Operations
877.604.9492 (US)

50% Prime Power	US gal	47

EXHAUST EMISSIONS

NOx - Oxides of Nitrogen	9.20 g/kWm-h
PM - Particulate Matter	0.54 g/kWm-h
CO - Carbon Monoxide	11.40 g/kWm-h
HC - Unburnt Hydrocarbons	1.3 g/kWm-h

EXHAUST SILENCER

Make/Type	CRITICAL
Permissible back pressure	2

RUNNING HOURS

100% Prime (hours)	10.35
75% Power (hours)	13.23
50% Power (hours)	19.15

NOISE DATA

Sound Pressure at 7M/21Ft	79 dBA

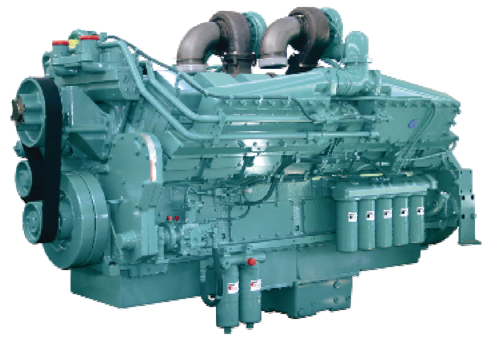
OTHER CAPACITIES AND DIMENSIONS

Lube Capacity (total)	US gal	54
Lube Capacity (pan)	US gal	47
Coolant Capacity (JW)	US gal	43
Coolant Capacity (LTA)	US gal	43
External Fuel Supply Max Above Base	ft	5.91
External Fuel Supply Max Below Base	ft	5.91

PHYSICAL CHARACTERISTICS

Length	in	480
Width	in	96
Height	in	114
Gross Weight	lbs	54,100
Net Weight	lbs	46,900
Gross Fuel	US Gal	1,000
Net Fuel	US Gal	900

KTA50-G9



> **Specification sheet**

Our energy working for you.™

Description

The KTA50-Series benefits from years of technical development and improvement to bring customers an innovative and future proof diesel engine that keeps pace with ever changing generator set requirements.

Recognised globally for its performance under even the most severe climatic conditions, the KTA50-Series is widely acknowledged as the most robust and cost-effective diesel engine in its power range for the generator set market.

This engine has been built to comply with CE certification.

This engine has been designed in facilities certified to ISO9001 and manufactured in facilities certified to ISO9001 or ISO9002.

Features

Coolpac Integrated Design - Products are supplied complete with cooling package and air cleaner kit for a complete power package. Each component has been specifically developed and rigorously tested for G-Drive products, ensuring high performance, durability and reliability.

Aftercooler – Large capacity integral aftercoolers are supplied with cooling water separate from the engine jacket. This provides cooler, denser intake air for more complete combustion and reduced engine stresses for longer life.

Cooling System – A one pump, two loop system must be employed; i.e. the engine jacket is cooled by one radiator or heat exchanger and the aftercoolers are cooled by a separate radiator or heat exchanger.

Pistons – Pistons are a dual Ni-resist, aluminium alloy, ground and shaped to compensate for thermal expansion, which assures a precise fit at all normal operating temperatures.

Service and Support - G-Drive products are backed by an uncompromising level of technical support and after sales service, delivered through a world class service network.

1800 rpm (60 Hz Ratings)

Gross Engine Output			Net Engine Output			Typical Generator Set Output					
Standby	Prime	Base	Standby	Prime	Base	Standby (ESP)		Prime (PRP)		Base (COP)	
kWm/BHP			kWm/BHP			kWe	kVA	kWe	kVA	kWe	kVA
1656/2220	1384/1855	1224/1640	1605/1252	1349/1809	1189/1594	1500	1875	1295	1619	1141	1427

General Engine Data

Type	4 cycle, in line, Turbocharged and After-cooled
Bore mm	158.8
Stroke mm	158.8
Displacement Litre	50
Cylinder Block	16-cylinder,direct injection, 4-cycle diesel engine
Battery Charging Alternator	55A
Starting Voltage	24V
Fuel System	Direct injection
Fuel Filter	Dual spin on paper element fuel filters with standard water separator
Lube Oil Filter Type(s)	Spin on full flow filter
Lube Oil Capacity (l)	204
Flywheel Dimensions	SAE 0

Coolpac Performance Data

Cooling System Design	2 pump - 2 loop
Coolant Ratio	50% ethylene glycol; 50% water
Coolant Capacity (l)	240.0
Limiting Ambient Temp (°C)**	50.0
Fan Power (kWm)	33.0
Cooling System Air Flow (m^3/s)**	28.2
Air Cleaner Type	Dry replaceable element with restriction indicator

** @ 13 mm H_2O

Ratings Definitions

Emergency Standby Power (ESP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-Time Running Power (LTP):
Applicable for supplying power to a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.

Prime Power (PRP):
Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base Load (Continuous) Power (COP):
Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN6271 and BS 5514.

Weight & Dimensions

Length mm	Width mm	Height mm	Weight (dry) kg
3497	2000	2703	6565

Fuel Consumption 1800 rpm (60 Hz)

%	kWm	BHP	L/ph	US gal/ph
Standby Power				
100	1656	2220	392	103.6
Prime Power				
100	1384	1855	330	87.3
75	1038	1391	257	68
50	692	928	180	47.6
25	346	463	111	29.2
Continuous Power				
100	1224	1640	299	79

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Our energy working for you.™

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Appendix B

Emissions Calculations and NSR Applicability Analysis

ProEnergy
2001 ProEnergy Blvd
Sedalia, Missouri 65301
660.829.5100 office
660.829.1160 fax

August 27, 2018

C.P. Crane, LLC
CP Crane Station, 1001 Carroll Island Rd.
Baltimore, MD 21220
Attn: David Dunbar

Dear Mr. Dunbar,

ProEnergy is pleased to provide you with the attached expected emissions data for the proposed 3 X LM6000PC Sprint Power Plant. The proposed facility will be dual fuel capable and will be able to produce approximately 150MW of power that can be injected into the Baltimore Gas & Electric 115kV Transmission system. As proof of ProEnergy's belief that the LM6000PC Sprint machines to be supplied to the C.P. Crane RePowering Project will meet NSPS Subpart TTTT and KKKK, ProEnergy provides the attached Performance Guarantee.

ProEnergy is a leading third-party solutions provider for the Power Generation and Oil & Gas industries. We are responsible for the construction, management, operations, maintenance and refurbishment and repair services for power generation facilities and equipment around the world.

ProEnergy's centrally-located US campus in Sedalia, Missouri provides a multitude of service and equipment solutions for our global customers. Our state-of-the-art facilities and campus design allow for a unique collaboration between our expert engineers and technicians. The result of this collaboration is an optimum design resulting in greater efficiencies and quicker turnaround times. ProEnergy's guiding principle in every aspect is to remain focused on customer satisfaction, while driving design and services to reduce costs, increase efficiency and provide real value. We remain dedicated to providing a level of service that exceeds our customer's expectations.

ProEnergy offers a multitude of service solutions to the Power Generation and Oil & Gas industries. We have a solution for every aspect of your plant's operation. ProEnergy's Core Solutions to be utilized on your project include EPC Fast Track, Aeroderivative Engine Overhauls, Field Services, High Voltage Substation Development, Technical Services, and Commissioning.

ProEnergy looks forward to working with you and hopes that the attached emissions data will be helpful in your efforts to show the overall reduction in plant emissions that will be experienced by re-powering the C.P. Crane Power Plant with our state of the art refurbished LM6000 Aeroderivative Gas Turbines.

Sincerely,

Bill Mars
Senior Vice President of Fast Track Power Solutions
ProEnergy Services
Office: 660-829-5100
Cell: 660-827-5327

2001 ProEnergy Blvd
Sedalia, Missouri 65301

660.829.5100 office
660.829.1160 fax

Supplemental NSPS Subpart TTTT and KKKK Information

Please note that while the proposed units will be refurbished by ProEnergy, ProEnergy is providing C. P. Crane the following emission and fuel input guarantees that will allow the proposed units to demonstrate compliance with the applicable NOx emission limits under NSPS Subpart KKKK:

Natural Gas:

- Peak load heat input rate of each of the proposed combustion turbines is 488 MMBtu/hr (HHV)
- NO_X - 25 ppm at 15% O_2

ULSD

- Peak load heat input rate of each of the proposed combustion turbines is 476 MMBtu/hr (HHV)
- NO_X - 42 ppm at 15% O_2

The Basis of the above Guarantees include:

- Gas Fuel: 21153 Btu/lb LHV, Gas Fuel that meets GE Fuel Specification MID-TD-0000-1 Latest Revision
- Distillate Fuel: ≤15 ppm Sulfur per ASTM D5453, Liquid Fuel that meets GE Fuel Specification MID-TD-0000-2 Latest Revision.
- Power Factor: ≥ 0.90
- Ambient Temp: 59F
- Inlet Chiller: On
- NOx Control: Water that meets GE Water Specification MID-TD-0000-3 Latest Revision
- Engine Condition: ≤ 200 site fired hours from delivery by ProEnergy

C. P. Crane's design for ProEnergy's proposed turbines will be categorized as a non-base load natural gas-fired unit or a non-base load multi-fuel-fired unit. Based on the use of natural gas and/or ULSD defined above, ProEnergy is providing C. P. Crane a guarantee that the proposed units will meet the standard of performance (see table below) for either of these non-base load categories that will allow the proposed units to demonstrate compliance with the applicable emission limits under NSPS Subpart TTTT:

Affected EGU	CO_2 Emission Standard
Newly constructed or reconstructed stationary combustion turbine that supplies its design efficiency or 50 percent, whichever time is less, times its potential electric output or less as net-electric sales on either a 12-operating month or a 3-year rolling average basis and combusts more than 90% natural gas on a heat input basis on a 12-operatima-month rolling average basis	50 kg CO_2 per gigajoule (GJ) of heat input (120 lb CO_2/MMBTU)
Newly constructed or reconstructed stationary combustion turbine that combusts 90% or less natural gas on a heat input basis on a 12-operating-month rolling average basis	50Kg CO_2/GJ of heat input (120 lb/MMBtu) to 69 kg CO_2/GJ of heat input (160 lb/MMBTU) as determined by the procedures in §60.5525

ProEnergy

Case No.
Permit Application Data Needed - GE LM6000 CTG's
Emissions Normal - 1 CTG
Stack, Process and Emissions Data

A. Stack Dimensions

Stack Height Above Grade	150	ft
Stack Exit Diameter	9	ft

B. Process Data and Emissions Rates (per CTG) - Natural Gas

Parameter		0°F Ambient						59°F Ambient									95°F Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	38/39	37	31	32/33	25	26/27	20	21	19	13	14	15	7	8	9	1	2	3
	Gas Compressor	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
1. Heat Input Data	Units																		
Natural Gas Consumed (3 CTG)	lb/s	10.65	12.21	14.40	14.01	18.2	17.6	10.08	9.72	12.07	14.48	13.10	12.56	18.18	16.34	15.59	16.3	12.9	11.7
Natural Gas Consumed (3 CTG)	lb/hr	38340.00	43956.00	51840.00	50425.20	65394.0	63450.0	36288.00	35002.80	43459.20	52120.80	47152.80	45219.60	65448.00	58816.80	56127.60	58773.6	46450.8	42238.8
CTG Heat Input LHV (1 CTG)	10^6 BTU/hr	268.48	307.04	361.07	350.89	454.1	440.3	254.36	245.61	303.41	362.84	328.38	315.06	454.40	408.30	389.84	408.53	323.49	294.61
CTG Heat Input HHV (1 CTG)[3]	10^6 BTU/hr	288.35	329.76	387.79	376.86	487.7	472.9	273.19	263.79	325.86	389.69	352.68	338.38	488.03	438.51	418.69	438.8	347.4	316.4
Natural Gas Consumed (1 CTG)	lb/s	3.55	4.07	4.80	4.67	6.1	5.9	3.36	3.24	4.02	4.83	4.37	4.19	6.06	5.45	5.20	5.4	4.3	3.9
Natural Gas Consumed (1 CTG)	lb/hr	12780.00	14652.00	17280.00	16808.40	21798.0	21150.0	12096.00	11667.60	14486.40	17373.60	15717.60	15073.20	21816.00	19605.60	18709.20	19591.2	15483.6	14079.6
Net Heat Rate LHV(3 CTG)	BTU/kWh	10790.58	10033.74	9417.66	9420.72	8896.44	8868.90	11196.54	11439.30	9986.82	9427.86	9635.94	9781.80	8943.36	8985.18	9075.96	9124.92	9643.08	10009.26
Net Heat Rate HHV(3 CTG)[3]	BTU/kWh	11589.08	10776.24	10114.57	10117.85	9554.78	9525.20	12025.08	12285.81	10725.84	10125.52	10349.00	10505.65	9605.17	9650.08	9747.58	9800.16	10356.67	10749.95
2. Power Data																			
Power Generated Gross (3 CTG)	kW	73149	89967	112719	109506	150066	145956	66792	63126	89319	113148	100191	94695	149379	133596	126282	131628	98625	86535
Power Generated Net (3 CTG)	kW	70677	87121	109487	106196	146196	142316	64459	60853	86546	109954	97340	91938	145563	130196	123013	128133	95815	83930
Power Generated Gross (1 CTG)	kW	24383	29989	37573	36502	50022	48652	22264	21042	29773	37716	33397	31565	49793	44532	42094	43876	32875	28845
Power Generated Net (1 CTG)	kW	23559	29040	36496	35399	48732	47439	21486	20284	28849	36651	32447	30646	48521	43399	41004	42711	31938	27977
3. Stack Data																			
Exhaust Composition:																			
Argon (Ar)	vol%	0.8945	0.8905	0.8784	0.8844	0.8695	0.8743	0.8853	0.8881	0.882	0.8639	0.8764	0.8796	0.8553	0.8674	0.8711	0.8386	0.8554	0.8625
Nitrogen (N_2)	vol%	74.36	74.04	73.04	73.53	72.31	72.71	73.59	73.82	73.33	71.83	72.86	73.13	71.14	72.13	72.44	69.74	71.13	71.71
Oxygen (O_2)	vol%	15.13	14.69	14.02	14.22	12.94	13.19	14.91	14.99	14.42	13.59	14.12	14.25	12.53	13.22	13.4	12.3	13.42	13.75
Carbon Dioxide (CO_2)	vol%	2.485	2.667	2.873	2.838	3.324	3.249	2.492	2.484	2.707	2.926	2.794	2.764	3.37	3.157	3.102	3.293	2.916	2.827
Water (H_2O)	vol%	7.113	7.718	9.196	8.528	10.56	9.975	8.117	7.813	8.661	10.79	9.342	8.972	12.11	10.63	10.18	13.82	11.68	10.85
Exhaust Flow Rate (1 CTG)	lb/s	246.5	262.7	285.906	282.2	310.1	308.55	231.7	224.5	254.9	280.4	267.4	259.386	304.2	293.6	285.6	277.644	250.002	235.11
Temperature	°F	699	729	741	747	826	816	722	731	758	757	760	765	840	815	816	864	826	831
Exhaust Flow Rate (1 CTG)	KPPH	887.5224	945.54	1029.2616	1016.04	1116.3	1110.78	834.28	808.21	917.63	1009.4	962.5	933.7896	1095.0	1056.8	1028.2	999.5184	900.0072	846.396
Exhaust Flow Rate (1 CTG)	ft^3/hr	26179346	28612631	31460441	31211535	36535348	36072377	25097156	24497993	28445413	31264139	29884360	29112611	36227770	34293204	33389307	33680211	29456625	27809672
Exhaust Flow Rate (1 CTG)	dscfm	436322	476877	524341	520192	608922	601206	418286	408300	474090	521069	498073	485210	603796	571553	556488	561337	490944	463495

B. Process Data and Emissions Rates (per CTG) - Natural Gas (continued)

Parameter		0°F Ambient						59°F Ambient									95°F Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	38/39	37	31	32/33	25	26/27	20	21	19	13	14	15	7	8	9	1	2	3
	Gas Compressor	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
4. Emissions Data																			
PM - Filterable[1]	lb/hr	0.87	0.99	1.17	1.13	1.47	1.42	0.82	0.79	0.98	1.17	1.06	1.02	1.47	1.32	1.26	1.32	1.05	0.95
PM - Condensible[1]	lb/hr	2.15	2.45	2.89	2.8	3.63	3.52	2.03	1.96	2.42	2.9	2.62	2.52	3.63	3.26	3.12	3.27	2.59	2.35
PM - Total[1]	lb/hr	3.01	3.45	4.05	3.94	5.1	4.94	2.85	2.76	3.41	4.07	3.69	3.54	5.1	4.58	4.38	4.59	3.63	3.31
SO2	ppmvd @ 15% O_2	0.1001	0.1075	0.1161	0.1143	0.1346	0.1312	0.1009	0.1006	0.1094	0.1189	0.1129	0.1116	0.1373	0.1278	0.1255	0.1352	0.1189	0.1152
	lb/hr	0.21	0.24	0.29	0.28	0.36	0.35	0.20	0.19	0.24	0.29	0.26	0.25	0.36	0.32	0.31	0.32	0.26	0.23
H_2SO_4 (mist)	lb/hr	0.0326	0.0373	0.0438	0.0426	0.0551	0.0534	0.0309	0.0298	0.0368	0.0440	0.0399	0.0382	0.0551	0.0495	0.0473	0.0496	0.0393	0.0358
NO_x (1 CTG)	ppmvd @ 15% O_2	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	lb/hr	35.56	37.89	41.24	40.71	44.73	44.51	33.43	32.38	36.77	40.45	38.57	37.42	43.88	42.35	41.2	40.05	36.06	33.91
CO (1 CTG)	ppmvd @ 15% O_2	40	38	35	35	30	30	27	27	25	22	22	22	20	20	20	17	17	17
	lb/hr	34.64	35.05	35.15	34.69	32.67	32.51	21.98	21.29	22.38	21.66	20.66	20.04	21.37	20.62	20.06	16.58	14.93	14.04
VOC (1 CTG)	ppmvd @ 15% O_2	7	6	5	5	2	2	4	4	3	2	2	2	1	1	1	1	1	1
	lb/hr	3.46	3.16	2.87	2.83	1.24	1.24	1.86	1.8	1.53	1.13	1.07	1.04	0.61	0.59	0.57	0.56	0.5	0.47
CO_2 Massflow	Lbs/hr	31718	36274	42657	41455	53647	52017	30050	29017	35845	42866	38795	37221	53683	48236	46056	48264	38217	34806
CO_2 Equivalent	Lbs/hr	32038	36640	43087	41873	54188	52541	30353	29309	36206	43298	39186	37597	54224	48722	46520	48751	38602	35156

C. Process Data and Emissions Rates (per CTG) - ULSD

Parameter		0°F Ambient						59°F Ambient									95°F Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	41/42	40	34	35/36	28	29/30	23	24	22	16	17	18	10	11	12	4	5	6
	Gas Compressor	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ailable - but (	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
1. Heat Input Data	Units																		
ULSD Consumed (3 CTG)	lb/s	11.73	13.25	15.47	15.44	19.6	19.3	11.12	10.75	13.03	15.57	14.46	13.89	19.45	18.08	17.26	17.4	14.3	13.0
ULSD Consumed (3 CTG)	lb/hr	42217.20	47714.40	55695.60	55576.80	70448.4	69552.0	40035.60	38685.60	46915.20	56052.00	52045.20	50004.00	70005.60	65070.00	62121.60	62542.8	51440.4	46839.6
CTG Heat Input LHV (1 CTG)	10^6 BTU/hr	267.51	301.66	351.05	350.13	442.8	437.0	253.87	245.55	296.52	353.18	328.11	315.43	439.88	409.01	390.62	393.49	324.31	295.80
CTG Heat Input HHV (1 CTG)[3]	10^6 BTU/hr	287.30	323.98	377.03	376.04	475.6	469.3	272.65	263.72	318.46	379.31	352.39	338.77	472.44	439.28	419.53	422.6	348.3	317.7
ULSD Consumed (1 CTG)	lb/s	3.91	4.42	5.16	5.15	6.5	6.4	3.71	3.58	4.34	5.19	4.82	4.63	6.48	6.03	5.75	5.8	4.8	4.3
ULSD Consumed (1 CTG)	lb/hr	14072.40	15904.80	18565.20	18525.60	23482.8	23184.0	13345.20	12895.20	15638.40	18684.00	17348.40	16668.00	23335.20	21690.00	20707.20	20847.6	17146.8	15613.2
Net Heat Rate LHV (3 CTG)	BTU/kWh	10790.58	10095.96	9407.46	9398.28	8904.60	8863.80	11193.48	11416.86	10126.56	9528.84	9642.06	9779.76	8949.48	8984.16	9081.06	9210.60	9673.68	10065.36
Net Heat Rate HHV(3 CTG)[3]	BTU/kWh	11589.08	10843.06	10103.61	10093.75	9563.54	9519.72	12021.80	12261.71	10875.93	10233.97	10355.57	10503.46	9611.74	9648.99	9753.06	9892.18	10389.53	10810.20
2. Power Data																			
Power Generated Gross (3 CTG)	kW	72885	87843	109710	109530	146202	144945	66678	63234	86085	108969	100044	94824	144507	133845	126465	125601	98565	86400
Power Generated Net (3 CTG)	kW	71185	85987	107705	107583	143945	142761	65065	61642	84289	107008	98203	93023	142311	131770	124448	123535	96740	84662
Power Generated Gross (1 CTG)	kW	24295	29281	36570	36510	48734	48315	22226	21078	28695	36323	33348	31608	48169	44615	42155	41867	32855	28800
Power Generated Net (1 CTG)	kW	23728	28662	35902	35861	47982	47587	21688	20547	28096	35669	32734	31008	47437	43923	41483	41178	32247	28221

ProEnergy

C. Process Data and Emissions Rates (per CTG) - ULSD (continued)

Parameter		0°F Ambient						59°F Ambient									95°F Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	41/42	40	34	35/36	28	29/30	23	24	22	16	17	18	10	11	12	4	5	6
	Gas Compressor	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ailable - but (	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
3. Stack Data																			
Exhaust Composition:																			
Argon (Ar)	vol%	0.9014	0.8985	0.8934	0.8922	0.8798	0.8833	0.8918	0.8946	0.8897	0.872	0.8835	0.8866	0.8652	0.8753	0.8789	0.8467	0.8617	0.8679
Nitrogen (N_2)	vol%	74.85	74.61	74.18	74.08	73.05	73.34	74.05	74.28	73.87	72.4	73.36	73.62	71.84	72.68	72.97	70.3	71.55	72.07
Oxygen (O_2)	vol%	15.12	14.72	14.19	14.19	13.06	13.19	14.89	14.96	14.45	13.64	14.09	14.21	12.68	13.16	13.34	12.41	13.34	13.65
Carbon Dioxide (CO_2)	vol%	3.339	3.562	3.841	3.818	4.391	4.354	3.348	3.341	3.611	3.889	3.759	3.742	4.424	4.258	4.187	4.327	3.936	3.822
Water (H_2O)	vol%	5.798	6.211	6.896	7.011	8.617	8.229	6.821	6.525	7.179	9.202	7.911	7.561	10.19	9.028	8.618	12.11	10.31	9.597
Exhaust Flow Rate (1 CTG)	lb/s	246.3	260.6	281.52	282.4	309.8	308.754	231.9	224.9	251.8	277.3	267.6	259.896	303.6	294.5	286.2	275.094	250.41	235.416
Temperature	°F	711	740	768	761	828	828	733	743	767	764	772	778	834	830	830	860	839	843
Exhaust Flow Rate (1 CTG)	KPPH	886.788	938.20	1013.472	1016.78	1115.2	1111.514	835.01	809.68	906.62	998.4	963.5	935.6256	1092.8	1060.1	1030.4	990.3384	901.476	847.4976
Exhaust Flow Rate (1 CTG)	ft^3/hr	26428513	28653050	31674236	31596380	36555389	36435689	25353015	24789794	28311596	31102072	30211566	29479409	35988679	34804484	33827981	33270060	29802957	28104698
Exhaust Flow Rate (1 CTG)	dscfm	440475	477551	527904	526606	609256	607261	422550	413163	471860	518368	503526	491323	599811	580075	563800	554501	496716	468412
4. Emissions Data																			
PM - Filterable[1]	lb/hr	3.36	3.79	4.41	4.39	5.56	5.48	3.19	3.08	3.72	4.43	4.12	3.96	5.52	5.13	4.90	4.94	4.07	3.71
PM - Condensible[1]	lb/hr	6.01	6.78	7.89	7.87	9.95	9.82	5.70	5.52	6.66	7.94	7.37	7.09	9.89	9.19	8.78	8.84	7.29	6.65
PM - Total[1]	lb/hr	9.37	10.56	12.29	12.26	15.51	15.30	8.89	8.60	10.38	12.37	11.49	11.05	15.41	14.32	13.68	13.78	11.36	10.36
SO2	ppmvd @ 15% O_2	0.2049	0.2184	0.2353	0.2339	0.2698	0.2671	0.2066	0.206	0.2222	0.2403	0.2313	0.229	0.2735	0.2621	0.2576	0.2699	0.2444	0.2371
	lb/hr	0.44	0.49	0.57	0.57	0.72	0.71	0.41	0.40	0.48	0.57	0.53	0.51	0.72	0.67	0.64	0.64	0.53	0.48
H_2SO_4 (mist)	lb/hr	0.0667	0.0752	0.0875	0.0872	0.1103	0.1089	0.0633	0.0612	0.0739	0.0880	0.0817	0.0786	0.1096	0.1019	0.0973	0.0980	0.0808	0.0737
NO_x (1 CTG)	ppmvd @ 15% O_2	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
	lb/hr	59.7	63.16	68.22	68.45	75.07	74.82	56.21	54.51	61.03	67.21	64.86	62.98	73.56	71.36	69.36	66.67	60.68	57.05
CO (1 CTG)	ppmvd @ 15% O_2	47	45	41	41	36	36	32	32	30	28	28	28	25	25	25	23	23	23
	lb/hr	40.66	41.19	40.54	40.67	39.17	39.04	26.07	25.28	26.54	27.27	26.32	25.56	26.65	25.86	25.13	22.22	20.23	19.02
VOC (1 CTG)	ppmvd @ 15% O_2	13	12	10	10	7	7	10	10	9	7	7	7	5	5	5	5	5	5
	lb/hr	6.43	6.28	5.65	5.67	4.35	4.34	4.66	4.51	4.55	3.9	3.76	3.65	3.05	2.96	2.87	2.76	2.51	2.36
CO_2 Massflow	Lbs/hr	45107	50865	59193	59039	74667	73685	42807	41405	49998	59552	55325	53187	74173	68967	65866	66349	54685	49877
CO_2 Equivalent	Lbs/hr	45266	51044	59401	59246	74930	73944	42957	41550	50174	59762	55520	53374	74433	69210	66098	66582	54877	50053

Notes:
1. All PM emitted is less than 2.5 microns
2. Fuels represented as pipeline quality natural gas fuel based upon Sulphur content of 0.5 grain/100scf and ultra low sulfur diesel fuel based upon Sulphur content of 0.0015%
3. Calculated from LHV

D. Start-up/Shutdown Emissions Rates (per CTG)

	Startup		Shutdown	
	Gas	Diesel	Gas	Diesel
Estimated Time per Event (min)	10		8	
NOx Emissions per Event (lb)	3.6	12.8	3.1	10.9
CO Emissions per Event (lb)	3.2	11.6	2.5	9.9
VOC Emissions per Event (lb)	0.5	0.4	0.33	0.4
Natural Gas Heat Consumption (mmBtu/event)	27.3	26.5	24.7	23

Emissions Calculations

Sample Calculations provided by ProEnergy

Sample Calculation for Stack Flow [Case 1]

Stack Flow (ft^3/hr) = Mass Flow (lb/hr) * Universal Gas Constant (ft^3*psia/(°R*lb-mol)) * Stack Temperature (°R) /(Stack Gas Pressure (psia) * Exhaust MW (lb/lb-mol))

= 999,518.4 (lb/hr) * 10.73 (ft^3*psia /(°R*lb-mol)) * 1324 (°R) / (14.69 (psia) * 28.70 (lb/lbmol))

= 33,680,211 ft^3/hr

Sample Calculation for NOx (CO and VOC follow the same methodology) [Case 1]

NOx Density (lb/ft^3) = Stack Gas Pressure (psia) * NOx MW (lb/lb-mol) / (Universal Gas Constant (ft^3*psia/(°R*lb-mol)) * Exhaust Temp (°R))

= 14.69 (psia) * 46 (lb/lb-mol) / (10.73 (ft^3*psia/(°R*lb-mol)) * 1324 (°R))

= 0.04757 lb NOx/ft^3

NOx Volume Flow (ft^3/hr) = Stack Flow (ft^3/hr) * NOx Concentration @ 15% O_2 (ppm) / 1000000

= 33,680,211 (ft^3/hr) * 25 (ppm) / 1000000

= 842.0 ft^3/hr

NOx Hourly Emissions (lb/hr) = NOx Density (lb/ft^3) * NOx Volume Flow (ft^3/hr)

= 0.04757 (lb NOx/ft^3) * 842.0 (ft^3/hr)

= 40.05 lb NOx/hr

*Same calculation methodology for natural gas and ULSD

Sample Calculation for PM Natural Gas [Case 1]

PM Total (lb/hr) = Case 7 PM Total Emission Rate (lb/hr) * Ratio Between Case 1 Heat Consumption and Case 7 Heat Consumption

= 5.1 (lb/hr) * (438.76 (mmBtu/hr) / 488.03 (mmBtu/hr))

= 4.59 lb PM/hr

* Vendor-specified data indicates Total PM emissions to be 5.1 lb/hr at ISO Base Load with SPRINT on. Case 7 and 8 are the best fit for this criteria. Case 7 was chosen to represent the ISO Base Load scenario as the Heat Consumption was higher for Case 7 than 8. PM emissions are linearly related to heat consumption so ratios of heat consumptions to Case 7's heat consumption were used.

PM Filterable (lb/hr) = PM Total (lb/hr) * PM Filterable Fraction From AP-42 Table 3.1-2a

= 4.59 (lb/hr) * (0.0019/0.0066)

= 1.32 lb Filterable PM/hr

PM Condensable (lb/hr) = PM Total (lb/hr) - PM Filterable

= 4.59 (lb/hr) – 1.32 (lb/hr)

= 3.27 lb Condensable PM/hr

Sample Calculation for PM ULSD [Case 4]

PM Total Hourly Emissions (lb/hr) = Heat Consumption (mmBtu/hr) *Conversion to Btu (Btu/mmBtu) * Vendor-Supplied Emissions Data (lb PM/1,000 lb fuel) / Fuel LHV (Btu/lb

= 422.60 (mmBtu/hr) * 1000000 (Btu/mmBtu) * (0.6 / 1,000 (lb PM/lb fuel)) / 18,400 (Btu/lb

= 13.78 lb PM/hr

PM Filterable (lb/hr) = PM Total (lb/hr) * PM Filterable Fraction From AP-42 Table 3.1-2a

= 13.78 (lb/hr) * (0.0043/0.012)

= 4.94 lb Filterable PM/hr

PM Condensable (lb/hr) = PM Total (lb/hr) - PM Filterable

= 13.78 (lb/hr) – 4.94 (lb/hr)

= 8.84 lb Condensable PM/hr

Sample Calculation for SO_2 [Case 1]

SO_2 Hourly Emissions (lb/hr) = Emission Factor From AP-42 Table 3.1-2a (lb/mmBtu) * Sulfur Fuel % * Heat Consumption (mmBtu/hr)

= 0.94 (lb/mmBtu) * 0.000785 (%) * 438.76 (mmBtu/hr)

= 0.32 lb SO_2/hr

*Same calculation methodology for ULSD using appropriate AP-42 factors

Sample Calculation for H_2SO_4 [Case 1]

H_2SO_4 Hourly Emissions (lb/hr) = SO_2 Hourly Emissions (lb/hr) * Molecular Weight Conversion (MW H_2SO_4/MW SO_2) * Conversion ratio of SO_2 to H_2SO_4

= 0.32 (lb/hr) * (98 (lb-mol / 64 lb-mol) * 0.1(

= 0.0496 lb H_2SO_4/hr

*Same calculation methodology for ULSD using appropriate AP-42 factors

Sample Calculation for CO_2 [Case 1]

CO_2 Massflow (lb/hr) = CO_2 Emission Factor From AP-42 Table 3.1-2a (lb/mmBtu) * Heat Consumption (mmBtu/hr)

= 110 (lb/mmBtu) * 438.76 (mmBtu/hr)

= 48264 lb CO_2/hr

CO_2 Equivalent (lb/hr) = Heat Consumption (mmBtu/hr) * (CO_2 Emission Factor From AP-42 Table 3.1-2a (lb/mmBtu) + (Methane Emission Factor From AP-42 Table 3.1-2a (lb/mmBtu) * Global Warming Potential) + (Nitrous Oxide Emission Factor From AP-42 Table 3.1-2a (lb/mmBtu) * Global Warming Potential)

= 438.76 (mmBtu/hr) * (110 + (0.0086 * 25) + (0.003 * 298) (lb/mmBtu)

= 48751 lb CO_2e/hr

*Same calculation methodology for ULSD using appropriate AP-42 factors

Sample Calculations by ECT

Sample Calculation for Net Fuel Rate Natural Gas [Case 1]

Net Fuel Rate (MMscf/hr) = Heat Consumption HHV (mmBtu/hr) / AP-42 Section 1.4 (Btu/scf)

= 438.76 (mmBtu/hr) / 1,020 (Btu/scf)

= 0.43 MMscf/hr

Sample Calculation for Net Fuel Rate ULSD [Case 4]

Net Fuel Rate (gal/hr) = Heat Consumption HHV (mmBtu/hr) * Conversion to Btu (Btu/mmBtu) / AP-42 Appendix A (Btu/gal)

= 422.60 (mmBtu/hr) * 1000000 (Btu/mmBtu) / 140,000 (Btu/gal)

= 3018.6 gal/hr

Sample Calculation for PM (lb/MMBtu) [Case 1]

PM (lb/MMBtu) = PM (lb/hr) / Heat Consumption HHV (mmBtu/hr)

= 4.59 (PM lb/hr) / 438.76 (mmBtu/hr)

= 0.0105 PM (lb/MMBtu)

* Same methodology for SO_2, H_2SO_4 and CO_2e natural gas and ULSD

Sample Calculation for ECT SO_2 (lb/MMBtu) for Natural Gas [Case 1]

SO_2 (lb/MMBtu) = sulfur content (grains/100 scf) * Conversion to lb (lb/grains) * (1 / AP-42 Section 1.4 (Btu/scf)) * Conversion to Btu (Btu/MMBtu) * (MW of SO_2/MW of sulfur)

= (0.5 gr/100 scf) * (1 lb/7000 grains) * (1 scf/1020 Btu) * (1,000,000 Btu/MMBtu) * (64.06/32.07)

= 1.40E-03 lb/MMBtu

Sample Calculation for ECT SO_2 (lb/MMBtu) for ULSD [Case 4]

SO_2 (lb/MMBtu) = sulfur content (% weight) * (MW of SO_2/MW of sulfur) * Conversion to Btu (Btu/MMBtu) / (AP-42 Appendix A (Btu/gal)/(lb/gal))

= (0.0015/100) * (64.06/32.07) * (1,000,000 Btu/MMBtu) / (140,000 (Btu/gal)/7.05 (lb/gal)

= 1.51E-03 lb/MMBtu

Sample Calculation for ECT H_2SO_4 (lb/MMBtu) for Natural Gas [Case 1]

H_2SO_4 (lb/MMBtu) = Percent sulfur to H_2SO_4 * SO_2 (lb/MMBtu) * (MW of H_2SO_4/MW of SO_2)

= (10/100) * 1.40E-03 (lb/MMBtu) * (98.08/64.06)

= 2.14E-04 lb/MMBtu

* Same methodology for H_2SO_4 ULSD

Sample Calculation for ECT SO_2 (lb/hr) for Natural Gas [Case 1]

SO_2 (lb/hr) = SO_2 (lb/MMBtu) * Heat Consumption HHV (mmBtu/hr)

= 1.4E-03 (lb/MMbtu) * 438.76 (mmBtu/hr)

= 0.61 lb/hr

* Same methodology for SO_2 ULSD and H_2SO_4 natural gas and ULSD

ProEnergy

8/27/2018
Case No.
Permit Application Data Needed - GE LM6000 CTG's
Emissions Normal - 1 CTG
Stack, Process and Emissions Data

A. Stack Dimensions

Stack Height Above Grade	150	ft
Stack Exit Diameter	9	ft

B. Process Data and Emissions Rates (per CTG) - Natural Gas

Parameter		0^oF Ambient						59^oF Ambient									95^oF Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	38/39	37	31	32/33	25	26/27	20	21	19	13	14	15	7	8	9	1	2	3
	Gas Compressor	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
1. Heat Input Data	Units																		
Natural Gas Consumed (3 CTG)	lb/s	10.65	12.21	14.40	14.01	18.2	17.6	10.08	9.72	12.07	14.48	13.10	12.56	18.18	16.34	15.59	16.3	12.9	11.7
Natural Gas Consumed (3 CTG)	lb/hr	38340.00	43956.00	51840.00	50425.20	65394.0	63450.0	36288.00	35002.80	43459.20	52120.80	47152.80	45219.60	65448.00	58816.80	56127.60	58773.6	46450.8	42238.8
CTG Heat Input LHV (1 CTG)	10^6 BTU/hr	268.48	307.04	361.07	350.89	454.1	440.3	254.36	245.61	303.41	362.84	328.38	315.06	454.40	408.30	389.84	408.53	323.49	294.61
CTG Heat Input HHV (1 CTG)[3]	10^6 BTU/hr	288.35	329.76	387.79	376.86	487.7	472.9	273.19	263.79	325.86	389.69	352.68	338.38	488.03	438.51	418.69	438.8	347.4	316.4
Natural Gas Consumed (1 CTG)	lb/s	3.55	4.07	4.80	4.67	6.1	5.9	3.36	3.24	4.02	4.83	4.37	4.19	6.06	5.45	5.20	5.4	4.3	3.9
Natural Gas Consumed (1 CTG)	lb/hr	12780.00	14652.00	17280.00	16808.40	21798.0	21150.0	12096.00	11667.60	14486.40	17373.60	15717.60	15073.20	21816.00	19605.60	18709.20	19591.2	15483.6	14079.6
Net Heat Rate LHV(3 CTG)	BTU/kWh	10790.58	10033.74	9417.66	9420.72	8896.44	8868.90	11196.54	11439.30	9986.82	9427.86	9635.94	9781.80	8943.36	8985.18	9075.96	9124.92	9643.08	10009.26
Net Heat Rate HHV(3 CTG)[3]	BTU/kWh	11589.08	10776.24	10114.57	10117.85	9554.78	9525.20	12025.08	12285.81	10725.84	10125.52	10349.00	10505.65	9605.17	9650.08	9747.58	9800.16	10356.67	10749.95
2. Power Data																			
Power Generated Gross (3 CTG)	kW	73149	89967	112719	109506	150066	145956	66792	63126	89319	113148	100191	94695	149379	133596	126282	131628	98625	86535
Power Generated Net (3 CTG)	kW	70677	87121	109487	106196	146196	142316	64459	60853	86546	109954	97340	91938	145563	130196	123013	128133	95815	83930
Power Generated Gross (1 CTG)	kW	24383	29989	37573	36502	50022	48652	22264	21042	29773	37716	33397	31565	49793	44532	42094	43876	32875	28845
Power Generated Net (1 CTG)	kW	23559	29040	36496	35399	48732	47439	21486	20284	28849	36651	32447	30646	48521	43399	41004	42711	31938	27977
3. Stack Data																			
Exhaust Composition:																			
Argon (Ar)	vol%	0.8945	0.8905	0.8784	0.8844	0.8695	0.8743	0.8853	0.8881	0.882	0.8639	0.8764	0.8796	0.8553	0.8674	0.8711	0.8386	0.8554	0.8625
Nitrogen (N_2)	vol%	74.36	74.04	73.04	73.53	72.31	72.71	73.59	73.82	73.33	71.83	72.86	73.13	71.14	72.13	72.44	69.74	71.13	71.71
Oxygen (O_2)	vol%	15.13	14.69	14.02	14.22	12.94	13.19	14.91	14.99	14.42	13.59	14.12	14.25	12.53	13.22	13.4	12.3	13.42	13.75
Carbon Dioxide (CO_2)	vol%	2.485	2.667	2.873	2.838	3.324	3.249	2.492	2.484	2.707	2.926	2.794	2.764	3.37	3.157	3.102	3.293	2.916	2.827
Water (H_2O)	vol%	7.113	7.718	9.196	8.528	10.56	9.975	8.117	7.813	8.661	10.79	9.342	8.972	12.11	10.63	10.18	13.82	11.68	10.85
Exhaust Flow Rate (1 CTG)	lb/s	246.5	262.7	285.906	282.2	310.1	308.55	231.7	224.5	254.9	280.4	267.4	259.386	304.2	293.6	285.6	277.644	250.002	235.11
Temperature	^oF	699	729	741	747	826	816	722	731	758	757	760	765	840	815	816	864	826	831
Exhaust Flow Rate (1 CTG)	KPPH	887.5224	945.54	1029.2616	1016.04	1116.3	1110.78	834.28	808.21	917.63	1009.4	962.5	933.7896	1095.0	1056.8	1028.2	999.5184	900.0072	846.396
Exhaust Flow Rate (1 CTG)	ft^3/hr	26179346	28612631	31460441	31211535	36535348	36072377	25097156	24497993	28445413	31264139	29884360	29112611	36227770	34293204	33389307	33680211	29456625	27809672
Exhaust Flow Rate (1 CTG)	dscfm	436322	476877	524341	520192	608922	601206	418286	408300	474090	521069	498073	485210	603796	571553	556488	561337	490944	463495

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B. Process Data and Emissions Rates (per CTG) - Natural Gas (continued)

Parameter		0°F Ambient						59°F Ambient									95°F Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	38/39	37	31	32/33	25	26/27	20	21	19	13	14	15	7	8	9	1	2	3
	Gas Compressor	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
4. Emissions Data																			
PM - Filterable[1]	lb/hr	0.87	0.99	1.17	1.13	1.47	1.42	0.82	0.79	0.98	1.17	1.06	1.02	1.47	1.32	1.26	1.32	1.05	0.95
PM - Condensible[1]	lb/hr	2.15	2.45	2.89	2.8	3.63	3.52	2.03	1.96	2.42	2.9	2.62	2.52	3.63	3.26	3.12	3.27	2.59	2.35
PM - Total[1]	lb/hr	3.01	3.45	4.05	3.94	5.1	4.94	2.85	2.76	3.41	4.07	3.69	3.54	5.1	4.58	4.38	4.59	3.63	3.31
SO2	ppmvd @ 15% O_2	0.1001	0.1075	0.1161	0.1143	0.1346	0.1312	0.1009	0.1006	0.1094	0.1189	0.1129	0.1116	0.1373	0.1278	0.1255	0.1352	0.1189	0.1152
	lb/hr	0.21	0.24	0.29	0.28	0.36	0.35	0.20	0.19	0.24	0.29	0.26	0.25	0.36	0.32	0.31	0.32	0.26	0.23
H_2SO_4 (mist)	lb/hr	0.0326	0.0373	0.0438	0.0426	0.0551	0.0534	0.0309	0.0298	0.0368	0.0440	0.0399	0.0382	0.0551	0.0495	0.0473	0.0496	0.0393	0.0358
NO_x (1 CTG)	ppmvd @ 15% O_2	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	lb/hr	35.56	37.89	41.24	40.71	44.73	44.51	33.43	32.38	36.77	40.45	38.57	37.42	43.88	42.35	41.2	40.05	36.06	33.91
CO (1 CTG)	ppmvd @ 15% O_2	40	38	35	35	30	30	27	27	25	22	22	22	20	20	20	17	17	17
	lb/hr	34.64	35.05	35.15	34.69	32.67	32.51	21.98	21.29	22.38	21.66	20.66	20.04	21.37	20.62	20.06	16.58	14.93	14.04
VOC (1 CTG)	ppmvd @ 15% O_2	7	6	5	5	2	2	4	4	3	2	2	2	1	1	1	1	1	1
	lb/hr	3.46	3.16	2.87	2.83	1.24	1.24	1.86	1.8	1.53	1.13	1.07	1.04	0.61	0.59	0.57	0.56	0.5	0.47
CO_2 Massflow	Lbs/hr	31718	36274	42657	41455	53647	52017	30050	29017	35845	42866	38795	37221	53683	48236	46056	48264	38217	34806
CO_2 Equivalent	Lbs/hr	32038	36640	43087	41873	54188	52541	30353	29309	36206	43298	39186	37597	54224	48722	46520	48751	38602	35156

C. Process Data and Emissions Rates (per CTG) - ULSD

Parameter		0°F Ambient						59°F Ambient									95°F Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	41/42	40	34	35/36	28	29/30	23	24	22	16	17	18	10	11	12	4	5	6
	Gas Compressor	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ailable - but O	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
1. Heat Input Data	Units																		
ULSD Consumed (3 CTG)	lb/s	11.73	13.25	15.47	15.44	19.6	19.3	11.12	10.75	13.03	15.57	14.46	13.89	19.45	18.08	17.26	17.4	14.3	13.0
ULSD Consumed (3 CTG)	lb/hr	42217.20	47714.40	55695.60	55576.80	70448.4	69552.0	40035.60	38685.60	46915.20	56052.00	52045.20	50004.00	70005.60	65070.00	62121.60	62542.8	51440.4	46839.6
CTG Heat Input LHV (1 CTG)	10^6 BTU/hr	267.51	301.66	351.05	350.13	442.8	437.0	253.87	245.55	296.52	353.18	328.11	315.43	439.88	409.01	390.62	393.49	324.31	295.80
CTG Heat Input HHV (1 CTG)[3]	10^6 BTU/hr	287.30	323.98	377.03	376.04	475.6	469.3	272.65	263.72	318.46	379.31	352.39	338.77	472.44	439.28	419.53	422.6	348.3	317.7
ULSD Consumed (1 CTG)	lb/s	3.91	4.42	5.16	5.15	6.5	6.4	3.71	3.58	4.34	5.19	4.82	4.63	6.48	6.03	5.75	5.8	4.8	4.3
ULSD Consumed (1 CTG)	lb/hr	14072.40	15904.80	18565.20	18525.60	23482.8	23184.0	13345.20	12895.20	15638.40	18684.00	17348.40	16668.00	23335.20	21690.00	20707.20	20847.6	17146.8	15613.2
Net Heat Rate LHV (3 CTG)	BTU/kWh	10790.58	10095.96	9407.46	9398.28	8904.60	8863.80	11193.48	11416.86	10126.56	9528.84	9642.06	9779.76	8949.48	8984.16	9081.06	9210.60	9673.68	10065.36
Net Heat Rate HHV(3 CTG)[3]	BTU/kWh	11589.08	10843.06	10103.61	10093.75	9563.54	9519.72	12021.80	12261.71	10875.93	10233.97	10355.57	10503.46	9611.74	9648.99	9753.06	9892.18	10389.53	10810.20
2. Power Data																			
Power Generated Gross (3 CTG)	kW	72885	87843	109710	109530	146202	144945	66678	63234	86085	108969	100044	94824	144507	133845	126465	125601	98565	86400
Power Generated Net (3 CTG)	kW	71185	85987	107705	107583	143945	142761	65065	61642	84289	107008	98203	93023	142311	131770	124448	123535	96740	84662
Power Generated Gross (1 CTG)	kW	24295	29281	36570	36510	48734	48315	22226	21078	28695	36323	33348	31608	48169	44615	42155	41867	32855	28800
Power Generated Net (1 CTG)	kW	23728	28662	35902	35861	47982	47587	21688	20547	28096	35669	32734	31008	47437	43923	41483	41178	32247	28221

C. Process Data and Emissions Rates (per CTG) - ULSD (continued)

Parameter		0°F Ambient						59°F Ambient									95°F Ambient		
	Load %	50	60	75	75	100	100	50	50	60	75	75	75	100	100	100	100	100	100
	Reference Case	41/42	40	34	35/36	28	29/30	23	24	22	16	17	18	10	11	12	4	5	6
	Gas Compressor	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Inlet Heating	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SPRINT	OFF	Available - but OFF	Available - but OFF	OFF	ON	OFF	OFF	OFF	Available - but OFF	ailable - but	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	Evap Cooling	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF
3. Stack Data																			
Exhaust Composition:																			
Argon (Ar)	vol%	0.9014	0.8985	0.8934	0.8922	0.8798	0.8833	0.8918	0.8946	0.8897	0.872	0.8835	0.8866	0.8652	0.8753	0.8789	0.8467	0.8617	0.8679
Nitrogen (N_2)	vol%	74.85	74.61	74.18	74.08	73.05	73.34	74.05	74.28	73.87	72.4	73.36	73.62	71.84	72.68	72.97	70.3	71.55	72.07
Oxygen (O_2)	vol%	15.12	14.72	14.19	14.19	13.06	13.19	14.89	14.96	14.45	13.64	14.09	14.21	12.68	13.16	13.34	12.41	13.34	13.65
Carbon Dioxide (CO_2)	vol%	3.339	3.562	3.841	3.818	4.391	4.354	3.348	3.341	3.611	3.889	3.759	3.742	4.424	4.258	4.187	4.327	3.936	3.822
Water (H_2O)	vol%	5.798	6.211	6.896	7.011	8.617	8.229	6.821	6.525	7.179	9.202	7.911	7.561	10.19	9.028	8.618	12.11	10.31	9.597
Exhaust Flow Rate (1 CTG)	lb/s	246.3	260.6	281.52	282.4	309.8	308.754	231.9	224.9	251.8	277.3	267.6	259.896	303.6	294.5	286.2	275.094	250.41	235.416
Temperature	°F	711	740	768	761	828	828	733	743	767	764	772	778	834	830	830	860	839	843
Exhaust Flow Rate (1 CTG)	KPPH	886.788	938.20	1013.472	1016.78	1115.2	1111.514	835.01	809.68	906.62	998.4	963.5	935.6256	1092.8	1060.1	1030.4	990.3384	901.476	847.4976
Exhaust Flow Rate (1 CTG)	ft^3/hr	26428513	28653050	31674236	31596380	36555389	36435689	25353015	24789794	28311596	31102072	30211566	29479409	35988679	34804484	33827981	33270060	29802957	28104698
Exhaust Flow Rate (1 CTG)	dscfm	440475	477551	527904	526606	609256	607261	422550	413163	471860	518368	503526	491323	599811	580075	563800	554501	496716	468412
4. Emissions Data																			
PM - Filterable[1]	lb/hr	3.36	3.79	4.41	4.39	5.56	5.48	3.19	3.08	3.72	4.43	4.12	3.96	5.52	5.13	4.90	4.94	4.07	3.71
PM - Condensible[1]	lb/hr	6.01	6.78	7.89	7.87	9.95	9.82	5.70	5.52	6.66	7.94	7.37	7.09	9.89	9.19	8.78	8.84	7.29	6.65
PM - Total[1]	lb/hr	9.37	10.56	12.29	12.26	15.51	15.30	8.89	8.60	10.38	12.37	11.49	11.05	15.41	14.32	13.68	13.78	11.36	10.36
SO2	ppmvd @ 15% O_2	0.2049	0.2184	0.2353	0.2339	0.2698	0.2671	0.2066	0.206	0.2222	0.2403	0.2313	0.229	0.2735	0.2621	0.2576	0.2699	0.2444	0.2371
	lb/hr	0.44	0.49	0.57	0.57	0.72	0.71	0.41	0.40	0.48	0.57	0.53	0.51	0.72	0.67	0.64	0.64	0.53	0.48
H_2SO_4 (mist)	lb/hr	0.0667	0.0752	0.0875	0.0872	0.1103	0.1089	0.0633	0.0612	0.0739	0.0880	0.0817	0.0786	0.1096	0.1019	0.0973	0.0980	0.0808	0.0737
NO_x (1 CTG)	ppmvd @ 15% O_2	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
	lb/hr	59.7	63.16	68.22	68.45	75.07	74.82	56.21	54.51	61.03	67.21	64.86	62.98	73.56	71.36	69.36	66.67	60.68	57.05
CO (1 CTG)	ppmvd @ 15% O_2	47	45	41	41	36	36	32	32	30	28	28	28	25	25	25	23	23	23
	lb/hr	40.66	41.19	40.54	40.67	39.17	39.04	26.07	25.28	26.54	27.27	26.32	25.56	26.65	25.86	25.13	22.22	20.23	19.02
VOC (1 CTG)	ppmvd @ 15% O_2	13	12	10	10	7	7	10	10	9	7	7	7	5	5	5	5	5	5
	lb/hr	6.43	6.28	5.65	5.67	4.35	4.34	4.66	4.51	4.55	3.9	3.76	3.65	3.05	2.96	2.87	2.76	2.51	2.36
CO_2 Massflow	Lbs/hr	45107	50865	59193	59039	74667	73685	42807	41405	49998	59552	55325	53187	74173	68967	65866	66349	54685	49877
CO_2 Equivalent	Lbs/hr	45266	51044	59401	59246	74930	73944	42957	41550	50174	59762	55520	53374	74433	69210	66098	66582	54877	50053

Notes:
1. All PM emitted is less than 2.5 microns
2. Fuels represented as pipeline quality natural gas fuel based upon Sulphur content of 0.5 grain/100scf and ultra low sulfur diesel fuel based upon Sulphur content of 0.0015%
3. Calculated from LHV

D. Start-up/Shutdown Emissions Rates (per CTG)

	Startup		Shutdown	
	Gas	Diesel	Gas	Diesel
Estimated Time per Event (min)	10		8	
NOx Emissions per Event (lb)	3.6	12.8	3.1	10.9
CO Emissions per Event (lb)	3.2	11.6	2.5	9.9
VOC Emissions per Event (lb)	0.5	0.4	0.33	0.4
Natural Gas Heat Consumption (mmBtu/event)	27.3	26.5	24.7	23

ProEnergy

8/27/2018
Case No.
Permit Application Data Needed - GE LM6000 CTG's
Emissions Normal - 1 CTG
Stack, Process and Emissions Data

A. Stack Dimensions

Stack Height Above Grade	150	ft
Stack Exit Diameter	9	ft

B. Process Data and Emissions Rates (per CTG) - Natural Gas

Parameter		95°F Ambient			59°F Ambient			0°F Ambient		59°F Ambient			0°F Ambient		59°F Ambient	0°F Ambient	59°F Ambient		0°F Ambient
	Load %	100	100	100	100	100	100	100	100	75	75	75	75	75	60	60	50	50	50
	Reference Case	1	2	3	7	8	9	25	26/27	13	14	15	31	32/33	19	37	20	21	38/39
	Gas Compressor	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
	Inlet Heating	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	ON
	SPRINT	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	Available - but OFF	OFF	Available - but OFF	Available - but OFF	OFF	OFF	OFF
	Evap Cooling	ON	ON	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
1. Heat Input Data	Units																		
Natural Gas Consumed (3 CTG)	lb/s	16.3	12.9	11.7	18.18	16.34	15.59	18.2	17.6	14.48	13.10	12.56	14.40	14.01	12.07	12.21	10.08	9.72	10.65
Natural Gas Consumed (3 CTG)	lb/hr	58773.6	46450.8	42238.8	65448.00	58816.80	56127.60	65394.0	63450.0	52120.80	47152.80	45219.60	51840.00	50425.20	43459.20	43956.00	36288.00	35002.80	38340.00
CTG Heat Input LHV (1 CTG)	10^6 BTU/hr	408.53	323.49	294.61	454.40	408.30	389.84	454.10	440.30	362.84	328.38	315.06	361.07	350.89	303.41	307.04	254.36	245.61	268.48
CTG Heat Input HHV (1 CTG)[3]	10^6 BTU/hr	438.76	347.42	316.41	488.03	438.51	418.69	487.70	472.88	389.69	352.68	338.38	387.79	376.86	325.86	329.76	273.19	263.79	288.35
Net Fuel Rate[4]	MMscf/hr	0.43	0.34	0.31	0.48	0.43	0.41	0.48	0.46	0.38	0.35	0.33	0.38	0.37	0.32	0.32	0.27	0.26	0.28
Natural Gas Consumed (1 CTG)	lb/s	5.4	4.3	3.9	6.06	5.45	5.20	6.1	5.9	4.83	4.37	4.19	4.80	4.67	4.02	4.07	3.36	3.24	3.55
Natural Gas Consumed (1 CTG)	lb/hr	19591.2	15483.6	14079.6	21816.00	19605.60	18709.20	21798.0	21150.0	17373.60	15717.60	15073.20	17280.00	16808.40	14486.40	14652.00	12096.00	11667.60	12780.00
Net Heat Rate LHV(3 CTG)	BTU/kWh	9124.92	9643.08	10009.26	8943.36	8985.18	9075.96	8896.44	8868.9	9427.86	9635.94	9781.80	9417.66	9420.72	9986.82	10033.74	11196.54	11439.30	10790.58
Net Heat Rate HHV(3 CTG)[3]	BTU/kWh	9800.16	10356.67	10749.95	9605.17	9650.08	9747.58	9554.78	9525.20	10125.52	10349.00	10505.65	10114.57	10117.85	10725.84	10776.24	12025.08	12285.81	11589.08
2. Power Data																			
Power Generated Gross (3 CTG)	kW	131628	98625	86535	149379	133596	126282	150066	145956	113148	100191	94695	112719	109506	89319	89967	66792	63126	73149
Power Generated Net (3 CTG)	kW	128133	95815	83930	145563	130196	123013	146196	142316	109954	97340	91938	109487	106196	86546	87121	64459	60853	70677
Power Generated Gross (1 CTG)	kW	43876	32875	28845	49793	44532	42094	50022	48652	37716	33397	31565	37573	36502	29773	29989	22264	21042	24383
Power Generated Net (1 CTG)	kW	42711	31938	27977	48521	43399	41004	48732	47439	36651	32447	30646	36496	35399	28849	29040	21486	20284	23559
3. Stack Data																			
Exhaust Composition:																			
Argon (Ar)	vol%	0.8386	0.8554	0.8625	0.8553	0.8674	0.8711	0.8695	0.8743	0.8639	0.8764	0.8796	0.8784	0.8844	0.882	0.8905	0.8853	0.8881	0.8945
Nitrogen (N_2)	vol%	69.74	71.13	71.71	71.14	72.13	72.44	72.31	72.71	71.83	72.86	73.13	73.04	73.53	73.33	74.04	73.59	73.82	74.36
Oxygen (O_2)	vol%	12.30	13.42	13.75	12.53	13.22	13.40	12.94	13.19	13.59	14.12	14.25	14.02	14.22	14.42	14.69	14.91	14.99	15.13
Carbon Dioxide (CO_2)	vol%	3.29	2.92	2.83	3.37	3.16	3.10	3.32	3.25	2.93	2.79	2.76	2.873	2.838	2.71	2.667	2.492	2.484	2.485
Water (H_2O)	vol%	13.82	11.68	10.85	12.11	10.63	10.18	10.56	9.98	10.79	9.34	8.97	9.196	8.528	8.661	7.718	8.117	7.813	7.113
Exhaust	MW	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.7	28.7	28.70	28.7	28.7	28.7	28.7
Exhaust Flow Rate (1 CTG)	lb/s	277.6	250.0	235.1	304.2	293.6	285.6	310.1	308.6	280.4	267.4	259.4	285.906	282.2	254.9	262.7	231.7	224.5	246.5
Temperature	°F	864	826	831	840	815	816	826	816	757	760	765	741	747	758	729	722	731	699
Exhaust Flow Rate (1 CTG)	KPPH	999.5184	900.0072	846.396	1095.0	1056.8	1028.2	1116.3	1110.78	1009.4	962.5	933.7896	1029.2616	1016.04	917.63	945.54	834.28	808.21	887.5224
Exhaust Flow Rate (1 CTG)	ft^3/hr	33680211	29456625	27809672	36227770	34293204	33389307	36535348	36072377	31264139	29884360	29112611	31460441	31211535	28445413	28612631	25097156	24497993	26179346
Exhaust Flow Rate (1 CTG)	dscfm	561337	490944	463495	603796	571553	556488	608922	601206	521069	498073	485210	524341	520192	474090	476877	418286	408300	436322
4. Emissions Data																			
PM - Filterable[1]	lb/hr	1.32	1.05	0.95	1.47	1.32	1.26	1.47	1.42	1.17	1.06	1.02	1.17	1.13	0.98	0.99	0.82	0.79	0.87
PM - Condensible[1]	lb/hr	3.27	2.59	2.35	3.63	3.26	3.12	3.63	3.52	2.90	2.62	2.52	2.89	2.80	2.42	2.45	2.03	1.96	2.15
PM - Total[1]	lb/hr	4.59	3.63	3.31	5.10	4.58	4.38	5.10	4.94	4.07	3.69	3.54	4.05	3.94	3.41	3.45	2.85	2.76	3.01
PM - Total[1]	lb/MMbtu	0.0105	0.0104	0.0105	0.0105	0.0104	0.0105	0.0105	0.0104	0.0104	0.0105	0.0105	0.0104	0.0105	0.0105	0.0105	0.0104	0.0105	0.0104

SO2	ppmvd @ 15% O_2	0.1352	0.1189	0.1152	0.1373	0.1278	0.1255	0.1346	0.1312	0.1189	0.1129	0.1116	0.1161	0.1143	0.1094	0.1075	0.1009	0.1006	0.1001
	lb/hr	0.32	0.26	0.23	0.36	0.32	0.31	0.36	0.35	0.29	0.26	0.25	0.29	0.28	0.24	0.24	0.20	0.19	0.21
SO2	lb/MMbtu	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04
Sulfur content	grains per 100 SCF	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SO2	lb/MMbtu	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03
SO2	lb/hr	0.61	0.49	0.44	0.68	0.61	0.59	0.68	0.66	0.55	0.49	0.47	0.54	0.53	0.46	0.46	0.38	0.37	0.40
H_2SO_4 (mist)	lb/hr	0.0496	0.0393	0.0358	0.0551	0.0495	0.0473	0.0551	0.0534	0.0440	0.0399	0.0382	0.0438	0.0426	0.0368	0.0373	0.0309	0.0298	0.0326
H_2SO_4 (mist)	lb/MMbtu	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04	1.13E-04
H_2SO_4 (mist)	Percent S to H2SO4 (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
H_2SO_4 (mist)	lb/MMbtu	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04
H_2SO_4 (mist)	lb/hr	0.094	0.074	0.068	0.105	0.094	0.090	0.104	0.101	0.083	0.076	0.072	0.083	0.081	0.070	0.071	0.059	0.056	0.062
NO_x (1 CTG)	ppmvd @ 15% O_2	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
	lb/hr	40.05	36.06	33.91	43.88	42.35	41.2	44.73	44.51	40.45	38.57	37.42	41.24	40.71	36.77	37.89	33.43	32.38	35.56
CO (1 CTG)	ppmvd @ 15% O_2	17	17	17	20	20	20	30	30	22	22	22	35	35	25	38	27	27	40
	lb/hr	16.58	14.93	14.04	21.37	20.62	20.06	32.67	32.51	21.66	20.66	20.04	35.15	34.69	22.38	35.05	21.98	21.29	34.64
VOC (1 CTG)	ppmvd @ 15% O_2	1	1	1	1	1	1	2	2	2	2	2	5	5	3	6	4	4	7
	lb/hr	0.56	0.50	0.47	0.61	0.59	0.57	1.24	1.24	1.13	1.07	1.04	2.87	2.83	1.53	3.16	1.86	1.80	3.46
CO_2 Massflow	Lbs/hr	48264	38217	34806	53683	48236	46056	53647	52017	42866	38795	37221	42657	41455	35845	36274	30050	29017	31718
CO_2 Equivalent	Lbs/hr	48751	38602	35156	54224	48722	46520	54188	52541	43298	39186	37597	43087	41873	36206	36640	30353	29309	32038
CO_2 Equivalent	lb/MMbtu	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11	111.11

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C. Process Data and Emissions Rates (per CTG) - ULSD

Parameter		95°F Ambient			59°F Ambient			0°F Ambient		59°F Ambient			0°F Ambient		59°F Ambient	0°F Ambient	59°F Ambient		0°F Ambient
	Load %	100	100	100	100	100	100	100	100	75	75	75	75	75	60	60	50	50	50
	Reference Case	4	5	6	10	11	12	28	29/30	16	17	18	34	35/36	22	40	23	24	41/42
	Gas Compressor	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Inlet Heating	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	ON
	SPRINT	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	Available - but OFF	OFF	OFF	Available - but OFF	OFF	Available - but OFF	Available - but OFF	OFF	OFF	OFF
	Evap Cooling	ON	ON	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
1. Heat Input Data	Units																		
Natural Gas Consumed (3 CTG)	lb/s	17.4	14.3	13.0	19.45	18.08	17.26	19.6	19.3	15.57	14.46	13.89	15.47	15.44	13.03	13.25	11.12	10.75	11.73
Natural Gas Consumed (3 CTG)	lb/hr	62542.8	51440.4	46839.6	70005.60	65070.00	62121.60	70448.4	69552.0	56052.00	52045.20	50004.00	55695.60	55576.80	46915.20	47714.40	40035.60	38685.60	42217.20
CTG Heat Input LHV (1 CTG)	10^6 BTU/hr	393.49	324.31	295.80	439.88	409.01	390.62	442.82	436.99	353.18	328.11	315.43	351.05	350.13	296.52	301.66	253.87	245.55	267.51
CTG Heat Input HHV (1 CTG)[3]	10^6 BTU/hr	422.60	348.31	317.69	472.44	439.28	419.53	475.59	469.33	379.31	352.39	338.77	377.03	376.04	318.46	323.98	272.65	263.72	287.30
Net Fuel Rate[5]	gal/hr	3018.6	2487.9	2269.2	3374.5	3137.7	2996.6	3397.0	3352.4	2709.4	2517.1	2419.8	2693.0	2686.0	2274.7	2314.1	1947.5	1883.7	2052.2
Natural Gas Consumed (1 CTG)	lb/s	5.8	4.8	4.3	6.48	6.03	5.75	6.5	6.4	5.19	4.82	4.63	5.16	5.15	4.34	4.42	3.71	3.58	3.91
Natural Gas Consumed (1 CTG)	lb/hr	20847.6	17146.8	15613.2	23335.20	21690.00	20707.20	23482.8	23184.0	18684.00	17348.40	16668.00	18565.20	18525.60	15638.40	15904.80	13345.20	12895.20	14072.40
Net Heat Rate LHV (3 CTG)	BTU/kWh	9210.60	9673.68	10065.36	8949.48	8984.16	9081.06	8904.60	8863.80	9528.84	9642.06	9779.76	9407.46	9398.28	10126.56	10095.96	11193.48	11416.86	10790.58
Net Heat Rate HHV(3 CTG)[3]	BTU/kWh	9892.18	10389.53	10810.20	9611.74	9648.99	9753.06	9563.54	9519.72	10233.97	10355.57	10503.46	10103.61	10093.75	10875.93	10843.06	12021.80	12261.71	11589.08
2. Power Data																			
Power Generated Gross (3 CTG)	kW	125601	98565	86400	144507	133845	126465	146202	144945	108969	100044	94824	109710	109530	86085	87843	66678	63234	72885
Power Generated Net (3 CTG)	kW	123535	96740	84662	142311	131770	124448	143945	142761	107008	98203	93023	107705	107583	84289	85987	65065	61642	71185
Power Generated Gross (1 CTG)	kW	41867	32855	28800	48169	44615	42155	48734	48315	36323	33348	31608	36570	36510	28695	29281	22226	21078	24295
Power Generated Net (1 CTG)	kW	41178	32247	28221	47437	43923	41483	47982	47587	35669	32734	31008	35902	35861	28096	28662	21688	20547	23728
3. Stack Data																			
Exhaust Composition:																			
Argon (Ar)	vol%	0.8467	0.8617	0.8679	0.8652	0.8753	0.8789	0.8798	0.8833	0.872	0.8835	0.8866	0.8934	0.8922	0.8897	0.8985	0.8918	0.8946	0.9014
Nitrogen (N_2)	vol%	70.3	71.55	72.07	71.84	72.68	72.97	73.05	73.34	72.4	73.36	73.62	74.18	74.08	73.87	74.61	74.05	74.28	74.85
Oxygen (O_2)	vol%	12.41	13.34	13.65	12.68	13.16	13.34	13.06	13.19	13.64	14.09	14.21	14.19	14.19	14.45	14.72	14.89	14.96	15.12
Carbon Dioxide (CO_2)	vol%	4.327	3.936	3.822	4.424	4.258	4.187	4.391	4.354	3.889	3.759	3.742	3.841	3.818	3.611	3.562	3.348	3.341	3.339
Water (H_2O)	vol%	12.11	10.31	9.597	10.19	9.028	8.618	8.617	8.229	9.202	7.911	7.561	6.896	7.011	7.179	6.211	6.821	6.525	5.798
Exhaust	MW	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7
Exhaust Flow Rate (1 CTG)	lb/s	275.094	250.41	235.416	303.6	294.5	286.2	309.8	308.754	277.3	267.6	259.896	281.52	282.4	251.8	260.6	231.9	224.9	246.3
Temperature	°F	860	839	843	834	830	830	828	828	764	772	778	768	761	767	740	733	743	711
Exhaust Flow Rate (1 CTG)	KPPH	990.3384	901.476	847.4976	1092.8	1060.1	1030.4	1115.2	1111.5144	998.4	963.5	935.6256	1013.472	1016.78	906.62	938.20	835.01	809.68	886.788
Exhaust Flow Rate (1 CTG)	ft^3/hr	33270060	29802957	28104698	35988679	34804484	33827981	36555389	36435689	31102072	30211566	29479409	31674236	31596380	28311596	28653050	25353015	24789794	26428513
Exhaust Flow Rate (1 CTG)	dscfm	554501	496716	468412	599811	580075	563800	609256	607261	518368	503526	491323	527904	526606	471860	477551	422550	413163	440475
4. Emissions Data																			
PM - Filterable[1]	lb/hr	4.94	4.07	3.71	5.52	5.13	4.90	5.56	5.48	4.43	4.12	3.96	4.41	4.39	3.72	3.79	3.19	3.08	3.36
PM - Condensible[1]	lb/hr	8.84	7.29	6.65	9.89	9.19	8.78	9.95	9.82	7.94	7.37	7.09	7.89	7.87	6.66	6.78	5.70	5.52	6.01
PM - Total[1]	lb/hr	13.78	11.36	10.36	15.41	14.32	13.68	15.51	15.30	12.37	11.49	11.05	12.29	12.26	10.38	10.56	8.89	8.60	9.37
PM - Total[1]	lb/MMBtu	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261	0.03261
SO2	ppmvd @ 15% O_2	0.2699	0.2444	0.2371	0.2735	0.2621	0.2576	0.2698	0.2671	0.2403	0.2313	0.2290	0.2353	0.2339	0.2222	0.2184	0.2066	0.2060	0.2049
	lb/hr	0.64	0.53	0.48	0.72	0.67	0.64	0.72	0.71	0.57	0.53	0.51	0.57	0.57	0.48	0.49	0.41	0.40	0.44
SO2	lb/MMBtu	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03
Sulfur content	% wt	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
SO2	lb/MMbtu	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03
SO2	lb/hr	0.64	0.53	0.48	0.71	0.66	0.63	0.72	0.71	0.57	0.53	0.51	0.57	0.57	0.48	0.49	0.41	0.40	0.43
H_2SO_4 (mist)	lb/hr	0.0980	0.0808	0.0737	0.1096	0.1019	0.0973	0.1103	0.1089	0.0880	0.0817	0.0786	0.0875	0.0872	0.0739	0.0752	0.0633	0.0612	0.0667
H_2SO_4 (mist)	lb/MMbtu	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04	2.32E-04
H_2SO_4 (mist)	Percent S to H2SO4 (%)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

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H_2SO_4 (mist)	lb/MMbtu	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04	2.31E-04
H_2SO_4 (mist)	lb/hr	9.76E-02	8.05E-02	7.34E-02	1.09E-01	1.01E-01	9.69E-02	1.10E-01	1.08E-01	8.76E-02	8.14E-02	7.83E-02	8.71E-02	8.69E-02	7.36E-02	7.48E-02	6.30E-02	6.09E-02	6.64E-02
NO_x (1 CTG)	ppmvd @ 15% O_2	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
	lb/hr	66.67	60.68	57.05	73.56	71.36	69.36	75.07	74.82	67.21	64.86	62.98	68.22	68.45	61.03	63.16	56.21	54.51	59.70
CO (1 CTG)	ppmvd @ 15% O_2	23	23	23	25	25	25	36	36	28	28	28	41	41	30	45	32	32	47
	lb/hr	22.22	20.23	19.02	26.65	25.86	25.13	39.17	39.04	27.27	26.32	25.56	40.54	40.67	26.54	41.19	26.07	25.28	40.66
VOC (1 CTG)	ppmvd @ 15% O_2	5	5	5	5	5	5	7	7	7	7	7	10	10	9	12	10	10	13
	lb/hr	2.76	2.51	2.36	3.05	2.96	2.87	4.35	4.34	3.90	3.76	3.65	5.65	5.67	4.55	6.28	4.66	4.51	6.43
CO_2 Massflow	Lbs/hr	66349	54685	49877	74173	68967	65866	74667	73685	59552	55325	53187	59193	59039	49998	50865	42807	41405	45107
CO_2 Equivalent	Lbs/hr	66582	54877	50053	74433	69210	66098	74930	73944	59762	55520	53374	59401	59246	50174	51044	42957	41550	45266
CO_2 Equivalent	lb/MMBtu	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55	157.55

Notes:

1. All PM emitted is less than 2.5 microns
2. Fuels represented as pipeline quality natural gas fuel based upon sulphur content of 0.5 grain/100 scf and ultra low sulfur diesel fuel based upon sulphur content of 0.0015%
3. Calculated from LHV
4. Based on AP-42 Section 1.4, 1,020 Btu/scf
5. Based on a AP-42 Appendix A, 140,000 Btu/gal

ECT calculated values	*From AP-42 Appendix A*		
	Distillate Fuel	140,000	Btu/gal
	Conversion	7.05	lb/gal
		19858	Btu/lb

D. Start-up/Shutdown Emissions Rates (per CTG)

	Startup		Shutdown	
	Gas	Diesel	Gas	Diesel
Estimated Time per Event (min)	10		8	
NOx Emissions per Event (lb)	3.6	12.8	3.1	10.9
CO Emissions per Event (lb)	3.2	11.6	2.5	9.9
VOC Emissions per Event (lb)	0.5	0.4	0.33	0.4
Natural Gas Heat Comsumption (mmBtu/event)	27.3	26.5	24.7	23

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Tubrine Model: GE LM6000PC

Estimated Emissions for LM6000PC Burning Natural Gas

	100% - Gas								75% - Gas					60% - Gas		50% - Gas		
Reference Case	1	2	3	7	8	9	25	26/27	13	14	15	31	32/33	19	37	20	21	38/39
Gas Compressor	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Inlet Heating	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	ON
SPRINT	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	Available - but OFF	OFF	Available - but OFF	Available - but OFF	OFF	OFF	OFF
Evap Cooling	ON	ON	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
Temperature	95	95	95	59	59	59	0	0	59	59	59	0	0	59	0	59	59	0
Load %	100%	100%	100%	100%	100%	100%	100%	100%	75%	75%	75%	75%	75%	60%	60%	50%	50%	50%
Fuel Type	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas
Stack Height (ft)	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Stack diameter (ft)	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Exhaust Temp (°F)	864	826	831	840	815	816	826	816	757	760	765	741	747	758	729	722	731	699
Exhaust velocity (ft/sec)	147.06	128.62	121.43	158.18	149.74	145.79	159.53	157.51	136.51	130.49	127.12	137.37	136.28	124.20	124.93	109.58	106.97	114.31
Estimated Stack Flow (ft^3/hr)	33,680,211	29,456,625	27,809,672	36,227,770	34,293,204	33,389,307	36,535,348	36,072,377	31,264,139	29,884,360	29,112,611	31,460,441	31,211,535	28,445,413	28,612,631	25,097,156	24,497,993	26,179,346
NOx - (Lbs/hr)	40.05	36.06	33.91	43.88	42.35	41.20	44.73	44.51	40.45	38.57	37.42	41.24	40.71	36.77	37.89	33.43	32.38	35.56
CO (Lbs/hr)	16.58	14.93	14.04	21.37	20.62	20.06	32.67	32.51	21.66	20.66	20.04	35.15	34.69	22.38	35.05	21.98	21.29	34.64
VOC (Lbs/hr)	0.56	0.50	0.47	0.61	0.59	0.57	1.24	1.24	1.13	1.07	1.04	2.87	2.83	1.53	3.16	1.86	1.80	3.46
Primary PM/PM_{10}/$PM_{2.5}$ Total (Lbs/hr)	4.59	3.63	3.31	5.10	4.58	4.38	5.10	4.94	4.07	3.69	3.54	4.05	3.94	3.41	3.45	2.85	2.76	3.01
SO_2 (lb/hr)	0.61	0.49	0.44	0.68	0.61	0.59	0.68	0.66	0.55	0.49	0.47	0.54	0.53	0.46	0.46	0.38	0.37	0.40
H_2SO_4 (Lbs/hr)	0.09	0.07	0.07	0.10	0.09	0.09	0.10	0.10	0.08	0.08	0.07	0.08	0.08	0.07	0.07	0.06	0.06	0.06
CO_2 Massflow (Lbs/hr)	48264	38217	34806	53683	48236	46056	53647	52017	42866	38795	37221	42657	41455	35845	36274	30050	29017	31718
CO_2 Equivalent (Lb/hr)	48751	38602	35156	54224	48722	46520	54188	52541	43298	39186	37597	43087	41873	36206	36640	30353	29309	32038

	100	75	60	50
Stack Parameters				
Height (ft)	150	150	150	150
Diameter (ft)	9	9	9	9
Temperature (deg F)	815	741	729	699
Velocity (ft/sec)	121.43	127.12	124.20	106.97
Emissions Data (lb/hr)				
NOx	44.73	41.24	37.89	35.56
CO	32.67	35.15	35.05	34.64
VOC	1.24	2.87	3.16	3.46
Primary PM/PM_{10}/$PM_{2.5}$	5.10	4.07	3.45	3.01
SO_2	0.68	0.55	0.46	0.40
H_2SO_4	0.10	0.08	0.07	0.06
CO_2	53683	42866	36274	31718
CO_2e	54224	43298	36640	32038

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Tubrine Model: GE LM6000PC

Estimated Emissions for LM6000PC Burning ULSD

	100% - Gas								75% - Gas					60% - Gas		50% - Gas		
Reference Case	4	5	6	10	11	12	28	29/30	16	17	18	34	35/36	22	40	23	24	41/42
Gas Compressor	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Inlet Heating	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	ON
SPRINT	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	Available - but OFF	OFF	OFF	Available - but OFF	OFF	Available - but OFF	Available - but OFF	OFF	OFF	OFF
Evap Cooling	ON	ON	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
Temperature	95	95	95	59	59	59	0	0	59	59	59	0	0	59	0	59	59	0
Load %	100%	100%	100%	100%	100%	100%	100%	100%	75%	75%	75%	75%	75%	60%	60%	50%	50%	50%
Fuel Type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Stack Height (ft)	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Stack diameter (ft)	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Exhaust Temp (°F)	860	839	843	834	830	830	828	828	764	772	778	768	761	767	740	733	743	711
Exhaust velocity (ft/sec)	145.27	130.13	122.72	157.14	151.97	147.71	159.62	159.09	135.80	131.92	128.72	138.30	137.96	123.62	125.11	110.70	108.24	115.40
Estimated Stack Flow (ft^3/hr)	33,270,060	29,802,957	28,104,698	35,988,679	34,804,484	33,827,981	36,555,389	36,435,689	31,102,072	30,211,566	29,479,409	31,674,236	31,596,380	28,311,596	28,653,050	25,353,015	24,789,794	26,428,513
NOx - (Lbs/hr)	66.67	60.68	57.05	73.56	71.36	69.36	75.07	74.82	67.21	64.86	62.98	68.22	68.45	61.03	63.16	56.21	54.51	59.70
CO (Lbs/hr)	22.22	20.23	19.02	26.65	25.86	25.13	39.17	39.04	27.27	26.32	25.56	40.54	40.67	26.54	41.19	26.07	25.28	40.66
VOC (Lbs/hr)	2.76	2.51	2.36	3.05	2.96	2.87	4.35	4.34	3.90	3.76	3.65	5.65	5.67	4.55	6.28	4.66	4.51	6.43
Primary PM/PM_{10}/$PM_{2.5}$ Total (Lbs/hr)	13.78	11.36	10.36	15.41	14.32	13.68	15.51	15.30	12.37	11.49	11.05	12.29	12.26	10.38	10.56	8.89	8.60	9.37
SO_2 (lb/hr)	0.64	0.53	0.48	0.71	0.66	0.63	0.72	0.71	0.57	0.53	0.51	0.57	0.57	0.48	0.49	0.41	0.40	0.43
H_2SO_4 (Lbs/hr)	9.76E-02	8.05E-02	7.34E-02	1.09E-01	1.01E-01	9.69E-02	1.10E-01	1.08E-01	8.76E-02	8.14E-02	7.83E-02	8.71E-02	8.69E-02	7.36E-02	7.48E-02	6.30E-02	6.09E-02	6.64E-02
CO_2 Massflow (Lbs/hr)	66349	54685	49877	74173	68967	65866	74667	73685	59552	55325	53187	59193	59039	49998	50865	42807	41405	45107
CO_2 Equivalent (Lb/hr)	66582	54877	50053	74433	69210	66098	74930	73944	59762	55520	53374	59401	59246	50174	51044	42957	41550	45266

	100	75	60	50
Stack Parameters				
Height (ft)	150	150	150	150
Diameter (ft)	9	9	9	9
Temperature (deg F)	828	761	740	711
Velocity (ft/sec)	122.72	128.72	123.62	108.24
Emissions Data (lb/hr)				
NOx	75.07	68.45	63.16	59.70
CO	39.17	40.67	41.19	40.66
VOC	4.35	5.67	6.28	6.43
Primary PM/PM_{10}/$PM_{2.5}$	15.51	12.37	10.56	9.37
SO_2	0.72	0.57	0.49	0.43
H_2SO_4	0.11	0.09	0.07	0.07
CO_2	74667	59552	50865	45107
CO_2e	74930	59762	51044	45266

ECT Environmental Consulting & Technology, Inc.

Natural Gas fired GE LM6000PC Turbine

Turbine Heat Input 488 MMBtu/hr 27 % Capacity Factor

Source		Load %	Operations	Emission Rates																	
				NO_x		CO		VOC		$PM/PM_{10}/PM_{2.5}$		NH_3		SO_2 ECT		Lead		H_2SO_4 ECT		CO_2e	
			(hrs/yr)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine- Natural Gas		100%	2,365	44.73	52.90	32.67	38.64	1.24	1.47	5.10	6.03	0.00	0.00	6.83E-01	8.07E-01	2.39E-04	2.83E-04	1.05E-01	1.24E-01	54,224	64,125
		75%	2,365	41.24	48.77	35.15	41.57	2.87	3.39	4.07	4.81	0.00	0.00	5.45E-01	6.45E-01	2.39E-04	2.83E-04	8.35E-02	9.87E-02	43,298	51,204
		60%	2,365	37.89	44.81	35.05	41.45	3.16	3.74	3.45	4.08	0.00	0.00	4.61E-01	5.46E-01	2.39E-04	2.83E-04	7.06E-02	8.35E-02	36,640	43,330
		50%	2,365	35.56	42.05	34.64	40.97	3.46	4.09	3.01	3.56	0.00	0.00	4.03E-01	4.77E-01	2.39E-04	2.83E-04	6.18E-02	7.30E-02	32,038	37,888
Turbine- Natural Gas	**events/yr**	**min/event**	**hrs/yr**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**
Startup	250	10	41.7	3.60	0.08	3.20	0.07	0.50	0.01	0.29	0.006	0.00	0.00	3.82E-02	7.96E-04	2.39E-04	4.98E-06	5.85E-03	1.22E-04	3033	63
Shutdown	250	8	33	3.10	0.05	2.50	0.04	0.33	0.01	0.26	0.004	0.00	0.00	3.46E-02	5.76E-04	2.39E-04	3.99E-06	5.29E-03	8.82E-05	2744	46
Subtotal - Startups/Shutdowns					0.13		0.11		0.02		0.01		0.000		1.37E-03		8.97E-06		2.10E-04		108.9
Total (Normal 100% and SUSD)					53.02		38.74		1.48		6.04		0.00		8.09E-01		2.92E-04		1.24E-01		64,234
Total (Normal 75% and SUSD)					48.90		41.68		3.41		4.82		0.00		6.46E-01		2.92E-04		9.89E-02		51,313
Total (Normal 60% and SUSD)					44.94		41.56		3.75		4.09		0.00		5.47E-01		2.92E-04		8.37E-02		43,439
Total (Normal 50% and SUSD)					42.18		41.07		4.11		3.57		0.00		4.78E-01		2.92E-04		7.32E-02		37,997

Notes:

Lead Emission factor Natural Gas **4.90E-07** lb/MMBtu

1) Short term lb/hr rates (except for Lead), Turbine heat input and SUSD hours are from the Performance Data provided by ProEnergy in August 2018.
2) Lead emissions are calculated using emission factor from AP-42 Section 1.4, Table 1.4-2 for Natural Gas.
3) SUSD events/yr is from "Prairie Power Alsey Station Compliance Report".
4) SUSD - $PM/PM_{10}/PM_{2.5}$, SO_2, H_2SO_4 and CO_2e emissions are based on SUSD MMBtu/event and maximum lb/MMBtu values of each pollutant.

ECT Environmental Consulting & Technology, Inc.

Burning 90% Natural Gas and 10% ULSD GE LM6000PC Turbine

Turbine Heat Input Natural Gas	488	MMBtu/hr	27	% Capacity Factor
Turbine Heat Input ULSD	476	MMBtu/hr	2365	hr/yr (100% NG operation)

Source		Load %	Operations	Emission Rates																		
				NO_x		CO		VOC		$PM/PM_{10}/PM_{2.5}$		NH_3		SO_2 ECT		Lead		H_2SO_4 ECT		CO_2e	
			(hrs/yr)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Turbine- Natural Gas		100%	2,129	44.73	47.61	32.67	34.77	1.24	1.32	5.10	5.43	0.00	0.00	6.83E-01	7.27E-01	2.39E-04	2.55E-04	1.05E-01	1.11E-01	54,224	57,713
		75%	2,129	41.24	43.89	35.15	37.41	2.87	3.05	4.07	4.33	0.00	0.00	5.45E-01	5.80E-01	2.39E-04	2.55E-04	8.35E-02	8.88E-02	43,298	46,084
		60%	2,129	37.89	40.33	35.05	37.31	3.16	3.36	3.45	3.67	0.00	0.00	4.61E-01	4.91E-01	2.39E-04	2.55E-04	7.06E-02	7.52E-02	36,640	38,997
		50%	2,129	35.56	37.85	34.64	36.87	3.46	3.68	3.01	3.20	0.00	0.00	4.03E-01	4.29E-01	2.39E-04	2.55E-04	6.18E-02	6.57E-02	32,038	34,099
Turbine- ULSD		100%	237	75.07	8.88	39.17	4.63	4.35	0.51	15.51	1.83	0.00	0.00	0.72	0.08	6.66E-03	7.87E-04	1.10E-01	1.30E-02	74,930	8,861
		75%	237	68.45	8.09	40.67	4.81	5.67	0.67	12.37	1.46	0.00	0.00	0.57	0.07	6.66E-03	7.87E-04	8.76E-02	1.04E-02	59,762	7,067
		60%	237	63.16	7.47	41.19	4.87	6.28	0.74	10.56	1.25	0.00	0.00	0.49	0.06	6.66E-03	7.87E-04	7.48E-02	8.85E-03	51,044	6,036
		50%	237	59.70	7.06	40.66	4.81	6.43	0.76	9.37	1.11	0.00	0.00	0.43	0.05	6.66E-03	7.87E-04	6.64E-02	7.85E-03	45,266	5,353
Turbine- Natural Gas	**events/yr**	**min/event**	**hrs/yr**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/event)**	**(tpy)**	**(lb/event)**	**(tpy)**
Startup	225	10	37.5	3.60	0.07	3.20	0.06	0.50	0.01	0.29	0.005	0.00	0.00	3.82E-02	7.16E-04	2.39E-04	4.49E-06	5.85E-03	1.10E-04	3,033	57
Shutdown	225	8	30	3.10	0.05	2.50	0.04	0.33	0.005	0.26	0.004	0.00	0.00	3.46E-02	5.18E-04	2.39E-04	3.59E-06	5.29E-03	7.93E-05	2,744	41
Turbine- ULSD																					
Startup	25	10	4.17	12.80	0.03	11.60	0.02	0.40	0.001	0.86	0.002	0.00	0.00	4.00E-02	8.33E-05	6.66E-03	1.39E-05	6.12E-03	1.28E-05	4,175	9
Shutdown	25	8	3.3	10.90	0.02	9.90	0.02	0.40	0.001	0.75	0.001	0.00	0.00	3.47E-02	5.78E-05	6.66E-03	1.11E-05	5.31E-03	8.86E-06	3,624	6
Subtotal - Startups/Shutdowns					0.16		0.14		0.02		0.012		0.000		1.38E-03		3.30E-05		2.11E-04		112.78
Total (Normal 100% and SUSD)					56.64		39.54		1.85		7.27		0.00		8.13E-01		1.08E-03		1.24E-01		66,687
Total (Normal 75% and SUSD)					52.15		42.36		3.74		5.81		0.00		6.49E-01		1.08E-03		9.94E-02		53,264
Total (Normal 60% and SUSD)					47.96		42.31		4.12		4.93		0.00		5.50E-01		1.08E-03		8.42E-02		45,146
Total (Normal 50% and SUSD)					45.07		41.82		4.46		4.32		0.00		4.82E-01		1.08E-03		7.38E-02		39,565

Notes:

1) Short term lb/hr rates (except for Lead), Turbine heat input and SUSD hours are from the Performance Data provided by ProEnergy in August 2018.
2) Lead emissions are calculated using emission factor from AP-42 Section 1.4, Table 1.4-2 for Natural Gas and AP-42 Section 3.1, Table 3.1-5 for Distillate Oil.
3) SUSD events/yr is from "Prairie Power Alsey Station Compliance Report".
4) SUSD - $PM/PM_{10}/PM_{2.5}$, SO_2, H_2SO_4 and CO_2e emissions are based on SUSD MMBtu/event and maximum lb/MMBtu values of each pollutant.

Lead Emission factor Natural Gas	**4.90E-07**	lb/MMBtu
Lead Emission factor Distillate Oil	**1.40E-05**	lb/MMBtu

Black Start Generator

POTENTIAL EMISSION INVENTORY WORKSHEET

EMISSION SOURCE TYPE

INTERNAL COMBUSTION ENGINES

FACILITY AND SOURCE DESCRIPTION

Emission Source Description:	Black Start Generator	
Emission Control Method(s)/ID No.(s):	None	
Emission Point Description:	2011.53 hp Diesel Engine	1500 kW

EMISSION ESTIMATION EQUATIONS

Emission (lb/hr) = Emission Factor (g/kW-hr) x Engine power rating (kW) x (1 lb / 453.6 g)

Emission (lb/hr) = Emission Factor (lb/hp-hr) x Engine power rating (hp)

Emission (lb/hr) = Emission Factor (lb/MMBtu) x Heat Input (MMBtu/hr)

Emission (ton/yr) = Hourly Emissions (lb/hr) x Operating Period (hrs/yr) x (1 ton / 2,000 lb)

INPUT DATA AND EMISSIONS CALCULATIONS

Permitted Hours:	100	hrs/yr
No. of Engines:	1	
Heat Input:	14.08	MMBtu/hr (HHV)
Diesel Sulfur Content:	0.0015	weight %
Diesel Heat Content:	7,000	Btu/hp-hr

Pollutant	Emission Factor		Potential Emission Rates	
	g/kW-hr	lb/-hp-hr	Per Unit (lb/hr)	Per Unit (tpy)
NO_x	9.20		30.4	1.52
CO	11.40		37.70	1.88
VOC	1.30		4.3	0.215
SO_2		1.21E-05	0.02	1.22E-03
PM	0.54		1.79	0.089
PM_{10}	0.54		1.79	0.089
$PM_{2.5}$	0.54		1.79	0.089
Highest HAP			1.09E-02	5.46E-04
Total HAPs			0.024	0.0012
H_2SO_4		9.29E-07	0.0019	9.34E-05

Pollutant[1]	Emission Factor (lb/MMBtu)	Potential Emission Rates Per Unit (lb/hr)	Potential Emission Rates Per Unit (tpy)
Acetaldehyde	2.52E-05	3.55E-04	1.77E-05
Acrolein	7.88E-06	1.11E-04	5.55E-06
Benzene	7.76E-04	1.09E-02	5.46E-04
Formaldehyde	7.89E-05	1.11E-03	5.55E-05
Naphthalene	1.30E-04	1.83E-03	9.15E-05
PAH	2.12E-04	2.99E-03	1.49E-04
Toluene	2.81E-04	3.96E-03	1.98E-04
Xylenes	1.93E-04	2.72E-03	1.36E-04

Summary of GHG Emissions:

Pollutant	**Emission Factor (kg/MMBtu)[2]**	**Emissions (metric tons/yr)[3]**	**Emissions (US tons/yr)[4]**
CO_2	73.96	104.1	114.76
CH_4	3.0E-03	0.004	0.005
N_2O	6.0E-04	0.001	0.001
CO_2e[5]	--	104.50	**115.16**

SOURCES OF INPUT DATA

Parameter	Data Source
Power Output, Heat Content and Hours of operation	By CP Crane
NOx , CO, PM, PM_{10}, $PM_{2.5}$ and VOC emission factor	NSPS Subpart IIII
H_2SO_4	Based on 5% conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4
SO_2	Emission factors based on Table 3.4-1, per US EPA AP-42, Chapter 3.4 - Large Stationary Diesel & All Stationary Dual-fuel Engines
1. HAPs	Emission factors based on Table 3.4-3, per US EPA AP-42, Chapter 3.4 - Large Stationary Diesel & All Stationary Dual-fuel Engines

2. Based on EPA default factors in 40 CFR Part 98 Subpart C Tables C-1 and C-2 for Distillate Fuel Oil No. 2.

3. Calculated based on the heat input, emission factors, and equations C-1b and C-8b of 40 CFR Part 98 Subpart C. CO_2e based on Subpart A Table A-1 factors.

CO_2, CH_4, or N_2O (metric tpy) = 1E-03 * Gas (MMBtu/yr) * Emission Factor (kg/MMBtu)

4. 1 metric ton = 1.102 US ton

5. CO_2e = CO_2, CH_4, or N_2O (tpy) * Global Warming Potential factor (GWP)

CO_2 GWP	1
CH_4 GWP	25
N_2O GWP	298

NOTES AND OBSERVATIONS

Assume PM = PM_{10} = $PM_{2.5}$

Proposed Project Emissions

CT Scenario	Description	NO_x		CO		VOC		$PM/PM_{10}/PM_{2.5}$		NH_3		SO_2		Lead		H_2SO_4		CO_2e	
		Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)
100% Load																			
1	Normal Operation burning NG	52.90	158.69	38.64	115.91	1.47	4.40	6.03	18.09	0.00	0.00	8.07E-01	2.42	2.83E-04	8.49E-04	1.24E-01	3.71E-01	64,125	192,376
2	Normal Operation burning NG with SUSD	53.02	159.07	38.74	116.23	1.48	4.45	6.04	18.12	0.00	0.00	8.09E-01	2.43	2.92E-04	8.76E-04	1.24E-01	3.71E-01	64,234	192,703
3	Normal Operation load burning 90% NG and 10% ULSD	56.49	169.46	39.40	118.21	1.83	5.50	7.26	21.79	0.00	0.00	8.11E-01	2.43	1.04E-03	3.13E-03	1.24E-01	3.73E-01	66,574	199,722
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	56.64	169.93	39.54	118.63	1.85	5.55	7.27	21.82	0.00	0.00	8.13E-01	2.44	1.08E-03	3.23E-03	1.24E-01	3.73E-01	66,687	200,060
75% Load																			
1	Normal Operation burning NG	48.77	146.31	41.57	124.71	3.39	10.18	4.81	14.44	0.00	0.00	6.45E-01	1.93	2.83E-04	8.49E-04	9.87E-02	2.96E-01	51,204	153,613
2	Normal Operation burning NG with SUSD	48.90	146.69	41.68	125.03	3.41	10.23	4.82	14.47	0.00	0.00	6.46E-01	1.94	2.92E-04	8.76E-04	9.89E-02	2.97E-01	51,313	153,940
3	Normal Operation load burning 90% NG and 10% ULSD	51.99	155.96	42.22	126.66	3.73	11.18	5.79	17.38	0.00	0.00	6.48E-01	1.94	1.04E-03	3.13E-03	9.92E-02	2.98E-01	53,151	159,454
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	52.15	156.44	42.36	127.08	3.74	11.22	5.81	17.42	0.00	0.00	6.49E-01	1.95	1.08E-03	3.23E-03	9.94E-02	2.98E-01	53,264	159,792
60% Load																			
1	Normal Operation burning NG	44.81	134.43	41.45	124.35	3.74	11.21	4.08	12.24	0.00	0.00	5.46E-01	1.64	2.83E-04	8.49E-04	8.35E-02	2.51E-01	43,330	129,990
2	Normal Operation burning NG with SUSD	44.94	134.81	41.56	124.68	3.75	11.26	4.09	12.27	0.00	0.00	5.47E-01	1.64	2.92E-04	8.76E-04	8.37E-02	2.51E-01	43,439	130,317
3	Normal Operation load burning 90% NG and 10% ULSD	47.80	143.39	42.18	126.53	4.11	12.32	4.92	14.76	0.00	0.00	5.49E-01	1.65	1.04E-03	3.13E-03	8.40E-02	2.52E-01	45,034	135,101
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	47.96	143.87	42.31	126.94	4.12	12.37	4.93	14.80	0.00	0.00	5.50E-01	1.65	1.08E-03	3.23E-03	8.42E-02	2.53E-01	45,146	135,439
50% Load																			
1	Normal Operation burning NG	42.05	126.16	40.97	122.90	4.09	12.28	3.56	10.68	0.00	0.00	4.77E-01	1.43	2.83E-04	8.49E-04	7.30E-02	2.19E-01	37,888	113,665
2	Normal Operation burning NG with SUSD	42.18	126.54	41.07	123.22	4.11	12.32	3.57	10.71	0.00	0.00	4.78E-01	1.44	2.92E-04	8.76E-04	7.32E-02	2.20E-01	37,997	113,991
3	Normal Operation load burning 90% NG and 10% ULSD	44.91	134.72	41.68	125.03	4.44	13.33	4.31	12.93	0.00	0.00	4.81E-01	1.44	1.04E-03	3.13E-03	7.36E-02	2.21E-01	39,452	118,357
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	45.07	135.20	41.82	125.45	4.46	13.38	4.32	12.97	0.00	0.00	4.82E-01	1.45	1.08E-03	3.23E-03	7.38E-02	2.21E-01	39,565	118,696
	Maximum Emissions from 3 turbines		169.93		127.08		13.38		21.82		0.00		2.44		3.23E-03		3.73E-01		200,060
	Black Start Generator		1.52		1.88		0.21		0.089		-		1.22E-03		-		9.34E-05		115.16
	Proposed Project Total Emissions		**171.45**		**128.96**		**13.59**		**21.91**		**0.00**		**2.44**		**3.23E-03**		**3.73E-01**		**200,175**

Notes:

1) Short term lb/hr rates (except for Lead), Turbine heat input and SUSD hours are from the Performance Data provided by ProEnergy in August 2018.
2) Lead emissions are calculated using emission factor from AP-42 Section 1.4, Table 1.4-2 for Natural Gas and AP-42 Section 3.1, Table 3.1-5 for Distillate Oil.
3) SUSD events/yr is from "Prairie Power Alsey Station Compliance Report".
4) SUSD - $PM/PM_{10}/PM_{2.5}$, SO_2, H_2SO_4 and CO_2e emissions are based on SUSD MMBtu/event and maximum lb/MMBtu values of each pollutant.

ECT Environmental Consulting & Technology, Inc.

Turbine Hazardous Air Pollutant Emissions

GE Simple Cycle Turbine Emissions Calculation

Summary of HAP Emission Rates Per Turbine

NG-Firing: Maximum CT HAP Emissions

Parameter	Units	
Maximum Heat Input (HHV):	MMBtu/hr	488
Maximum Annual Hours:	hrs/yr	2,440

Pollutant	CT Emission Factor[1] (lb/MMBtu)	CT Total (lb/hr)	CT Total TPY
1,3-Butadiene	4.3E-07	2.10E-04	2.56E-04
Acetaldehyde	4.0E-05	1.95E-02	2.38E-02
Acrolein	6.4E-06	3.12E-03	3.81E-03
Benzene	1.2E-05	5.86E-03	7.15E-03
Ethylbenzene	3.2E-05	1.56E-02	1.91E-02
Formaldehyde	7.1E-04	3.46E-01	4.23E-01
Naphthalene	1.3E-06	6.34E-04	7.74E-04
Polycyclic Aromatic Hydrocarbons (PAHs)	2.2E-06	1.07E-03	1.31E-03
Propylene Oxide	2.9E-05	1.42E-02	1.73E-02
Toluene	1.3E-04	6.34E-02	7.74E-02
Xylene	6.4E-05	3.12E-02	3.81E-02
Max. individual HAP			0.42
Total HAPs			0.61

Notes:
CT = Combustion Turbine
[1] EPA AP-42, Table 3.1-3, April 2000.

Dual Fuel: Maximum CT HAP Emissions

Parameter	Units	Fuel Type	
		NG	ULSD
Maximum Heat Input (HHV):	MMBtu/hr	488	476
Maximum Annual Hours:	hrs/yr	2,196	244

Pollutant	CT Emission Factor NG[1] (lb/MMBtu)	CT Emission Factor ULSD[2] (lb/MMBtu)	CT Total NG (lb/hr)	CT Total ULSD (lb/hr)	CT Total TPY
1,3-Butadiene	4.3E-07	1.6E-05	2.10E-04	7.61E-03	1.16E-03
Acetaldehyde	4.0E-05		1.95E-02		2.14E-02
Acrolein	6.4E-06		3.12E-03		3.43E-03
Benzene	1.2E-05	5.5E-05	5.86E-03	2.62E-02	9.62E-03
Ethylbenzene	3.2E-05		1.56E-02		1.71E-02
Formaldehyde	7.1E-04	2.8E-04	3.46E-01	1.33E-01	3.97E-01
Naphthalene	1.3E-06	3.5E-05	6.34E-04	1.66E-02	2.73E-03
Polycyclic Aromatic Hydrocarbons (PAHs)	2.2E-06	4.0E-05	1.07E-03	1.90E-02	3.50E-03
Propylene Oxide	2.9E-05		1.42E-02		1.55E-02
Toluene	1.3E-04		6.34E-02		6.97E-02
Xylene	6.4E-05		3.12E-02		3.43E-02
Arsenic		1.1E-05		5.23E-03	6.38E-04
Beryllium		3.1E-07		1.47E-04	1.80E-05
Cadmium		4.8E-06		2.28E-03	2.79E-04
Chromium		1.1E-05		5.23E-03	6.38E-04
Lead		1.4E-05		6.66E-03	8.12E-04
Manganese		7.9E-04		3.76E-01	4.58E-02
Mercury		1.2E-06		5.71E-04	6.96E-05
Nickel		4.6E-06		2.19E-03	2.67E-04
Selenium		2.5E-05		1.19E-02	1.45E-03
Max. individual HAP					0.40
Total HAPs					0.63

Notes:
CT = Combustion Turbine
[1] EPA AP-42, Table 3.1-3, April 2000.
[2] EPA AP-42, Table 3.1-4 and 3.1-5, April 2000.

Pollutant	One CT Worst Case TPY
1,3-Butadiene	1.16E-03
Acetaldehyde	2.38E-02
Acrolein	3.81E-03
Benzene	9.62E-03
Ethylbenzene	1.91E-02
Formaldehyde	4.23E-01
Naphthalene	2.73E-03
Polycyclic Aromatic Hydrocarbons (PAHs)	3.50E-03
Propylene Oxide	1.73E-02
Toluene	7.74E-02
Xylene	3.81E-02
Arsenic	6.38E-04
Beryllium	1.80E-05
Cadmium	2.79E-04
Chromium	6.38E-04
Lead	8.12E-04
Manganese	4.58E-02
Mercury	6.96E-05
Nickel	2.67E-04
Selenium	1.45E-03
Max. individual HAP	0.42
Total HAPs	0.67

Diesel Firewater Pump

POTENTIAL EMISSION INVENTORY WORKSHEET

EMISSION SOURCE TYPE

INTERNAL COMBUSTION ENGINES < 600 HP

FACILITY AND SOURCE DESCRIPTION

Emission Source Description:	Firewater Pump	Old - 1987
Emission Control Method(s)/ID No.(s):	None	
Emission Point Description:	399 hp Diesel Engine	

EMISSION ESTIMATION EQUATIONS

Emission (lb/hr) = Emission Factor (g/hp-hr) x Engine power rating (hp) x (1 lb / 453.6 g)

Emission (lb/hr) = Emission Factor (lb/hp-hr) x Engine power rating (hp)

Emission (lb/hr) = Emission Factor (lb/MMBtu) x Heat Input (MMBtu/hr)

Emission (ton/yr) = Hourly Emissions (lb/hr) x Operating Period (hrs/yr) x (1 ton / 2,000 lb)

INPUT DATA AND EMISSIONS CALCULATIONS

Permitted Hours:	100	hrs/yr			
No. of Engines:	1		Diesel Sulfur Content:	0.0015	weight %
Heat Input:	2.79	MMBtu/hr (HHV)	Diesel Heat Content:	7,000	Btu/hp-hr

Pollutant	Emission Factor		Potential Emission Rates	
	lb/MMBtu	lb/-hp-hr	Per Unit (lb/hr)	Per Unit (tpy)
NO_x		0.031	12.37	0.618
CO		6.68E-03	2.67	0.133
VOC		2.47E-03	0.99	0.049
SO_2		2.05E-03	0.82	0.041
PM		2.20E-03	0.88	0.044
PM_{10}		2.20E-03	0.88	0.044
$PM_{2.5}$		2.20E-03	0.88	0.044
Highest HAP			3.30E-03	1.65E-04
Total HAPs			0.0111	5.53E-04
H_2SO_4		1.57E-04	0.06	0.003

Pollutant[1]	Emission Factor (lb/MMBtu)	Potential Emission Rates Per Unit (lb/hr)	Potential Emission Rates Per Unit (tpy)
1,3-Butadiene	3.91E-05	1.09E-04	5.46E-06
Acetaldehyde	7.67E-04	2.14E-03	1.07E-04
Acrolein	9.25E-05	2.58E-04	1.29E-05
Benzene	9.33E-04	2.61E-03	1.30E-04
Formaldehyde	1.18E-03	3.30E-03	1.65E-04
Naphthalene	8.48E-05	2.37E-04	1.18E-05
PAH	1.68E-04	4.69E-04	2.35E-05
Toluene	4.09E-04	1.14E-03	5.71E-05
Xylenes	2.85E-04	7.96E-04	3.98E-05

Summary of GHG Emissions:

Pollutant	**Emission Factor (kg/MMBtu)[2]**	**Emissions (metric tons/yr)[3]**	**Emissions (US tons/yr)[4]**
CO_2	73.96	20.7	22.76
CH_4	3.0E-03	0.001	0.001
N_2O	6.0E-04	0.000	0.000
CO_2e[5]	--	20.73	**22.84**

SOURCES OF INPUT DATA

Parameter	Data Source
Power Output, Heat Content and Hours of operation	By CP Crane
NOx , CO, PM, PM_{10}, $PM_{2.5}$, SO_2 and VOC emission factor	Emission Factors based on Table 3.3 -1, per US EPA AP-42, Chapter 3.3 - Gasoline & Diesel Industrial Engines
H_2SO_4	Based on 5% conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4
1. HAPs	Emission factors based on Table 3.3 -2, per US EPA AP-42, Chapter 3.3 - Gasoline & Diesel Industrial Engines

2. Based on EPA default factors in 40 CFR Part 98 Subpart C Tables C-1 and C-2 for Distillate Fuel Oil No. 2.

3. Calculated based on the heat input, emission factors, and equations C-1b and C-8b of 40 CFR Part 98 Subpart C. CO_2e based on Subpart A Table A-1 factors.

CO_2, CH_4, or N_2O (metric tpy) = 1E-03 * Gas (MMBtu/yr) * Emission Factor (kg/MMBtu)

4. 1 metric ton = 1.102 US ton

5. CO_2e = CO_2, CH_4, or N_2O (tpy) * Global Warming Potential factor (GWP)

CO_2 GWP	1
CH_4 GWP	25
N_2O GWP	298

NOTES AND OBSERVATIONS

Assume PM = PM_{10} = $PM_{2.5}$

Emergency Generator

POTENTIAL EMISSION INVENTORY WORKSHEET

EMISSION SOURCE TYPE

INTERNAL COMBUSTION ENGINES

FACILITY AND SOURCE DESCRIPTION

Emission Source Description:	Emergency Generator	Old - 1987	
Emission Control Method(s)/ID No.(s):	None		
Emission Point Description:	600 hp Diesel Engine		447.4 kW

EMISSION ESTIMATION EQUATIONS

Emission (lb/hr) = Emission Factor (g/kW-hr) x Engine power rating (kW) x (1 lb / 453.6 g)

Emission (lb/hr) = Emission Factor (lb/hp-hr) x Engine power rating (hp)

Emission (lb/hr) = Emission Factor (lb/MMBtu) x Heat Input (MMBtu/hr)

Emission (ton/yr) = Hourly Emissions (lb/hr) x Operating Period (hrs/yr) x (1 ton / 2,000 lb)

INPUT DATA AND EMISSIONS CALCULATIONS

Permitted Hours:	100	hrs/yr			
No. of Engines:	1		Diesel Sulfur Content:	0.0015	weight %
Heat Input:	4.20	MMBtu/hr (HHV)	Diesel Heat Content:	7,000	Btu/hp-hr

Pollutant	Emission Factor		Potential Emission Rates		Pollutant[1]	Emission Factor	Potential Emission Rates	
	lb/MMBtu	lb/-hp-hr	Per Unit (lb/hr)	Per Unit (tpy)		(lb/MMBtu)	Per Unit (lb/hr)	Per Unit (tpy)
NO_x		0.031	18.60	0.93	1,3-Butadiene	3.91E-05	1.64E-04	8.21E-06
CO		6.68E-03	4.01	0.20	Acetaldehyde	7.67E-04	3.22E-03	1.61E-04
VOC		2.47E-03	1.48	0.074	Acrolein	9.25E-05	3.89E-04	1.94E-05
SO_2		2.05E-03	1.23	0.062	Benzene	9.33E-04	3.92E-03	1.96E-04
PM		2.20E-03	1.32	0.066	Formaldehyde	1.18E-03	4.96E-03	2.48E-04
PM_{10}		2.20E-03	1.32	0.066	Naphthalene	8.48E-05	3.56E-04	1.78E-05
$PM_{2.5}$		2.20E-03	1.32	0.066	PAH	1.68E-04	7.06E-04	3.53E-05
Highest HAP			4.96E-03	2.48E-04	Toluene	4.09E-04	1.72E-03	8.59E-05
Total HAPs			0.016	8.31E-04	Xylenes	2.85E-04	1.20E-03	5.99E-05
H_2SO_4		1.57E-04	0.0942	4.71E-03				

Summary of GHG Emissions:

Pollutant	**Emission Factor (kg/MMBtu)**[2]	**Emissions (metric tons/yr)**[3]	**Emissions (US tons/yr)**[4]
CO_2	73.96	31.1	34.23
CH_4	3.0E-03	0.001	0.001
N_2O	6.0E-04	0.0003	0.0003
CO_2e[5]	--	31.17	**34.35**

SOURCES OF INPUT DATA

Parameter	Data Source
Power Output, Heat Content and Hours of operation	By CP Crane
NOx , CO, PM, PM_{10}, $PM_{2.5,}$ SO_2 and VOC emission factor	Emission Factors based on Table 3.3-1, per US EPA AP-42, Chapter 3.3 - Gasoline & Diesel Industrial Engines
H_2SO_4	Based on 5% conversion of SO_2 to SO_3 and 100% conversion of SO_3 to H_2SO_4
1. HAPs	Emission factors based on Table 3.3-2, per US EPA AP-42, Chapter 3.3 - Gasoline & Diesel Industrial Engines

2. Based on EPA default factors in 40 CFR Part 98 Subpart C Tables C-1 and C-2 for Distillate Fuel Oil No. 2.

3. Calculated based on the heat input, emission factors, and equations C-1b and C-8b of 40 CFR Part 98 Subpart C. CO_2e based on Subpart A Table A-1 factors.

CO_2, CH_4, or N_2O (metric tpy) = 1E-03 * Gas (MMBtu/yr) * Emission Factor (kg/MMBtu)

4. 1 metric ton = 1.102 US ton

5. CO_2e = CO_2, CH_4, or N_2O (tpy) * Global Warming Potential factor (GWP)

CO_2 GWP	1
CH_4 GWP	25
N_2O GWP	298

NOTES AND OBSERVATIONS

Assume PM = PM_{10} = $PM_{2.5}$

Existing Combustion Turbine 14 MW (summer capability) (No. 2 Fuel Oil)

	Days/yr 18 hrs/day 3			Days/yr 17 hrs/day 2.6			Days/yr 25 hrs/day 7.7			Days/yr 15 hrs/day 3.6			Days/yr 27 hrs/day 1						
Pollutant	**2016**			**2015**			**2014**			**2013**			**2012**			**Maximum (2012-2016)**		**Average (2012-2016)**	
	tpy	**lb/day**	**lb/hr**	**tpy**	**lb/day**	**lb/hr**	**tpy**	**lb/day**	**lb/hr**	**tpy**	**lb/day**	**lb/hr**	**tpy**	**lb/day**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**
NO_x	5.90	656	218.67	5.10	600.00	230.77	21.00	1680.00	218.18	3.10	413.00	114.72	1.67	123.67	123.67	21.00	230.77	7.35	181.20
SO_2	0.45	50	16.67	0.39	46.00	17.69	1.59	127.00	16.49	0.76	101	28.06	0.26	19.35	19.35	1.59	28.06	0.69	19.65
CO	0.02	2.22	0.74	0.02	2.35	0.90	0.08	6.40	0.83	0.02	2.67	0.74	0.01	0.5	0.50	0.08	0.90	0.03	0.74
VOC	0.003	0.33	0.11	0.002	0.24	0.09	0.01	0.80	0.10	0.003	0.40	0.11	0.00	0.00	0.00	0.01	0.11	0.004	0.08
PM (filterable)	0.029	3.22	1.07	0.025	2.94	1.13	0.103	8.24	1.07	2.60E-02	3.47	0.96	0.00	0.60	0.60	0.10	1.13	0.04	0.97
PM (Condensable)	0.048	5.33	1.78	0.042	4.94	1.90	0.17	13.76	1.79	0.044	5.87	1.63	0.00	1.00	1.00	0.17	1.90	0.06	1.62
PM_{10} (filterable)*	0.029	3.22	1.07	0.025	2.94	1.13	3.30E-04	0.026	3.38E-03	8.60E-05	0.011	3.06E-03	0.00	0.60	0.60	0.03	1.13	0.027	1.10
$PM_{2.5}$ (filterable)	0.027	3.00	1.00	0.023	2.71	1.04	0.096	7.68	1.00	2.50E-02	3.33	0.93	0.00	0.60	0.60	0.10	1.04	0.034	0.91
Lead	9.35E-05	0.01	3.33E-03	8.11E-05	9.54E-03	3.67E-03	3.35E-04	2.68E-02	3.48E-03	8.58E-05	1.14E-02	3.17E-03	0.00	0.00	0.00	3.35E-04	3.67E-03	1.19E-04	2.73E-03
CO_2	1,089	121,000	40,333	944	111,059	42,715	3,517	281,360	36,540	962	128,000	35,600	0.00	0.00	0.00	3,517	42,715	1,302	31,038
CH_4	0.05	5.56	1.85	3.80E-02	4.47	1.72	1.54E-01	12.30	1.60	1.00E-02	1.33	0.37	0.00	0.00	0.00	0.15	1.85	0.05	1.11
N_2O	0.01	1.111	0.37	0.008	0.941	0.362	0.032	2.56	0.33	0.011	1.47	0.41	0.00	0.00	0.00	0.03	0.41	0.01	0.29
CO_2e	1,093.23	121,470.08	40,489.51	947.33	111,451.17	42,865.88	3,530.39	282,430.38	36,678.34	965.53	128,471.31	35,731.43	0.00	0.00	0.00	3,530.39	42,865.88	1,307.30	31153.03
HAPS																			
Benzene	3.70E-04	4.11E-02	1.37E-02	3.19E-04	3.75E-02	1.44E-02	1.32E-03	1.06E-01	1.37E-02	NA	NA	NA	NA	NA	NA	1.32E-03	1.44E-02	6.70E-04	1.39E-02
Formaldehyde	1.88E-03	2.09E-01	6.96E-02	1.63E-03	1.92E-01	7.38E-02	6.70E-03	5.36E-01	6.96E-02	3.07E-07	4.09E-05	1.14E-05	NR	NR	NR	6.70E-03	7.38E-02	2.55E-03	5.33E-02
Arsenic	7.40E-05	8.22E-03	2.74E-03	6.40E-05	7.53E-03	2.90E-03	2.63E-04	2.10E-02	2.73E-03	2.46E-05	3.28E-03	9.11E-04	NR	NR	NR	2.63E-04	2.90E-03	1.06E-04	2.32E-03
Beryllium	2.09E-06	2.32E-04	7.74E-05	1.80E-06	2.12E-04	8.14E-05	7.40E-06	5.92E-04	7.69E-05	1.85E-05	2.47E-03	6.85E-04	NR	NR	NR	1.85E-05	6.85E-04	7.45E-06	2.30E-04
1,3-Butadiene	1.08E-04	1.19E-02	3.98E-03	9.30E-05	1.09E-02	4.21E-03	3.83E-04	3.06E-02	3.97E-03	NA	NA	NA	NA	NA	NA	3.83E-04	4.21E-03	1.95E-04	4.05E-03
Cadmium	3.23E-05	3.59E-03	1.20E-03	2.79E-05	3.28E-03	1.26E-03	1.15E-04	9.20E-03	1.19E-03	1.85E-05	2.47E-03	6.85E-04	NR	NR	NR	1.15E-04	1.26E-03	4.84E-05	1.08E-03
Chromium	7.40E-05	8.22E-03	2.74E-03	6.40E-05	7.53E-03	2.90E-03	2.63E-04	2.10E-02	2.73E-03	1.85E-05	2.47E-03	6.85E-04	NR	NR	NR	2.63E-04	2.90E-03	1.05E-04	2.26E-03
Chromium IV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.72E-10	3.49E-08	5.55E-08	4.72E-10	5.55E-08	4.72E-10	5.55E-08
Manganese	5.30E-03	5.89E-01	1.96E-01	4.58E-03	5.39E-01	2.07E-01	1.89E-02	1.51	1.96E-01	3.69E-05	4.92E-03	1.37E-03	NR	NR	NR	1.89E-02	2.07E-01	7.20E-03	1.50E-01
Mercury	8.05E-06	8.94E-04	2.98E-04	6.95E-06	8.18E-04	3.14E-04	2.87E-05	2.30E-03	2.98E-04	1.85E-05	2.47E-03	6.85E-04	NR	NR	NR	2.87E-05	6.85E-04	1.56E-05	3.99E-04
Nickel	3.09E-05	3.43E-03	1.14E-03	2.67E-05	3.14E-03	1.21E-03	1.10E-04	8.80E-03	1.14E-03	1.85E-05	2.47E-03	6.85E-04	NR	NR	NR	1.10E-04	1.21E-03	4.65E-05	1.04E-03
Naphthalene	2.35E-04	2.61E-02	8.70E-03	2.03E-04	2.39E-02	9.19E-03	8.35E-04	6.68E-02	8.68E-03	NA	NA	NA	NA	NA	NA	8.35E-04	9.19E-03	4.24E-04	8.85E-03
PAH	2.69E-04	2.98E-02	9.94E-03	2.32E-04	2.73E-02	1.05E-02	9.55E-04	7.64E-02	9.92E-03	NA	NA	NA	NA	NA	NA	9.55E-04	1.05E-02	4.85E-04	1.01E-02
Selenium	1.68E-04	1.87E-02	6.22E-03	1.45E-04	1.71E-02	6.56E-03	6.00E-04	4.80E-02	6.23E-03	9.20E-05	1.23E-02	3.41E-03	NR	NR	NR	6.00E-04	6.56E-03	2.51E-04	5.61E-03
															Total HAPs	**0.0305**	**0.34**	**0.012**	**0.25**

NR - Not Reportable

NA - Not Applicable

* PM_{10} (filterable) max and average values are based on emissions from 2016 and 2015. PM_{10} emission factor for 2013 and 2014 are incorrect, hence values reported from 2012-2014 are not included.

Emissions data from CP Crane Emissions Certification Report 2012-2016.

Facility Hazardous Air Pollutant Emissions

Pollutant	Proposed Units				Existing Units							
	Three Simple Cycle Turbines		Black Start Generator		Firewater Pump		Emergency Generator		Combustion Turbine		Facility Total	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1,3-Butadiene	2.28E-02	3.48E-03			1.09E-04	5.46E-06	1.64E-04	8.21E-06	4.21E-03	3.83E-04	2.73E-02	3.87E-03
2-Methylnaphthalene											0.00E+00	0.00E+00
3-Methylchloranthrene											0.00E+00	0.00E+00
7,12-Dimethylbenz(a)anthracene											0.00E+00	0.00E+00
Acenaphthene											0.00E+00	0.00E+00
Acenaphthylene											0.00E+00	0.00E+00
Acetaldehyde	5.86E-02	7.15E-02	3.55E-04	1.77E-05	2.14E-03	1.07E-04	3.22E-03	1.61E-04			6.43E-02	7.17E-02
Acrolein	9.37E-03	1.14E-02	1.11E-04	5.55E-06	2.58E-04	1.29E-05	3.89E-04	1.94E-05			1.01E-02	1.15E-02
Anthracene											0.00E+00	0.00E+00
Benz(a)anthracene											0.00E+00	0.00E+00
Benzene	7.85E-02	2.89E-02	1.09E-02	5.46E-04	2.61E-03	1.30E-04	3.92E-03	1.96E-04	1.44E-02	1.32E-03	1.10E-01	3.11E-02
Benzo(a)pyrene											0.00E+00	0.00E+00
Benzo(b)fluoranthene											0.00E+00	0.00E+00
Benzo(g,h,i)perylene											0.00E+00	0.00E+00
Benzo(k)fluoranthene											0.00E+00	0.00E+00
Chrysene											0.00E+00	0.00E+00
Dibenzo(a,h)anthracene											0.00E+00	0.00E+00
Dichlorobenzene											0.00E+00	0.00E+00
Ethylbenzene	4.69E-02	5.72E-02									4.69E-02	5.72E-02
Fluoranthene											0.00E+00	0.00E+00
Fluorene											0.00E+00	0.00E+00
Formaldehyde	1.04E+00	1.27E+00	1.11E-03	5.55E-05	3.30E-03	1.65E-04	4.96E-03	2.48E-04	7.38E-02	6.70E-03	1.12E+00	1.28E+00
Hexane											0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene											0.00E+00	0.00E+00
Naphthalene	4.99E-02	8.18E-03	1.83E-03	9.15E-05	2.37E-04	1.18E-05	3.56E-04	1.78E-05	9.19E-03	8.35E-04	6.15E-02	9.14E-03
PAH	5.71E-02	1.05E-02	2.99E-03	1.49E-04	4.69E-04	2.35E-05	7.06E-04	3.53E-05	1.05E-02	9.55E-04	7.17E-02	1.17E-02
Phenanathrene											0.00E+00	0.00E+00
Propylene Oxide	4.25E-02	5.18E-02									4.25E-02	5.18E-02
Pyrene											0.00E+00	0.00E+00
Toluene	1.90E-01	2.32E-01	3.96E-03	1.98E-04	1.14E-03	5.71E-05	1.72E-03	8.59E-05			1.97E-01	2.33E-01
Xylenes	9.37E-02	1.14E-01	2.72E-03	1.36E-04	7.96E-04	3.98E-05	1.20E-03	5.99E-05			9.84E-02	1.15E-01
Arsenic	1.57E-02	1.91E-03							0.0029	2.63E-04	1.86E-02	2.18E-03
Beryllium	4.42E-04	5.40E-05							0.0007	1.85E-05	1.13E-03	7.25E-05
Cadmium	6.85E-03	8.36E-04							0.0013	1.15E-04	8.11E-03	9.51E-04
Chromium	1.57E-02	1.91E-03							0.0029	2.63E-04	1.86E-02	2.18E-03
Cobalt											0.00E+00	0.00E+00
Lead	2.00E-02	2.44E-03									2.00E-02	2.44E-03
Manganese	1.13E+00	1.38E-01							0.207	0.019	1.33E+00	1.56E-01
Mercury	1.71E-03	2.09E-04							0.001	2.87E-05	2.40E-03	2.38E-04
Nickel	6.56E-03	8.01E-04							0.001	1.10E-04	7.77E-03	9.11E-04
Selenium	3.57E-02	4.35E-03							6.56E-03	6.00E-04	4.22E-02	4.95E-03
Maximum Individual HAP		1.27		5.46E-04		1.65E-04		2.48E-04		1.89E-02		1.28
Total HAPS		2.01		1.20E-03		5.53E-04		8.31E-04		3.05E-02		2.04

Source: ECT, 2018.

NSR Applicability Analysis

Proposed Project Emissions

CT Scenario	Description	NO_x		CO		VOC		$PM/PM_{10}/PM_{2.5}$		NH_3		SO_2		Lead		H_2SO_4		CO_2e	
		Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)	Per turbine (tpy)	3 Turbines (tpy)
100% Load																			
1	Normal Operation burning NG	52.90	158.69	38.64	115.91	1.47	4.40	6.03	18.09	0.00	0.00	8.07E-01	2.42	2.83E-04	8.49E-04	1.24E-01	3.71E-01	64,125	192,376
2	Normal Operation burning NG with SUSD	53.02	159.07	38.74	116.23	1.48	4.45	6.04	18.12	0.00	0.00	8.09E-01	2.43	2.92E-04	8.76E-04	1.24E-01	3.71E-01	64,234	192,703
3	Normal Operation load burning 90% NG and 10% ULSD	56.49	169.46	39.40	118.21	1.83	5.50	7.26	21.79	0.00	0.00	8.11E-01	2.43	1.04E-03	3.13E-03	1.24E-01	3.73E-01	66,574	199,722
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	56.64	169.93	39.54	118.63	1.85	5.55	7.27	21.82	0.00	0.00	8.13E-01	2.44	1.08E-03	3.23E-03	1.24E-01	3.73E-01	66,687	200,060
75% Load																			
1	Normal Operation burning NG	48.77	146.31	41.57	124.71	3.39	10.18	4.81	14.44	0.00	0.00	6.45E-01	1.93	2.83E-04	8.49E-04	9.87E-02	2.96E-01	51,204	153,613
2	Normal Operation burning NG with SUSD	48.90	146.69	41.68	125.03	3.41	10.23	4.82	14.47	0.00	0.00	6.46E-01	1.94	2.92E-04	8.76E-04	9.89E-02	2.97E-01	51,313	153,940
3	Normal Operation load burning 90% NG and 10% ULSD	51.99	155.96	42.22	126.66	3.73	11.18	5.79	17.38	0.00	0.00	6.48E-01	1.94	1.04E-03	3.13E-03	9.92E-02	2.98E-01	53,151	159,454
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	52.15	156.44	42.36	127.08	3.74	11.22	5.81	17.42	0.00	0.00	6.49E-01	1.95	1.08E-03	3.23E-03	9.94E-02	2.98E-01	53,264	159,792
60% Load																			
1	Normal Operation burning NG	44.81	134.43	41.45	124.35	3.74	11.21	4.08	12.24	0.00	0.00	5.46E-01	1.64	2.83E-04	8.49E-04	8.35E-02	2.51E-01	43,330	129,990
2	Normal Operation burning NG with SUSD	44.94	134.81	41.56	124.68	3.75	11.26	4.09	12.27	0.00	0.00	5.47E-01	1.64	2.92E-04	8.76E-04	8.37E-02	2.51E-01	43,439	130,317
3	Normal Operation load burning 90% NG and 10% ULSD	47.80	143.39	42.18	126.53	4.11	12.32	4.92	14.76	0.00	0.00	5.49E-01	1.65	1.04E-03	3.13E-03	8.40E-02	2.52E-01	45,034	135,101
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	47.96	143.87	42.31	126.94	4.12	12.37	4.93	14.80	0.00	0.00	5.50E-01	1.65	1.08E-03	3.23E-03	8.42E-02	2.53E-01	45,146	135,439
50% Load																			
1	Normal Operation burning NG	42.05	126.16	40.97	122.90	4.09	12.28	3.56	10.68	0.00	0.00	4.77E-01	1.43	2.83E-04	8.49E-04	7.30E-02	2.19E-01	37,888	113,665
2	Normal Operation burning NG with SUSD	42.18	126.54	41.07	123.22	4.11	12.32	3.57	10.71	0.00	0.00	4.78E-01	1.44	2.92E-04	8.76E-04	7.32E-02	2.20E-01	37,997	113,991
3	Normal Operation load burning 90% NG and 10% ULSD	44.91	134.72	41.68	125.03	4.44	13.33	4.31	12.93	0.00	0.00	4.81E-01	1.44	1.04E-03	3.13E-03	7.36E-02	2.21E-01	39,452	118,357
4	Normal Operation load burning 90% NG and 10% ULSD with SUSD	45.07	135.20	41.82	125.45	4.46	13.38	4.32	12.97	0.00	0.00	4.82E-01	1.45	1.08E-03	3.23E-03	7.38E-02	2.21E-01	39,565	118,696
	Maximum Emissions from 3 turbines		169.93		127.08		13.38		21.82		0.00		2.44		3.23E-03		3.73E-01		200,060
	Black Start Generator		1.52		1.88		0.21		0.089		-		1.22E-03		-		9.34E-05		115.16
	Proposed Project Total Emissions		**171.45**		**128.96**		**13.59**		**21.91**		**0.00**		**2.44**		**3.23E-03**		**3.73E-01**		**200,175**

Notes:

1) Short term lb/hr rates (except for Lead), Turbine heat input and SUSD hours are from the Performance Data provided by ProEnergy in August 2018.
2) Lead emissions are calculated using emission factor from AP-42 Section 1.4, Table 1.4-2 for Natural Gas and AP-42 Section 3.1, Table 3.1-5 for Distillate Oil.
3) SUSD events/yr is from "Prairie Power Alsey Station Compliance Report".
4) SUSD - $PM/PM_{10}/PM_{2.5}$, SO_2, H_2SO_4 and CO_2e emissions are based on SUSD MMBtu/event and maximum lb/MMBtu values of each pollutant.

Environmental Consulting & Technology, Inc.

Proposed Project Emissions and Comparison with the respective SERs

Pollutant	tpy	SER (tpy)	Netting Required
PM	21.91	25	No
PM_{10}	21.91	15	Yes
$PM_{2.5}$	21.91	10	Yes
SO_2	2.44	40	No
NO_x	171.45	25	Yes
CO	128.96	100	Yes
VOC	13.59	25	No
Lead	3.23E-03	0.6	No
H_2SO_4	3.73E-01	7	No
CO_2e	200,175	75,000	Yes

Notes:

"Significant" means, in reference to a net emissions increase, a significant emissions increase or the potential of a source to emit a regulated NSR pollutant, or a rate of emissions that would equal or exceed any of the following rates (SER-Significant Emission Rates) as shown in table above.

(a) Volatile organic compounds or nitrogen oxides: 25 tons per year (tpy) in Baltimore City or Anne Arundel, Baltimore, Calvert, Carroll, Cecil, Charles, Frederick, Harford, Howard, Montgomery, and Prince George's counties;

(b) Volatile organic compounds or nitrogen oxides: 40 tpy in Allegany, Caroline, Dorchester, Garrett, Kent, Queen Anne's, St. Mary's, Somerset, Talbot, Washington, Wicomico, and Worcester counties.

ECT Environmental Consulting & Technology, Inc.

CP Crane - New Source Review Netting Analysis

Description	NO_x (TPY)	CO (TPY)	PM (TPY)	PM_{10} (TPY)	$PM_{2.5}$ (TPY)	VOC (TPY)	SO_2 (TPY)	Lead (TPY)	H_2SO_4 (TPY)	CO_2e (TPY)
Three (3) GE LM6000 Turbines and one (1) Black Start Generator (Proposed Increases)	171.45	128.96		21.91	21.91					200,175
Baseline Actual Emissions (Units 1 & 2) (Proposed Decreases)	1,235.03	131.83		82.87	35.87					776,674
Other Contemporaneous Emissions	0.00	0.00		0.00	0.00					0.00
Net Emission Increases/Decreases	**-1,063.57**	**-2.87**		**-60.95**	**-13.95**					**-576,499**
New Source Review Significant Emission Rates	25	100		15	10					75,000
Major Modification (Yes/No)	**No**	**No**		**No**	**No**					**No**

Capacity Factor 27 %

Indicates netting is not required.

Baseline Actual Emission Calculation

Year	Month	Heat Input Unit 1	Heat Input Unit 2	Heat Input Total	Heat Input 24-Month Rolling Ann Avg	NO_x Total	NO_x 24-Month Rolling Ann Avg	NOx - 0.09 lb/MMBtu (Ozone season) Total	NOx - 0.09 lb/MMBtu (Ozone season) 24-Month Rolling Ann Avg	CO Total	CO 24-Month Rolling Ann Avg
		MMBtu	MMBtu	MMBtu	MMBtu	Tons	Tons	Tons	Tons	Tons	Tons
2012	January	115,873	261,382	377,255.10		71.0		71.007		6.99	
2012	February	43,989	99,126	143,114.70		23.0		22.991		1.88	
2012	March	40,508	0	40,508.20		8.2		8.247		0.81	
2012	April	90,640	91,845	182,484.50		32.1		32.098		2.78	
2012	May	624,188	849,213	1,473,401.70		286.7		66.303		14.22	
2012	June	378,980	322,367	701,346.60		133.6		31.561		7.28	
2012	July	888,992	1,027,141	1,916,132.70		411.9		86.226		25.90	
2012	August	411,022	698,387	1,109,408.80		230.6		49.923		11.02	
2012	September	493,005	369,528	862,532.60		174.2		38.814		13.11	
2012	October	160,929	106,788	267,716.40		55.1		55.128		3.71	
2012	November	468,371	232,745	701,116.00		139.4		139.443		12.22	
2012	December	904,213	330,027	1,234,240.40		245.8		245.769		26.36	
2013	January	353,028	256,108	609,136.00		129.6		129.560		23.77	
2013	February	133,755	116,464	250,218.90		49.1		49.088		3.79	
2013	March	73,156	471,039	544,194.80		115.6		115.557		8.36	
2013	April	0	139,138	139,137.50		31.0		30.974		0.69	
2013	May	204,941	294,099	499,040.20		116.6		22.457		4.11	
2013	June	321,936	375,113	697,049.70		165.8		31.367		5.17	
2013	July	570,285	654,763	1,225,048.10		275.5		55.127		8.50	
2013	August	131,372	352,293	483,664.50		110.0		21.765		3.43	
2013	September	402,568	769,841	1,172,408.70		294.3		52.758		8.91	
2013	October	330,684	344,183	674,866.60		142.9		142.935		6.24	
2013	November	692,871	598,829	1,291,700.80		270.2		270.201		18.01	
2013	December	175,674	468,791	644,465.50		126.9		126.881		9.44	
2014	January	1,065,540	886,769	1,952,308.50		427.3		427.308		32.96	
2014	February	460,740	523,081	983,821.10		225.9		225.930		11.98	
2014	March	245,792	658,354	904,146.10		203.7		203.724		8.80	
2014	April	100,392	223,828	324,220.60		64.6		64.588		4.10	
2014	May	0	412,540	412,540.40		34.5		18.564		4.53	
2014	June	0	736,284	736,283.50		76.5		33.133		9.02	
2014	July	0	254,866	254,865.80		30.0		11.469		2.64	
2014	August	31,036	162,958	193,993.70		3.1		8.730		1.21	
2014	September	35,518	136,187	171,704.40		16.8		7.727		3.20	
2014	October	43,177	55,402	98,578.80		13.9		13.898		2.26	
2014	November	92,876	0	92,875.50		20.9		20.939		1.34	
2014	December	77,281	24,244	101,525.70		21.9		21.921		2.45	
2015	January	102,916	374,851	477,766.50		133.2		133.184		15.34	
2015	February	806,396	837,963	1,644,359.40		413.9		413.870		58.65	
2015	March	218,166	284,030	502,196.30	7,839,283.95	131.8	1675.6	131.752	1245.6	15.43	119.2
2015	April	0	262,055	262,054.60	7,900,742.50	59.6	1689.9	59.638	1259.9	4.26	121.0
2015	May	3,318	147,548	150,866.50	7,726,655.65	10.9	1637.1	6.789	1252.1	6.41	122.1
2015	June	8,080	568,989	577,069.30	7,666,665.45	64.2	1586.3	25.968	1249.4	8.53	123.8
2015	July	76,152	367,009	443,160.90	7,275,721.85	46.4	1471.7	19.942	1231.8	8.73	123.9
2015	August	310,593	316,198	626,791.20	7,347,285.20	62.0	1447.7	28.206	1235.0	19.23	131.8
2015	September	343,752	173,482	517,234.20	7,019,697.95	54.5	1327.8	23.276	1220.3	13.72	134.2
2015	October	0	96,818	96,817.70	6,730,673.50	24.9	1268.8	24.942	1161.3	2.56	132.4
2015	November	0	163	163.20	6,084,904.70	0.0	1133.7	0.001	1026.2	0.00	123.4
2015	December	0	53,655	53,654.90	5,789,499.40	11.7	1076.2	11.748	968.6	0.31	118.8
2016	January	325,048	241,433	566,480.50	5,096,585.40	114.2	919.6	114.240	812.1	26.30	115.5
2016	February	245,769	144,795	390,564.30	4,799,957.00	78.2	845.8	78.237	738.2	13.51	116.3
2016	March	5,712	4,022	9,734.10	4,352,751.00	2.5	745.2	2.456	637.6	0.59	112.2
2016	April	0	0	0.00	4,190,640.70	0.0	712.9	0.000	605.3	0.00	110.1
2016	May	33,900	0	33,900.20	4,001,320.60	4.7	698.0	1.526	596.8	0.62	108.2
2016	June	102,739	133,470	236,208.50	3,751,283.10	26.9	673.2	10.629	585.5	7.74	107.5
2016	July	284,229	394,242	678,471.40	3,963,085.90	72.6	694.5	30.531	595.1	19.01	115.7
2016	August	253,258	384,487	637,744.10	4,184,961.10	74.0	729.9	28.698	605.1	11.15	120.7
2016	September	258,999	367,217	626,215.60	4,412,216.70	59.6	751.4	28.180	615.3	16.00	127.1
2016	October	33,134	127,745	160,879.60	4,443,367.10	45.5	767.2	45.508	631.1	2.80	127.3
2016	November	6,907	151,486	158,392.80	4,476,125.75	48.2	780.8	48.216	644.7	2.20	127.8
2016	December	152,060	179,706	331,765.30	4,591,245.55	77.8	808.8	77.830	672.7	7.50	130.3
2017	January	40,660	178,712	219,372.60	4,462,048.60	59.5	771.9	59.539	635.9	6.69	126.0
2017	February	0	78,539	78,538.70	3,679,138.25	23.3	576.6	23.265	440.6	2.61	98.0
2017	March	6,385	194,977	201,361.50	3,528,720.85	50.9	536.2	50.878	400.1	13.69	97.1
2017	April	0	0	0.00	3,397,693.55	0.0	506.4	0.000	370.3	0.00	95.0
2017	May	0	54,381	54,380.90	3,349,450.75	3.9	502.9	2.447	368.1	0.38	91.9
2017	June	0	191,090	191,089.80	3,156,461.00	17.8	479.7	8.599	359.4	7.05	91.2
2017	July	459,984	104,204	564,188.40	3,216,974.75	63.7	488.3	25.388	362.2	17.46	95.6

Year	Month	VOC Unit 1	VOC Unit 2	VOC Total	VOC 24-Month Rolling Ann Avg	PM Unit 1 Method 5	PM Unit 1 Method 202	PM Unit 2 Method 5	PM Unit 2 Method 202	PM Total PM Unit 1	PM Total PM Unit 2	PM Total PM	PM 24-Month Rolling Ann Avg
		lb/MMBtu	lb/MMBtu	Tons	Tons	lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMBtu	lb/MMBtu	Tons	Tons
2012	January	0.0007	0.001	0.171		0.007	0.017	0.021	0.012	0.024	0.033	5.703	
2012	February	0.0007	0.001	0.065		0.007	0.017	0.021	0.012	0.024	0.033	2.163	
2012	March	0.0007	0.001	0.014		0.007	0.017	0.021	0.012	0.024	0.033	0.486	
2012	April	0.0007	0.001	0.078		0.007	0.017	0.021	0.012	0.024	0.033	2.603	
2012	May	0.0007	0.001	0.643		0.007	0.017	0.021	0.012	0.024	0.033	21.502	
2012	June	0.0007	0.001	0.294		0.007	0.017	0.021	0.012	0.024	0.033	9.867	
2012	July	0.0007	0.001	0.825		0.007	0.017	0.021	0.012	0.024	0.033	27.616	
2012	August	0.0007	0.001	0.493		0.007	0.017	0.021	0.012	0.024	0.033	16.456	
2012	September	0.0007	0.001	0.357		0.007	0.017	0.021	0.012	0.024	0.033	12.013	
2012	October	0.0007	0.001	0.110		0.007	0.017	0.021	0.012	0.024	0.033	3.693	
2012	November	0.0007	0.001	0.280		0.007	0.017	0.021	0.012	0.024	0.033	9.461	
2012	December	0.0007	0.001	0.481		0.007	0.017	0.021	0.012	0.024	0.033	16.296	
2013	January	0.0007	0.001	0.252		0.007	0.017	0.021	0.012	0.024	0.033	8.462	
2013	February	0.0007	0.001	0.105		0.007	0.017	0.021	0.012	0.024	0.033	3.527	
2013	March	0.0007	0.001	0.261		0.007	0.017	0.021	0.012	0.024	0.033	8.650	
2013	April	0.0007	0.001	0.070		0.007	0.017	0.021	0.012	0.024	0.033	2.296	
2013	May	0.0007	0.001	0.219		0.007	0.017	0.021	0.012	0.024	0.033	7.312	
2013	June	0.0007	0.001	0.300		0.007	0.017	0.021	0.012	0.024	0.033	10.053	
2013	July	0.0007	0.001	0.527		0.007	0.017	0.021	0.012	0.024	0.033	17.647	
2013	August	0.0007	0.001	0.222		0.007	0.017	0.021	0.012	0.024	0.033	7.389	
2013	September	0.0007	0.001	0.526		0.007	0.017	0.021	0.012	0.024	0.033	17.533	
2013	October	0.0007	0.001	0.288		0.007	0.017	0.021	0.012	0.024	0.033	9.647	
2013	November	0.0007	0.001	0.542		0.007	0.017	0.021	0.012	0.024	0.033	18.195	
2013	December	0.0007	0.001	0.296		0.007	0.017	0.021	0.012	0.024	0.033	9.843	
2014	January	0.0007	0.001	0.816		0.007	0.017	0.021	0.012	0.024	0.033	27.418	
2014	February	0.0007	0.001	0.423		0.007	0.017	0.021	0.012	0.024	0.033	14.160	
2014	March	0.0007	0.001	0.415		0.007	0.017	0.021	0.012	0.024	0.033	13.812	
2014	April	0.0007	0.001	0.147		0.007	0.017	0.021	0.012	0.024	0.033	4.898	
2014	May	0.0007	0.001	0.206		0.007	0.017	0.021	0.012	0.024	0.033	6.807	
2014	June	0.0007	0.001	0.368		0.007	0.017	0.021	0.012	0.024	0.033	12.149	
2014	July	0.0007	0.001	0.127		0.007	0.017	0.021	0.012	0.024	0.033	4.205	
2014	August	0.0007	0.001	0.092		0.007	0.017	0.03	0.019	0.024	0.049	4.365	
2014	September	0.0007	0.001	0.081		0.007	0.017	0.03	0.019	0.024	0.049	3.763	
2014	October	0.0007	0.001	0.043		0.007	0.017	0.03	0.019	0.024	0.049	1.875	
2014	November	0.0007	0.001	0.033		0.007	0.017	0.03	0.019	0.024	0.049	1.115	
2014	December	0.001	0.001	0.051		0.012	0.008	0.03	0.019	0.02	0.049	1.367	
2015	January	0.001	0.001	0.239		0.012	0.008	0.03	0.019	0.02	0.049	10.213	
2015	February	0.001	0.001	0.822		0.012	0.008	0.03	0.019	0.02	0.049	28.594	
2015	March	0.001	0.001	0.251	3.6	0.012	0.008	0.03	0.019	0.02	0.049	9.140	121.9
2015	April	0.001	0.001	0.131	3.6	0.012	0.008	0.03	0.019	0.02	0.049	6.420	124.0
2015	May	0.001	0.001	0.075	3.5	0.012	0.008	0.03	0.019	0.02	0.049	3.648	122.1
2015	June	0.001	0.001	0.289	3.5	0.012	0.008	0.03	0.019	0.02	0.049	14.021	124.1
2015	July	0.001	0.001	0.222	3.4	0.012	0.008	0.03	0.019	0.02	0.049	9.753	120.2
2015	August	0.001	0.001	0.313	3.4	0.023	0.023	0.029	0.017	0.046	0.046	14.416	123.7
2015	September	0.001	0.001	0.259	3.3	0.023	0.023	0.029	0.017	0.046	0.046	11.896	120.9
2015	October	0.001	0.001	0.048	3.1	0.023	0.023	0.029	0.017	0.046	0.046	2.227	117.2
2015	November	0.001	0.001	0.000	2.9	0.023	0.023	0.029	0.017	0.046	0.046	0.004	108.1
2015	December	0.001	0.001	0.027	2.7	0.023	0.023	0.029	0.017	0.046	0.046	1.234	103.8
2016	January	0.001	0.001	0.283	2.5	0.023	0.023	0.029	0.017	0.046	0.046	13.029	96.6
2016	February	0.001	0.001	0.195	2.4	0.023	0.023	0.029	0.017	0.046	0.046	8.983	94.0
2016	March	0.001	0.001	0.005	2.2	0.023	0.023	0.029	0.017	0.046	0.046	0.224	87.2
2016	April	0.001	0.001	0.000	2.1	0.023	0.023	0.029	0.017	0.046	0.046	0.000	84.7
2016	May	0.001	0.001	0.017	2.0	0.023	0.023	0.029	0.017	0.046	0.046	0.780	81.7
2016	June	0.001	0.001	0.118	1.9	0.033	0.008	0.029	0.017	0.041	0.046	5.176	78.2
2016	July	0.001	0.001	0.339	2.0	0.033	0.008	0.029	0.017	0.041	0.046	14.894	83.6
2016	August	0.001	0.001	0.319	2.1	0.033	0.008	0.029	0.017	0.041	0.046	14.035	88.4
2016	September	0.001	0.001	0.313	2.2	0.033	0.008	0.018	0.012	0.041	0.03	10.818	91.9
2016	October	0.001	0.001	0.080	2.2	0.033	0.008	0.018	0.012	0.041	0.03	2.595	92.3
2016	November	0.001	0.001	0.079	2.2	0.033	0.008	0.018	0.012	0.041	0.03	2.414	92.9
2016	December	0.001	0.001	0.166	2.3	0.033	0.008	0.018	0.012	0.041	0.03	5.813	95.2
2017	January	0.001	0.001	0.110	2.2	0.033	0.008	0.018	0.012	0.041	0.03	3.514	91.8
2017	February	0.001	0.001	0.039	1.8	0.033	0.008	0.018	0.012	0.041	0.03	1.178	78.1
2017	March	0.001	0.001	0.101	1.8	0.033	0.008	0.018	0.012	0.041	0.03	3.056	75.1
2017	April	0.001	0.001	0.000	1.7	0.033	0.008	0.018	0.012	0.041	0.03	0.000	71.9
2017	May	0.001	0.001	0.027	1.7	0.033	0.008	0.018	0.012	0.041	0.03	0.816	70.4
2017	June	0.001	0.001	0.096	1.6	0.033	0.008	0.018	0.012	0.041	0.03	2.866	64.9
2017	July	0.001	0.001	0.282	1.6	0.033	0.008	0.018	0.012	0.041	0.03	10.993	65.5

Year	Month	PM_{10} (PM_{10} (67% of PM))	PM_{10} 24-Month Rolling Ann Avg	$PM_{2.5}$ ($PM_{2.5}$ (29% of PM))	$PM_{2.5}$ 24-Month Rolling Ann Avg	SO_2 Total	SO_2 24-Month Rolling Ann Avg	CO_2e Total	CO_2e 24-Month Rolling Ann Avg
		Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
2012	January	3.821		1.654		71.14		39879.59	
2012	February	1.450		0.627		27.82		15128.42	
2012	March	0.326		0.141		7.69		4282.18	
2012	April	1.744		0.755		34.61		19290.65	
2012	May	14.407		6.236		299.10		155750.04	
2012	June	6.611		2.861		153.40		74138.72	
2012	July	18.503		8.009		408.24		202554.10	
2012	August	11.025		4.772		256.61		117274.64	
2012	September	8.049		3.484		201.29		91178.12	
2012	October	2.474		1.071		57.27		28300.20	
2012	November	6.339		2.744		170.62		74114.23	
2012	December	10.918		4.726		486.93		130469.91	
2013	January	5.670		2.454		117.13		64390.59	
2013	February	2.363		1.023		85.03		26450.30	
2013	March	5.796		2.509		104.37		57526.56	
2013	April	1.538		0.666		39.12		14708.03	
2013	May	4.899		2.120		99.94		52753.53	
2013	June	6.735		2.915		215.95		73683.76	
2013	July	11.823		5.118		560.12		129498.29	
2013	August	4.951		2.143		229.61		51127.49	
2013	September	11.747		5.085		549.58		123935.26	
2013	October	6.464		2.798		273.29		71339.07	
2013	November	12.191		5.277		555.70		136545.14	
2013	December	6.595		2.855		145.11		68125.87	
2014	January	18.370		7.951		646.49		206376.49	
2014	February	9.487		4.106		393.79		103997.75	
2014	March	9.254		4.006		330.81		95577.11	
2014	April	3.282		1.420		46.52		34273.33	
2014	May	4.561		1.974		77.07		43609.14	
2014	June	8.140		3.523		161.67		77832.48	
2014	July	2.818		1.220		54.50		26942.15	
2014	August	2.924		1.266		82.91		20506.59	
2014	September	2.521		1.091		35.04		18150.32	
2014	October	1.257		0.544		22.24		10420.91	
2014	November	0.747		0.323		18.24		9817.98	
2014	December	0.916		0.396		19.76		10731.85	
2015	January	6.843		2.962		189.02		50503.90	
2015	February	19.158		8.292		340.51		173822.34	
2015	March	6.124	81.7	2.651	35.4	113.64	2600.3	53086.85	828682.8
2015	April	4.302	83.1	1.862	35.9	61.37	2611.4	27702.31	835180.0
2015	May	2.444	81.8	1.058	35.4	26.52	2574.7	15948.45	816777.4
2015	June	9.394	83.2	4.066	36.0	131.78	2532.6	61001.51	810436.3
2015	July	6.535	80.5	2.828	34.8	80.69	2292.9	46844.72	769109.5
2015	August	9.659	82.9	4.181	35.9	215.65	2286.0	66257.42	776674.5
2015	September	7.971	81.0	3.450	35.0	104.55	2063.4	54675.31	742044.5
2015	October	1.492	78.5	0.646	34.0	19.28	1936.4	10234.65	711492.3
2015	November	0.003	72.4	0.001	31.3	0.00	1658.6	17.04	643228.2
2015	December	0.827	69.5	0.358	30.1	44.04	1608.1	5671.77	612001.2
2016	January	8.729	64.7	3.778	28.0	98.56	1334.1	59882.33	538754.1
2016	February	6.019	63.0	2.605	27.3	70.90	1172.7	41285.92	507398.2
2016	March	0.150	58.4	0.065	25.3	1.27	1007.9	1028.87	460124.1
2016	April	0.000	56.8	0.000	24.6	0.00	984.6	0.00	442987.4
2016	May	0.522	54.7	0.226	23.7	6.02	949.1	3583.70	422974.7
2016	June	3.468	52.4	1.501	22.7	43.58	890.1	24968.68	396542.8
2016	July	9.979	56.0	4.319	24.2	152.59	939.1	71720.36	418931.9
2016	August	9.403	59.2	4.070	25.6	137.02	966.2	67414.40	442385.8
2016	September	7.248	61.6	3.137	26.7	252.08	1074.7	66195.04	466408.2
2016	October	1.739	61.8	0.753	26.8	81.36	1104.2	17007.25	469701.3
2016	November	1.617	62.3	0.700	27.0	90.83	1140.5	16743.19	473163.9
2016	December	3.895	63.8	1.686	27.6	117.10	1189.2	35071.19	485333.6
2017	January	2.355	61.5	1.019	26.6	69.48	1129.4	23190.63	471677.0
2017	February	0.789	52.3	0.342	22.7	24.08	971.2	8302.90	388917.2
2017	March	2.047	50.3	0.886	21.8	55.98	942.4	21286.50	373017.1
2017	April	0.000	48.1	0.000	20.8	0.00	911.7	0.00	359165.9
2017	May	0.547	47.2	0.237	20.4	13.98	905.4	5748.17	354065.8
2017	June	1.920	43.5	0.831	18.8	59.13	869.1	20199.49	333664.8
2017	July	7.365	43.9	3.188	19.0	155.78	906.6	59639.33	340062.1

Lead				
Year	Unit 1	Unit 2	Total	2 year Rolling Ann Avg
	Tons	Tons	Tons	Tons
2014	2.50E-02	4.00E-02	6.50E-02	
2015	2.20E-02	3.60E-02	5.80E-02	6.15E-02
2016	2.10E-02	3.10E-02	5.20E-02	5.50E-02

Selected 24-month rolling average emissions within 5 year look back (Sep 2013 to Aug 2015)

Heat Input	NO_x	NOx (ozone)	CO	VOC	PM	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
MMBtu	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
7,347,285.20	1,447.71	1,235.03	131.83	3.40	123.68	82.87	35.87	2,285.96	776,674.47

Notes:

1) For an existing electric utility steam generating unit, "baseline actual emissions" is determined by the average rate, in tons per year, at which the unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 5-year period immediately preceding the date on which a complete application was submitted.
2) Heat Input, NO_x, CO, SO_2 and CO_2 emissions provided by C.P. Crane.
3) VOC/PM Stack Test was performed as per data provided by C.P. Crane.
4) VOC and PM lb/MMBtu values provided by C.P. Crane, email dated Sep 6, 2017.
5) Assumed the smallest stack test value for PM where no test was conducted.
6) VOC and PM emissions were calculated based on the lb/MMBtu and heat input values.
7) AP-42 presents particulate size fractions that may be applied to the total particulate emissions to determine that fraction which is less than 10 microns and 2.5 microns. These values are 67% and 29%, respectively.
8) Lead emissions data - 2016 actual emissions from email dated Sep 15, 2017 and 2014 & 2015 actual emissions from email dated Sep 21, 2017, provided by C.P. Crane.

NO_x Actual Emissions Data Provided by C.P. Crane

Year	Month	Unit 1 Tons	Unit 1 Daily Avg lbs/mmBTU	Unit 1 Gross MW	Unit 1 lbs/MWg	Unit 2 Tons	Unit 2 Daily Avg lbs/mmBTU	Unit 2 Gross MW	Unit 2 lbs/MWg
2012	January	27.1	0.460	11,247	4.81	43.9	0.315	21,138	4.16
2012	February	8.0	0.332	3,729	4.30	15.0	0.222	7,272	4.12
2012	March	8.2	0.331	5,269	3.13	0.0	#DIV/0!	0	#DIV/0!
2012	April	16.4	0.312	8,571	3.83	15.7	0.232	6,462	4.85
2012	May	123.5	0.363	59,005	4.19	163.2	0.367	69,776	4.68
2012	June	74.9	0.426	34,919	4.29	58.7	0.323	24,271	4.84
2012	July	181.7	0.400	87,159	4.17	230.2	0.429	84,697	5.44
2012	August	87.7	0.382	39,560	4.43	142.9	0.386	55,933	5.11
2012	September	100.0	0.401	46,554	4.30	74.2	0.389	29,509	5.03
2012	October	32.6	0.421	15,495	4.21	22.5	0.362	8,627	5.21
2012	November	88.3	0.382	45,670	3.87	51.2	0.377	18,611	5.50
2012	December	191.9	0.424	85,003	4.51	53.9	0.328	24,060	4.48
2013	January	73.6	0.408	33,677	4.37	56.0	0.389	20,029	5.59
2013	February	26.8	0.380	13,186	4.07	22.3	0.332	9,092	4.90
2013	March	15.5	0.405	6,394	4.83	100.1	0.392	38,099	5.25
2013	April	0.0	#DIV/0!	0	#DIV/0!	31.0	0.421	10,940	5.66
2013	May	42.6	0.352	19,465	4.37	74.1	0.375	23,921	6.19
2013	June	67.8	0.396	30,936	4.38	98.0	0.462	29,476	6.65
2013	July	120.9	0.397	56,808	4.26	154.6	0.549	54,714	5.65
2013	August	29.6	0.426	11,365	5.20	80.4	0.372	27,943	5.75
2013	September	84.5	0.401	39,566	4.27	209.7	0.492	65,688	6.39
2013	October	69.9	0.423	33,561	4.17	73.0	0.390	27,045	5.40
2013	November	131.7	0.372	63,964	4.12	138.5	0.441	50,335	5.50
2013	December	32.4	0.388	15,645	4.15	94.4	0.373	38,576	4.90
2014	January	215.5	0.406	98,723	4.37	211.8	0.477	78,438	5.40
2014	February	92.0	0.393	46,367	3.97	133.9	0.427	44,891	5.97
2014	March	56.2	0.447	24,789	4.53	147.6	0.389	56,523	5.22
2014	April	22.6	0.376	8,944	5.05	42.0	0.388	17,723	4.74
2014	May	0.0	#DIV/0!	0	#DIV/0!	34.5	0.231	31,013	2.23
2014	June	0.0	#DIV/0!	0	#DIV/0!	76.5	0.266	56,819	2.69
2014	July	0.0	#DIV/0!	0	#DIV/0!	30.0	0.208	18,605	3.23
2014	August	0.5	0.344	2,591	0.38	2.6	0.346	12,694	0.41
2014	September	2.0	0.311	3,542	1.11	14.8	0.256	9,061	3.27
2014	October	6.2	0.328	4,145	2.99	7.7	0.235	3,696	4.17
2014	November	20.9	0.403	8,173	5.12	0.0	#DIV/0!	0	#DIV/0!
2014	December	16.6	0.420	6,556	5.05	5.4	0.390	1,279	8.39
2015	January	22.7	0.415	8,084	5.61	110.5	0.503	28,084	7.87
2015	February	158.5	0.391	70,550	4.49	255.4	0.545	66,454	7.69
2015	March	54.3	0.450	18,087	6.01	77.4	0.508	21,778	7.11
2015	April	0.0	#DIV/0!	0	#DIV/0!	59.6	0.414	20,715	5.76
2015	May	0.4	0.236	0	#DIV/0!	10.6	0.243	9,481	2.23
2015	June	1.1	0.288	282	7.81	63.1	0.239	44,016	2.87
2015	July	7.4	0.274	7,491	1.97	39.0	0.220	27,753	2.81
2015	August	30.3	0.316	28,739	2.11	31.7	0.249	24,281	2.61
2015	September	34.0	0.290	34,068	2.00	20.5	0.277	16,954	2.42
2015	October	0.0	#DIV/0!	0	#DIV/0!	24.9	0.431	9,622	5.18
2015	November	0.0	#DIV/0!	0	#DIV/0!	0.0	0.017	0	#DIV/0!
2015	December	0.0	#DIV/0!	0	#DIV/0!	11.7	0.315	5,283	4.45
2016	January	60.4	0.361	31,549	3.83	53.8	0.437	27,458	3.92
2016	February	49.9	0.383	24,034	4.15	28.4	0.378	16,078	3.53
2016	March	1.2	0.400	213	11.71	1.2	0.405	285	8.48
2016	April	0.0	#DIV/0!	0	#DIV/0!	0.0	#DIV/0!	0	#DIV/0!
2016	May	4.7	0.276	2,785	3.40	0.0	#DIV/0!	0	#DIV/0!
2016	June	12.3	0.278	9,389	2.61	14.7	0.234	14,430	2.03
2016	July	26.1	0.307	26,755	1.95	46.5	0.229	45,626	2.04
2016	August	30.5	0.277	23,891	2.55	43.5	0.257	39,126	2.22
2016	September	30.0	0.267	25,098	2.39	29.7	0.272	39,807	1.49
2016	October	7.9	0.432	2,995	5.29	37.6	0.454	14,025	5.36
2016	November	1.3	0.366	321	7.97	46.9	0.586	17,418	5.39
2016	December	31.4	0.425	13,959	4.51	46.4	0.472	19,701	4.71
2017	January	10.6	0.343	3,730	5.68	49.0	0.431	18,693	5.24
2017	February	0.0	#DIV/0!	0	#DIV/0!	23.3	0.379	8,093	5.75
2017	March	1.6	0.536	244	13.50	49.2	0.444	20,477	4.81
2017	April	0.0	#DIV/0!	0	#DIV/0!	0.0	#DIV/0!	0	#DIV/0!
2017	May	0.0	#DIV/0!	0	#DIV/0!	3.9	0.267	4,792	1.64
2017	June	0.0	#DIV/0!	0	#DIV/0!	17.8	0.271	16,316	2.18
2017	July	55.1	0.268	43,283	2.55	8.5	0.216	9,482	1.80

Non Compliance

Month	Day	Year	Unit 1 (lb)	Unit 1 (ton)
6	4	2012	13924.8	6.96
8	27	2014	1795	0.90
8	28	2014	13175	6.59
9	29	2014	8198.6	4.10
7	29	2015	5029.6	2.51
8	16	2015	549.6	0.27
8	17	2015	9409.7	4.70
8	25	2015	6537.3	3.27
8	27	2015	13458.4	6.73
9	7	2015	1582.1	0.79
9	8	2015	12639.3	6.32
9	14	2015	12183.3	6.09
6	19	2016	1599.6	0.80
7	4	2016	1814.5	0.91
7	11	2016	455.8	0.23
7	13	2016	12428.6	6.21
7	14	2016	10468.1	5.23
8	10	2016	682.7	0.34
8	11	2016	2786.9	1.39
9	5	2016	521.7	0.26
7	9	2017	704.7	0.35
7	10	2017	2742.4	1.37

Non Compliance

Month	Day	Year	Unit 2 (lb)	Unit 2 (ton)
7	19	2013	33850.9	16.93
7	20	2013	27843.5	13.92
7	21	2013	24180.6	12.09
5	7	2014	7111.5	3.56
5	11	2014	9800.7	4.90
5	13	2014	10806	5.40
5	26	2014	7919	3.96
6	1	2014	8409.6	4.20
6	10	2014	756.5	0.38
6	11	2014	9311	4.66
6	17	2014	11617.7	5.81
6	23	2014	9534.5	4.77
8	18	2014	9960.3	4.98
8	20	2014	12539.5	6.27
8	21	2014	24595.5	12.30
8	22	2014	15194.8	7.60
9	2	2014	4101.2	2.05
9	11	2014	6803.4	3.40
5	10	2015	1561.5	0.78
5	11	2015	12127.8	6.06
5	18	2015	5510.4	2.76
6	5	2015	10524.5	5.26
7	29	2015	5993	3.00
8	23	2015	3099.1	1.55
8	26	2015	9448.3	4.72
8	30	2015	7117.6	3.56
9	13	2015	1096.8	0.55
6	6	2016	3406.4	1.70
6	20	2016	4054.4	2.03
8	9	2016	4980	2.49
8	31	2016	11360.2	5.68
9	6	2016	7821	3.91
9	12	2016	4464.6	2.23
9	13	2016	11397.8	5.70
9	23	2016	12848.2	6.42
9	24	2016	8547.8	4.27
9	28	2016	3674.1	1.84
5	17	2017	7638.4	3.82
6	27	2017	2040.1	1.02
6	28	2017	16875.2	8.44
7	26	2017	328.8	0.16
7	27	2017	9963.9	4.98

Highlighted cells indicate that from the monthly data, emissions from the days of non complaince has been subtracted

Selected 24-month rolling average emissions within 5 year look back (June 2013 to May 2015

CO Actual Emissions Data Provided by C.P. Crane

Year	Month	Unit 1				Unit 2			
		Tons	Heat Input (MMBTu)	Gross MW	lbs/mmBTU	Tons	Heat Input (MMBTu)	Gross MW	lbs/mmBTU
2012	January	1.1	115,873	11,247	0.02	5.9	261,382	21,138	0.05
2012	February	0.8	43,989	3,729	0.04	1.1	99,126	7,272	0.02
2012	March	0.8	40,508	5,269	0.04	0.0	0	0	#DIV/0!
2012	April	1.1	90,640	8,571	0.02	1.7	91,845	6,462	0.04
2012	May	6.9	624,188	59,005	0.02	7.3	849,213	69,776	0.02
2012	June	3.5	378,980	34,919	0.02	3.8	322,367	24,271	0.02
2012	July	13.1	888,992	87,159	0.03	12.8	1,027,141	84,697	0.02
2012	August	5.3	411,022	39,560	0.03	5.7	698,387	55,933	0.02
2012	September	5.2	493,005	46,554	0.02	7.9	369,528	29,509	0.04
2012	October	1.0	160,929	15,495	0.01	2.7	106,788	8,627	0.05
2012	November	7.9	468,371	45,670	0.03	4.4	232,745	18,611	0.04
2012	December	12.6	904,213	85,003	0.03	13.7	330,027	24,060	0.08
2013	January	7.4	353,028	33,677	0.04	16.3	256,108	20,029	0.13
2013	February	2.3	133,755	13,186	0.03	1.5	116,464	9,092	0.03
2013	March	0.6	73,156	6,394	0.02	7.7	471,039	38,099	0.03
2013	April	0.0	0	0	#DIV/0!	0.7	139,138	10,940	0.01
2013	May	2.5	204,941	19,465	0.02	1.6	294,099	23,921	0.01
2013	June	2.7	321,936	30,936	0.02	2.5	375,113	29,476	0.01
2013	July	7.8	570,285	56,808	0.03	0.7	654,763	54,714	0.00
2013	August	1.0	131,372	11,365	0.02	2.4	352,293	27,943	0.01
2013	September	4.4	402,568	39,566	0.02	4.5	769,841	65,688	0.01
2013	October	2.2	330,684	33,561	0.01	4.1	344,183	27,045	0.02
2013	November	11.0	692,871	63,964	0.03	7.1	598,829	50,335	0.02
2013	December	4.0	175,674	15,645	0.05	5.4	468,791	38,576	0.02
2014	January	21.0	1,065,540	98,723	0.04	11.9	886,769	78,438	0.03
2014	February	8.2	460,740	46,367	0.04	3.8	523,081	44,891	0.01
2014	March	1.2	245,792	24,789	0.01	7.6	658,354	56,523	0.02
2014	April	1.6	100,392	8,944	0.03	2.5	223,828	17,723	0.02
2014	May	0.0	0	0	#DIV/0!	4.5	412,540	31,013	0.02
2014	June	0.0	0	0	#DIV/0!	9.0	736,284	56,819	0.02
2014	July	0.0	0	0	#DIV/0!	2.6	254,866	18,605	0.02
2014	August	0.3	31,036	2,591	0.02	0.9	162,958	12,694	0.01
2014	September	0.6	35,518	3,542	0.04	2.6	136,187	9,061	0.04
2014	October	1.0	43,177	4,145	0.05	1.2	55,402	3,696	0.04
2014	November	1.3	92,876	8,173	0.03	0.0	0	0	#DIV/0!
2014	December	1.9	77,281	6,556	0.05	0.6	24,244	1,279	0.05
2015	January	3.2	102,916	8,084	0.06	12.2	374,851	28,084	0.06
2015	February	31.7	806,396	70,550	0.08	27.0	837,963	66,454	0.06
2015	March	10.0	218,166	18,087	0.09	5.4	284,030	21,778	0.04
2015	April	0.0	0	0	#DIV/0!	4.3	262,055	20,715	0.03
2015	May	0.1	3,318	0	0.06	6.3	147,548	9,481	0.09
2015	June	0.2	8,080	282	0.05	8.3	568,989	44,016	0.03
2015	July	2.8	76,152	7,491	0.07	6.0	367,009	27,753	0.03
2015	August	9.7	310,593	28,739	0.06	9.6	316,198	24,281	0.06
2015	September	9.24	343,752	34,068	0.05	4.5	173,482	16,954	0.05
2015	October	0.0	0	0	#DIV/0!	2.6	96,818	9,622	0.05
2015	November	0.0	0	0	#DIV/0!	0.0	163	0	0.05
2015	December	0.0	0	0	#DIV/0!	0.3	53,655	5,283	0.01
2016	January	14.6	325,048	31,549	0.09	11.7	241,433	27,458	0.10
2016	February	6.1	245,769	24,034	0.05	7.4	144,795	16,078	0.10
2016	March	0.4	5,712	213	0.14	0.2	4,022	285	0.09
2016	April	0.0	0	0	#DIV/0!	0.0	0	0	#DIV/0!
2016	May	0.6	33,900	2,785	0.04	0.0	0	0	#DIV/0!
2016	June	1.6	102,739	9,389	0.03	6.1	133,470	14,430	0.09
2016	July	5.1	284,229	26,755	0.04	13.9	394,242	45,626	0.07
2016	August	2.8	253,258	23,891	0.02	8.4	384,487	39,126	0.04
2016	September	4.9	258,999	25,098	0.04	11.1	367,217	39,807	0.06
2016	October	0.2	33,134	2,995	0.01	2.6	127,745	14,025	0.04
2016	November	0.1	6,907	321	0.04	2.1	151,486	17,418	0.03
2016	December	3.6	152,060	13,959	0.05	3.9	179,706	19,701	0.04
2017	January	2.2	40,660	3,730	0.11	4.5	178,712	18,693	0.05
2017	February	0.0	0	0	#DIV/0!	2.6	78,539	8,093	0.07
2017	March	0.8	6,385	244	0.26	12.8	194,977	20,477	0.13
2017	April	0.0	0	0	#DIV/0!	0.0	0	0	#DIV/0!
2017	May	0.0	0	0	#DIV/0!	0.4	54,381	4,792	0.01
2017	June	0.0	0	0	#DIV/0!	7.1	191,090	16,316	0.07
2017	July	13.9	459,984	43,283	0.06	3.6	104,204	9,482	0.07

Non Compliance

Month	Day	Year	Unit 1 (lb)	Unit 1 (ton)
6	24	2015	2350.8	1.18
6	25	2015	341.2	0.17
7	30	2015	6554.2	3.28
9	3	2015	6212	3.11
1	27	2016	587.3	0.29
11	14	2016	1066.9	0.53

			Unit 2 (lb)	Unit 2 (ton)
12	13	2012	202.2	0.10
1	30	2013	1188.9	0.59
2	23	2013	287.8	0.14
12	17	2016	219.8	0.11

Highlighted cells indicate that from the monthly data, emissions from the days of non complaince has been subtracted

Selected 24-month rolling average emissions within 5 year look back (June 2013 to May 2015)

SO_2 Actual Emissions Data Provided by C.P. Crane

Year	Month	Unit 1				Unit 2			
		Tons	Heat Input (MMBTu)	Gross MW	lbs/mmBTU	Tons	Heat Input (MMBTu)	Gross MW	lbs/mmBTU
2012	January	20.238	115873.200	11247	0.35	50.9003	261381.9	21138	0.39
2012	February	8.383	43988.900	3729	0.38	19.4361	99125.8	7272	0.39
2012	March	7.693	40508.200	5269	0.38	0	0.0	0	#DIV/0!
2012	April	17.029	90640.000	8571	0.38	17.5772	91844.5	6462	0.38
2012	May	122.645	624188.400	59005	0.39	176.458	849213.3	69776	0.42
2012	June	81.867	378980.000	34919	0.43	71.5341	322366.6	24271	0.44
2012	July	183.079	888992.000	87159	0.41	225.1605	1027140.7	84697	0.44
2012	August	94.116	411022.300	39560	0.46	162.4957	698386.5	55933	0.47
2012	September	113.111	493005.100	46554	0.46	88.17455	369527.5	29509	0.48
2012	October	34.022	160928.900	15495	0.42	23.24725	106787.5	8627	0.44
2012	November	117.431	468370.800	45670	0.50	53.18945	232745.2	18611	0.46
2012	December	413.330	904213.400	85003	0.91	73.59595	330027.0	24060	0.45
2013	January	69.779	353028.000	33677	0.40	47.3512	256108.0	20029	0.37
2013	February	30.102	133755.300	13186	0.45	54.92685	116463.6	9092	0.94
2013	March	13.102	73156.000	6394	0.36	91.2684	471038.8	38099	0.39
2013	April	0.000	0.000	0	#DIV/0!	39.12115	139137.5	10940	0.56
2013	May	38.480	204941.100	19465	0.38	61.4604	294099.1	23921	0.42
2013	June	77.929	321936.400	30936	0.48	138.0209	375113.3	29476	0.74
2013	July	152.607	570284.900	56808	0.54	407.5137	654763.2	54714	1.24
2013	August	27.515	131371.500	11365	0.42	202.0958	352293.0	27943	1.15
2013	September	110.068	402568.100	39566	0.55	439.5126	769840.6	65688	1.14
2013	October	80.031	330684.000	33561	0.48	193.255	344182.6	27045	1.12
2013	November	196.415	692871.400	63964	0.57	359.2802	598829.4	50335	1.20
2013	December	36.295	175674.100	15645	0.41	108.8163	468791.4	38576	0.46
2014	January	265.965	1065539.600	98723	0.50	380.5245	886768.9	78438	0.86
2014	February	146.370	460740.100	46367	0.64	247.4171	523081.0	44891	0.95
2014	March	92.408	245791.700	24789	0.75	238.4045	658354.4	56523	0.72
2014	April	10.161	100392.300	8944	0.20	36.3553	223828.3	17723	0.32
2014	May	0.000	0.000	0	#DIV/0!	77.07325	412540.4	31013	0.37
2014	June	0.000	0.000	0	#DIV/0!	161.6726	736283.5	56819	0.44
2014	July	0.000	0.000	0	#DIV/0!	54.50305	254865.8	18605	0.43
2014	August	8.453	31036.100	2591	0.54	74.45225	162957.6	12694	0.91
2014	September	6.858	35517.700	3542	0.39	28.18255	136186.7	9061	0.41
2014	October	9.677	43177.100	4145	0.45	12.56355	55401.7	3696	0.45
2014	November	18.237	92875.500	8173	0.39	0	0.0	0	#DIV/0!
2014	December	15.417	77281.300	6556	0.40	4.3441	24244.4	1279	0.36
2015	January	24.926	102915.600	8084	0.48	164.0987	374850.9	28084	0.88
2015	February	163.585	806396.300	70550	0.41	176.9291	837963.1	66454	0.42
2015	March	47.699	218166.200	18087	0.44	65.9368	284030.1	21778	0.46
2015	April	0.000	0.000	0	#DIV/0!	61.3722	262054.6	20715	0.47
2015	May	0.396	3318.100	0	0.24	26.12655	147548.4	9481	0.35
2015	June	1.137	8079.900	282	0.28	130.6461	568989.4	44016	0.46
2015	July	14.036	76151.800	7491	0.37	66.6571	367009.1	27753	0.36
2015	August	61.653	310593.200	28739	0.40	154.0011	316198.0	24281	0.97
2015	September	68.084	343752.400	34068	0.40	36.47065	173481.8	16954	0.42
2015	October	0.000	0.000	0	#DIV/0!	19.2842	96817.7	9622	0.40
2015	November	0.000	0.000	0	#DIV/0!	0	163.2	0	0.00
2015	December	0.000	0.000	0	#DIV/0!	44.03765	53654.9	5283	1.64
2016	January	56.804	325048.000	31549	0.35	41.7559	241432.5	27458	0.35
2016	February	44.746	245769.100	24034	0.36	26.1586	144795.2	16078	0.36
2016	March	0.796	5712.400	213	0.28	0.4742	4021.7	285	0.24
2016	April	0.000	0.000	0	#DIV/0!	0	0.0	0	#DIV/0!
2016	May	6.022	33900.200	2785	0.36	0	0.0	0	#DIV/0!
2016	June	18.613	102738.600	9389	0.36	24.9708	133469.9	14430	0.37
2016	July	61.608	284229.100	26755	0.43	90.9799	394242.3	45626	0.46
2016	August	50.138	253257.500	23891	0.40	86.88335	384486.6	39126	0.45
2016	September	98.497	258999.100	25098	0.76	153.583	367216.5	39807	0.84
2016	October	17.778	33134.300	2995	1.07	63.58645	127745.3	14025	1.00
2016	November	3.404	6906.500	321	0.99	87.42835	151486.3	17418	1.15
2016	December	55.143	152059.700	13959	0.73	61.95205	179705.6	19701	0.69
2017	January	12.879	40660.200	3730	0.63	56.60015	178712.4	18693	0.63
2017	February	0.000	0.000	0	#DIV/0!	24.07755	78538.7	8093	0.61
2017	March	1.190	6384.700	244	0.37	54.78925	194976.8	20477	0.56
2017	April	0.000	0.000	0	#DIV/0!	0	0.0	0	#DIV/0!
2017	May	0.000	0.000	0	#DIV/0!	13.97845	54380.9	4792	0.51
2017	June	0.000	0.000	0	#DIV/0!	59.1261	191089.8	16316	0.62
2017	July	127.351	459984.100	43283	0.55	28.42495	104204.3	9482	0.55

Non Compliance
None

CO_2 Actual Emissions Data Provided by C.P. Crane

Year	Month	Unit 1							Unit 2						
		CO_2 Tons	Heat Input (MMBTu)	CH_4 Emission factor (kg/MMBtu)	CH_4 Tons	N_2O Emission factor (kg/MMBtu)	N_2O Tons	CO_2e	CO_2 Tons	Heat Input (MMBTu)	CH_4 Emission factor (kg/MMBtu)	CH_4 Tons	N_2O Emission factor (kg/MMBtu)	N_2O Tons	CO_2e
2012	January	12,152.90	115,873	1.10E-02	1.4	1.60E-03	0.2	12,248.94	27,414.00	261,382	1.10E-02	3.2	1.60E-03	0.5	27,630.65
2012	February	4,613.70	43,989	1.10E-02	0.5	1.60E-03	0.1	4,650.16	10,396.10	99,126	1.10E-02	1.2	1.60E-03	0.2	10,478.26
2012	March	4,248.60	40,508	1.10E-02	0.5	1.60E-03	0.1	4,282.18	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00
2012	April	9,506.70	90,640	1.10E-02	1.1	1.60E-03	0.2	9,581.83	9,632.70	91,845	1.10E-02	1.1	1.60E-03	0.2	9,708.83
2012	May	65,464.40	624,188	1.10E-02	7.6	1.60E-03	1.1	65,981.76	89,064.40	849,213	1.10E-02	10.3	1.60E-03	1.5	89,768.28
2012	June	39,747.60	378,980	1.10E-02	4.6	1.60E-03	0.7	40,061.72	33,809.80	322,367	1.10E-02	3.9	1.60E-03	0.6	34,077.00
2012	July	93,238.40	888,992	1.10E-02	10.8	1.60E-03	1.6	93,975.25	107,727.50	1,027,141	1.10E-02	12.5	1.60E-03	1.8	108,578.86
2012	August	43,107.70	411,022	1.10E-02	5.0	1.60E-03	0.7	43,448.38	73,247.40	698,387	1.10E-02	8.5	1.60E-03	1.2	73,826.26
2012	September	51,706.30	493,005	1.10E-02	6.0	1.60E-03	0.9	52,114.93	38,756.90	369,528	1.10E-02	4.5	1.60E-03	0.7	39,063.19
2012	October	16,878.30	160,929	1.10E-02	2.0	1.60E-03	0.3	17,011.69	11,200.00	106,788	1.10E-02	1.3	1.60E-03	0.2	11,288.51
2012	November	49,123.10	468,371	1.10E-02	5.7	1.60E-03	0.8	49,511.31	24,410.00	232,745	1.10E-02	2.8	1.60E-03	0.4	24,602.91
2012	December	94,833.90	904,213	1.10E-02	11.0	1.60E-03	1.6	95,583.37	34,613.00	330,027	1.10E-02	4.0	1.60E-03	0.6	34,886.55
2013	January	37,025.20	353,028	1.10E-02	4.3	1.60E-03	0.6	37,317.81	26,860.50	256,108	1.10E-02	3.1	1.60E-03	0.5	27,072.78
2013	February	14,028.50	133,755	1.10E-02	1.6	1.60E-03	0.2	14,139.36	12,214.40	116,464	1.10E-02	1.4	1.60E-03	0.2	12,310.93
2013	March	7,672.70	73,156	1.10E-02	0.9	1.60E-03	0.1	7,733.34	49,402.80	471,039	1.10E-02	5.7	1.60E-03	0.8	49,793.22
2013	April	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	14,592.70	139,138	1.10E-02	1.7	1.60E-03	0.2	14,708.03
2013	May	21,494.90	204,941	1.10E-02	2.5	1.60E-03	0.4	21,664.77	30,845.00	294,099	1.10E-02	3.6	1.60E-03	0.5	31,088.77
2013	June	33,764.60	321,936	1.10E-02	3.9	1.60E-03	0.6	34,031.44	39,341.40	375,113	1.10E-02	4.5	1.60E-03	0.7	39,652.32
2013	July	59,811.20	570,285	1.10E-02	6.9	1.60E-03	1.0	60,283.89	68,671.70	654,763	1.10E-02	7.9	1.60E-03	1.2	69,214.41
2013	August	13,777.80	131,372	1.10E-02	1.6	1.60E-03	0.2	13,886.69	36,948.80	352,293	1.10E-02	4.3	1.60E-03	0.6	37,240.80
2013	September	42,222.10	402,568	1.10E-02	4.9	1.60E-03	0.7	42,555.77	80,741.40	769,841	1.10E-02	9.3	1.60E-03	1.4	81,379.49
2013	October	34,681.80	330,684	1.10E-02	4.0	1.60E-03	0.6	34,955.89	36,097.90	344,183	1.10E-02	4.2	1.60E-03	0.6	36,383.18
2013	November	72,669.30	692,871	1.10E-02	8.4	1.60E-03	1.2	73,243.59	62,805.20	598,829	1.10E-02	7.3	1.60E-03	1.1	63,301.55
2013	December	18,424.60	175,674	1.10E-02	2.1	1.60E-03	0.3	18,570.21	49,167.10	468,791	1.10E-02	5.7	1.60E-03	0.8	49,555.66
2014	January	111,753.80	1,065,540	1.10E-02	12.9	1.60E-03	1.9	112,636.98	93,004.50	886,769	1.10E-02	10.8	1.60E-03	1.6	93,739.51
2014	February	48,322.30	460,740	1.10E-02	5.6	1.60E-03	0.8	48,704.19	54,860.00	523,081	1.10E-02	6.3	1.60E-03	0.9	55,293.56
2014	March	25,778.50	245,792	1.10E-02	3.0	1.60E-03	0.4	25,982.23	69,049.20	658,354	1.10E-02	8.0	1.60E-03	1.2	69,594.88
2014	April	10,529.30	100,392	1.10E-02	1.2	1.60E-03	0.2	10,612.51	23,475.30	223,828	1.10E-02	2.7	1.60E-03	0.4	23,660.82
2014	May	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	43,267.20	412,540	1.10E-02	5.0	1.60E-03	0.7	43,609.14
2014	June	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	77,222.20	736,284	1.10E-02	8.9	1.60E-03	1.3	77,832.48
2014	July	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	26,730.90	254,866	1.10E-02	3.1	1.60E-03	0.4	26,942.15
2014	August	3,254.90	31,036	1.10E-02	0.4	1.60E-03	0.1	3,280.62	17,090.90	162,958	1.10E-02	2.0	1.60E-03	0.3	17,225.97
2014	September	3,725.10	35,518	1.10E-02	0.4	1.60E-03	0.1	3,754.54	14,282.90	136,187	1.10E-02	1.7	1.60E-03	0.2	14,395.78
2014	October	4,528.60	43,177	1.10E-02	0.5	1.60E-03	0.1	4,564.39	5,810.60	55,402	1.10E-02	0.7	1.60E-03	0.1	5,856.52
2014	November	9,741.00	92,876	1.10E-02	1.1	1.60E-03	0.2	9,817.98	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00
2014	December	8,105.20	77,281	1.10E-02	0.9	1.60E-03	0.1	8,169.26	2,542.50	24,244	1.10E-02	0.3	1.60E-03	0.0	2,562.60
2015	January	10,793.70	102,916	1.10E-02	1.2	1.60E-03	0.2	10,879.00	39,314.20	374,851	1.10E-02	4.5	1.60E-03	0.7	39,624.90
2015	February	84,573.80	806,396	1.10E-02	9.8	1.60E-03	1.4	85,242.19	87,885.60	837,963	1.10E-02	10.2	1.60E-03	1.5	88,580.15
2015	March	22,881.10	218,166	1.10E-02	2.6	1.60E-03	0.4	23,061.93	29,789.50	284,030	1.10E-02	3.4	1.60E-03	0.5	30,024.92
2015	April	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	27,485.10	262,055	1.10E-02	3.2	1.60E-03	0.5	27,702.31
2015	May	347.80	3,318	1.10E-02	0.0	1.60E-03	0.0	350.55	15,475.60	147,548	1.10E-02	1.8	1.60E-03	0.3	15,597.90
2015	June	847.50	8,080	1.10E-02	0.1	1.60E-03	0.0	854.20	59,675.70	568,989	1.10E-02	6.9	1.60E-03	1.0	60,147.31
2015	July	7,986.40	76,152	1.10E-02	0.9	1.60E-03	0.1	8,049.52	38,491.00	367,009	1.10E-02	4.5	1.60E-03	0.6	38,795.20
2015	August	32,575.20	310,593	1.10E-02	3.8	1.60E-03	0.5	32,832.64	33,162.70	316,198	1.10E-02	3.8	1.60E-03	0.6	33,424.78
2015	September	36,052.50	343,752	1.10E-02	4.2	1.60E-03	0.6	36,337.42	18,194.10	173,482	1.10E-02	2.1	1.60E-03	0.3	18,337.89
2015	October	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	10,154.40	96,818	1.10E-02	1.2	1.60E-03	0.2	10,234.65
2015	November	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	16.90	163	1.10E-02	0.0	1.60E-03	0.0	17.04
2015	December	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	5,627.30	53,655	1.10E-02	0.7	1.60E-03	0.1	5,671.77
2016	January	34,091.50	325,048	1.10E-02	3.9	1.60E-03	0.6	34,360.92	25,321.30	241,433	1.10E-02	2.9	1.60E-03	0.4	25,521.41
2016	February	25,776.10	245,769	1.10E-02	3.0	1.60E-03	0.4	25,979.81	15,186.10	144,795	1.10E-02	1.8	1.60E-03	0.3	15,306.11
2016	March	599.20	5,712	1.10E-02	0.1	1.60E-03	0.0	603.93	421.60	4,022	1.10E-02	0.0	1.60E-03	0.0	424.93
2016	April	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00
2016	May	3,555.60	33,900	1.10E-02	0.4	1.60E-03	0.1	3,583.70	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00
2016	June	10,775.00	102,739	1.10E-02	1.2	1.60E-03	0.2	10,860.16	13,997.90	133,470	1.10E-02	1.6	1.60E-03	0.2	14,108.53
2016	July	29,810.20	284,229	1.10E-02	3.4	1.60E-03	0.5	30,045.79	41,347.80	394,242	1.10E-02	4.8	1.60E-03	0.7	41,674.57
2016	August	26,561.50	253,258	1.10E-02	3.1	1.60E-03	0.4	26,771.41	40,324.30	384,487	1.10E-02	4.7	1.60E-03	0.7	40,642.99
2016	September	27,163.30	258,999	1.10E-02	3.1	1.60E-03	0.5	27,377.97	38,512.70	367,217	1.10E-02	4.5	1.60E-03	0.6	38,817.07
2016	October	3,475.20	33,134	1.10E-02	0.4	1.60E-03	0.1	3,502.66	13,398.70	127,745	1.10E-02	1.5	1.60E-03	0.2	13,504.58
2016	November	724.40	6,907	1.10E-02	0.1	1.60E-03	0.0	730.12	15,887.50	151,486	1.10E-02	1.8	1.60E-03	0.3	16,013.06
2016	December	15,948.20	152,060	1.10E-02	1.8	1.60E-03	0.3	16,074.24	18,848.00	179,706	1.10E-02	2.2	1.60E-03	0.3	18,996.95
2017	January	4,264.80	40,660	1.10E-02	0.5	1.60E-03	0.1	4,298.50	18,744.00	178,712	1.10E-02	2.2	1.60E-03	0.3	18,892.13
2017	February	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	8,237.80	78,539	1.10E-02	1.0	1.60E-03	0.1	8,302.90
2017	March	669.60	6,385	1.10E-02	0.1	1.60E-03	0.0	674.89	20,450.00	194,977	1.10E-02	2.4	1.60E-03	0.3	20,611.61
2017	April	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00
2017	May	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	5,703.10	54,381	1.10E-02	0.7	1.60E-03	0.1	5,748.17
2017	June	0.00	0	1.10E-02	0.0	1.60E-03	0.0	0.00	20,041.10	191,090	1.10E-02	2.3	1.60E-03	0.3	20,199.49
2017	July	48,243.40	459,984	1.10E-02	5.6	1.60E-03	0.8	48,624.66	10,928.30	104,204	1.10E-02	1.3	1.60E-03	0.2	11,014.67

CO_2 (Tons) data provided by C.P. Crane. ECT calculated CH_4 and N_2O to get CO_2e emissions.

Emission Factors for CH_4 and N_2O - Mandatory Reporting of Greenhouse Gases, Final Rule; Federal Register Vol. 74, No. 209, October 30, 2009, Table C-1 (Anthracite coal) and Table C-2 (Coal) to Subpart C of Part 98.
Based on global warming potential of 1 for CO_2, 25 for CH_4 and 298 for N_2O.

Selected 24-month rolling average emissions within 5 year look back (June 2013 to May 2015)

Appendix C

Air Dispersion Modeling Protocol

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C.P. Crane Combustion Turbine Repowering Project

Air Quality Impact Analysis Modeling Protocol

C.P. CRANE, LLC
Chase, Maryland

February 2018
ECT No. 170604-0300

Document Review

The dual signatory process is an integral part of Environmental Consulting & Technology, Inc.'s (ECT's) Document Review Policy No. 9.03. ECT documents undergo technical/peer review prior to dispatching these documents to an outside entity.

This document has been authored and reviewed by the following employees:

Joshua Ralph	Thomas O. Pritcher
Author	Peer Review
Signature	Signature
February 27, 2018	February 27, 2018
Date	Date

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List of Acronyms and Abbreviations

$\mu g/m^3$	microgram per cubic meter
AERMAP	AERMOD terrain preprocessing program
AERMET	AERMOD meteorological preprocessing program
AERMOD	AMS/EPA Regulatory Model
AMS	American Meteorological Society
AQS	Air Quality System
BPIP	EPA's Building Profile Input Program
BPIPPRM	EPA's Building Profile Input Program for plume rise model enhancements
BWI	Baltimore/Washington International Thurgood Marshall Airport
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CPCN	certificate of public convenience and necessity
CT	combustion turbine
ECT	Environmental Consulting & Technology, Inc.
EPA	U.S. Environmental Protection Agency
ft	foot
ft-msl	foot above mean sea level
GAQM	Guideline for Air Quality Models
GeoTIFF	geo-referenced tagged image file format
GEP	good engineering practice
GHG	greenhouse gas
hr/yr	hour per year
km	kilometer
MDE	Maryland Department of the Environment
NAAQS	national ambient air quality standard
NED	National Elevation Dataset
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NWS	National Weather Service
PM	particulate matter
PM_{10}	particulate matter equal to or less than 10 microns
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns
ppb	part per billion
PRIME	plume rise model enhancements
SO_2	sulfur dioxide
ULSD	ultra-low-sulfur diesel
USGS	U.S. Geological Survey
WBAN	Weather-Bureau-Army-Navy

1.0 Introduction

C.P. Crane, LLC (C.P. Crane) is proposing to modify the C.P. Crane power plant site located in Baltimore County, Maryland. The project involves adding three General Electric (GE) LM6000 combustion turbines (CTs) in simple cycle service in conjunction with shutting down the existing coal-fired units.

The planned project at the C.P. Crane power plant will result in the permanent shutdown of two existing coal-fired generating units and installation of three CTs of the aero-derivative type and associated ancillary equipment. The proposed CTs will fire natural gas as their primary fuel and will also be capable of firing ultra-low sulfur distillate (ULSD) fuel oil in situations when natural gas is not available in sufficient quantities. The CTs are expected to serve as peaking units and operate at an annual average capacity factor of up to 30 percent. The CTs design will allow them to start up and shut down quickly and at multiple times per day, if circumstances warrant.

The Maryland Department of the Environment (MDE) requested submittal of an air quality impact analysis modeling protocol for agency review and approval prior to the start of modeling. Accordingly, Environmental Consulting & Technology, Inc. (ECT), prepared this modeling protocol for the project air quality impact analysis for agency review and comments.

This modeling protocol addresses the following major topics:

- General project information, including project description, and location.
- Pollutants to be evaluated.
- Modeled emissions sources.
- Dispersion models and model options.
- Building wake effects (downwash).
- Receptor grids, including terrain considerations.
- Meteorological data.
- Representative Ambient Background Concentrations
- Format of model results.

Following this introduction, this project modeling protocol is organized as follows:

- Section 2.0—Project Overview.
- Section 3.0—Models Proposed and Modeling Techniques.
- Section 4.0—Terrain Consideration.
- Section 5.0—Building Wake Effects.
- Section 6.0—Receptor Grids.
- Section 7.0—Meteorological Data.
- Section 8.0— Representative Ambient Background Concentrations.
- Section 9.0—Model Results.
- Section 10.0—References/Bibliography.

2.0 Project Overview

2.1 Project Location

The C.P. Crane facility is located in eastern Baltimore County, along the Chesapeake Bay approximately 20 kilometers (km) east of Baltimore. Figure 2-1 illustrates the location of the project within the state of Maryland and within Baltimore County. Figure 2-2 provides an aerial photograph showing the location of the project. A conceptual site layout is provided in the appendix.

2.2 Project Description

Based on the preliminary New Source Review (NSR) applicability analysis, the proposed project is expected to be a minor source modification with regards the federal NSR regulations. The preliminary NSR applicability analysis suggests that the proposed project will not result in a significant increase in emissions of a NSR pollutant, with a possible exception for Greenhouse Gas (GHG) emissions. Please note that GHG emissions have been categorized as an "anyway" pollutant and require another NSR pollutant to be subject to NSR review before NSR review applies to GHG emissions. Therefore, GHG emissions are not expected to be subject to NSR review for the proposed project.

In support of the Certificate of Public Convenience and Necessity (CPCN) and Permit to Construct applications for the proposed project, an air quality impact modeling, facility-only National Ambient Air Quality Standards (NAAQS) analysis will be provided in the Environmental Review Document (ERD). Table 2-1 shows the air pollutants/averaging periods that will be addressed in the C. P. Crane's compliance demonstration.

The application will provide a demonstration through air dispersion modeling utilizing agency approved meteorological data that the post-project emission rates for criteria air pollutants are in compliance with the NAAQS. Specifically, the NAAQS modeling analysis will consist of the

existing sources remaining in operation, the proposed new emission sources, and a representative, agency-approved ambient background concentration. Please note that nearby, off-site emission sources are not proposed for this analysis.

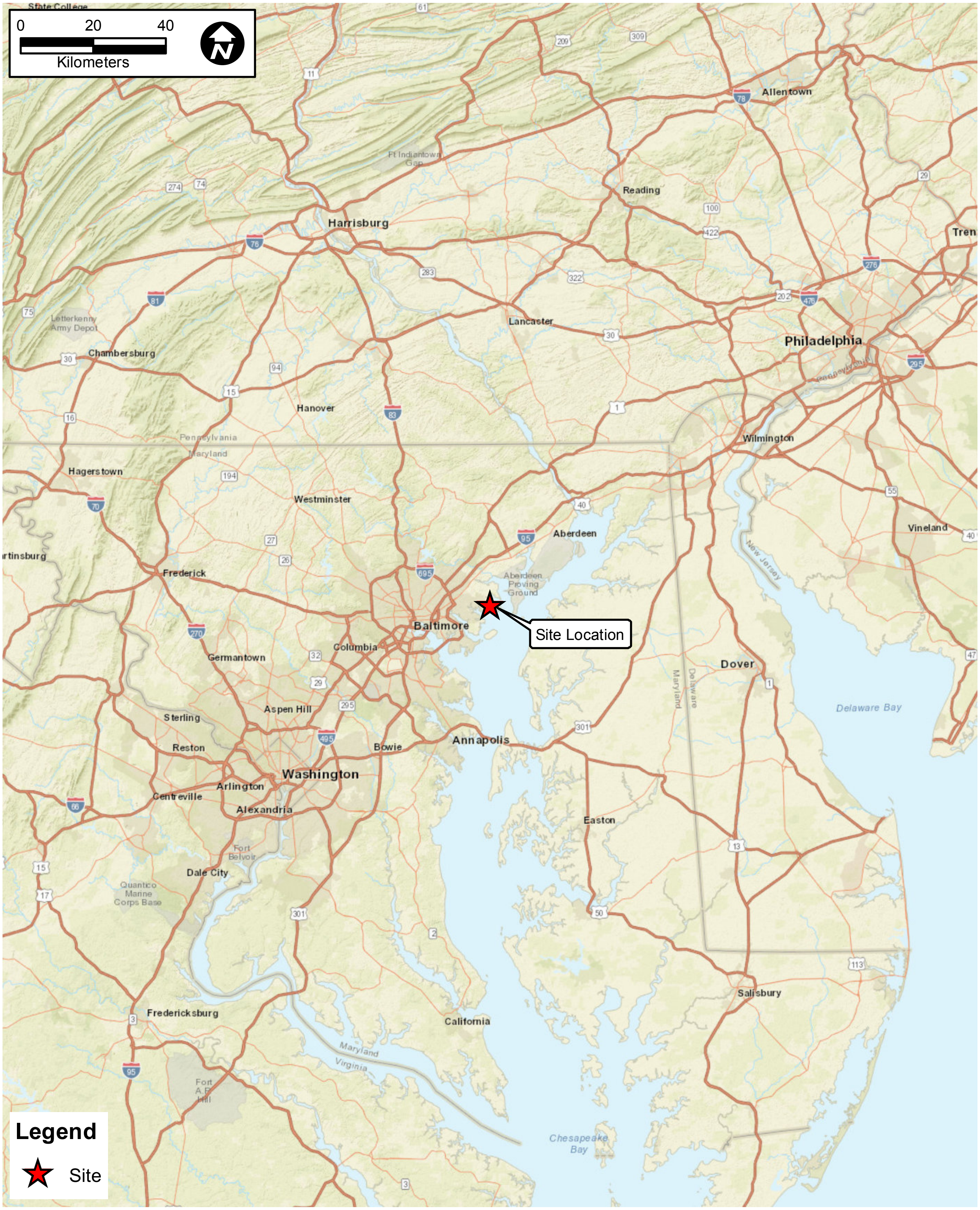

FIGURE 2-1.
GENERAL SITE LOCATION MAP

Sources: Esri Basemap, ECT 2018.

Environmental Consulting & Technology, Inc.

FIGURE 2-2.
AERIAL IMAGERY OF PROJECT SITE AND VICINITY

Sources: Esri Basemap, ECT 2018.

ECT Environmental Consulting & Technology, Inc.

Table 2-1. National Ambient Air Quality Standards

Pollutant (units)	Averaging Periods	NAAQS
SO_2 (ppb)	1-hour*	75
	3-hour†	500
PM_{10} (µg/m^3)	24-hour§	150
$PM_{2.5}$ (µg/m^3)	24-hour**	35
	Annual††	12
CO (ppm)	1-hour†	35
	8-hour†	9
NO_2 (ppb)	1-hour	100¥¥
	Annual‡	53
Lead (µg/m^3)	Rolling 3-month average	0.15

Note: ppmv = part per million by volume.
ppb = part per billion.
µg/m^3 = microgram per cubic meter.
ppm = part per million.

*Standard based on three-year average of the 99th percentile of the annual distribution of 1-hour daily maximum SO_2 concentrations.
†Not to be exceeded more than once per calendar year.
‡Arithmetic mean.
§The standards are attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3, as determined in accordance with 40 CFR 50 Appendix K, is equal to or less than one.
**98th percentile concentration, as determined in accordance with 40 CFR 50 Appendix N.
††Arithmetic mean concentration, as determined in accordance with 40 CFR 50 Appendix N.
¥¥Standard based on three-year average of the 98th percentile of the annual distribution of 1-hour daily maximum NO_2 concentrations.

Source: 40 CFR 50.

3.0 Models Proposed and Modeling Techniques

3.1 Models Proposed

Air quality models are applied at two levels: screening and refined. At the screening level, models provide conservative estimates of impacts to determine whether more detailed modeling is required. Screening modeling can also be used to identify worst-case operating scenarios for subsequent refined modeling analysis.

The refined level consists of techniques that provide more advanced technical treatment of atmospheric processes. Refined modeling requires more detailed and precise input data but also provides improved estimates of source impacts. For the air quality impact analysis, the current version of the U.S. Environmental Protection Agency (EPA)-approved American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) system, together with a set of five years of hour-by-hour National Weather Service (NWS) meteorological data, will be used to obtain refined impact predictions for short-term periods (i.e., periods equal to or less than 24 hours), as well as annual average concentrations.

Recommended procedures for conducting air quality impact assessments are contained in EPA's Guideline for Air Quality Models (GAQM) (EPA, 2017). The GAQM is codified in Appendix W of Title 40, Part 51, Code of Federal Regulations (CFR). In the November 9, 2005, Federal Register, EPA approved the use of AERMOD as a GAQM Appendix A preferred model effective December 9, 2005. AERMOD is recommended for use in a wide range of regulatory applications, including both simple and complex terrain. The AERMOD system consists of meteorological and terrain preprocessing programs (AERMET and AERMAP, respectively) and the dispersion aspects of AERMOD. The current EPA-approved versions of AERMOD (Version 16216r dated January 17, 2017) and AERMAP (Version 11103 dated April 13, 2011) will be used to assess project air quality impacts. AERMOD will be run using the most recent

version of the Providence Engineering and Environmental Group, LLC, BEEST suite (BEEST), currently Version 11.10, interface for EPA's AERMOD.

Procedures applicable to the AERMOD system specified in the latest version of the AERMOD User's Guide (December 2016), AERMOD Implementation Guide (updated December 2016), the Addendums to the User's Guide, and the current GAQM will be followed. In particular, the AERMOD control pathway MODELOPT keyword parameters DFAULT and CONC will be selected. Selection of the parameter DFAULT, which specifies use of the regulatory default options, is recommended by the GAQM. The CONC option specifies the calculation of concentrations. Since the proposed project will be located in rural Baltimore County, the AERMOD options regarding urban area increased surface heating (URBANOPT keyword), pollutant exponential decay (HALFLIFE and DCAYCOEF keywords), and flagpole receptors (FLAGPOLE keyword) will not be employed.

3.2 NO_2 Ambient Impact Analysis

For the 1-hour and annual average NO_2 refined modeling, the default Tier 2/ambient ratio method (ARM2) NO_x conversion option will be used in accordance with 40 CFR Part 51, EPA guidance revised in 2017. The national default for ARM2 has a minimum ambient NO_2/NO_x ratio of 0.5 and a maximum ambient ratio of 0.9 which will be used as discussed in EPA NO_2 modeling guidance.

It is not anticipated that a Tier 3 NO_x conversion option will be necessary (e.g., the Plume Volume Molar Ratio Method) for this modeling analysis. Therefore, additional documentation in support of its use is not provided in this protocol.

Additionally, as identified in the EPA's March 1, 2011, 1-hour NO_2 modeling guidance memorandum, emissions sources that operate intermittently will not be included in the modeling analysis.

4.0 Terrain Consideration

The GAQM defines flat terrain as terrain equal to the elevation of the stack base, simple terrain as terrain lower than the height of the stack top, and complex terrain as terrain exceeding the height of the stack being modeled. As previously discussed in Section 4.1, AERMOD is capable of developing estimates of air quality impacts for the three types of terrain.

The elevation of the project site is approximately 10 feet above mean sea level (ft-msl). U.S. Geological Survey (USGS) National Elevation Dataset (NED) terrain data in geo-referenced tagged image file format (GeoTIFF) were examined for terrain features within the expected project impact area. Based on this examination, terrain in the vicinity of the project site is classified as ranging from flat to complex terrain.

In accordance with the GAQM recommendations for AERMOD, each modeled receptor will be assigned a terrain elevation based on USGS NED data and use of AERMAP, the AERMOD terrain preprocessor program. AERMAP will be used in accordance with the latest version of the AERMAP User's Guide (March 2011) (EPA, 2011) and EPA's GAQM.

5.0 Building Wake Effects

The Clean Air Act (CAA) Amendments of 1990 require the degree of emissions limitation required for control of any pollutant not be affected by a stack height that exceeds good engineering practice (GEP) or any other dispersion technique. On July 8, 1985, EPA promulgated final stack height regulations (40 CFR 51). The stack heights for the project emissions sources will comply with EPA stack height regulations.

While the GEP stack height rules address the maximum stack height that can be employed in a dispersion model analysis, stacks having heights lower than GEP stack height can potentially result in higher downwind concentrations due to building downwash effects. AERMOD evaluates the effects of building downwash based on the plume rise model enhancements (PRIME) building downwash algorithms. For the project's ambient impact analysis, the complex downwash analysis implemented by AERMOD will be performed using the current version of EPA's Building Profile Input Program (BPIP) for PRIME (BPIPPRM) (Version 04274 [September 30, 2004]). The EPA BPIPPRM program will be used to determine the area of influence for each building/structure, whether a particular stack is subject to building downwash, the area of influence for directionally dependent building downwash, and to generate the specific building dimension data required by the model. BPIPPRM output consists of an array of 36 direction-specific (10- to 360-degree) building heights (BUILDHGT keyword), lengths (BUILDLEN keyword), widths (BUILDWID keyword), and along-flow (XBADJ keyword) and across-flow (YBADJ keyword) distances for each stack suitable for use as input to AERMOD.

6.0 Receptor Grids

Receptors will be placed at locations considered to be *ambient air*, defined as “that portion of the atmosphere, external to buildings, to which the general public has access.” The nearest locations of general public access will be at the existing fence line and the water front boundary.

The following receptors will be used to assess the air quality impact of the proposed facility:

- Fence Line Receptors—Receptors placed along the existing fence line and water front boundary spaced 25 meters apart.
- Fine Grid Receptors—Receptors at 100-meter spacings starting at the fence line and extending to approximately 10,000 meters.

7.0 Meteorological Data

The EPA AERMET and AERSURFACE meteorological data preprocessing programs were used to generate the meteorological data required by AERMOD. The AERMET meteorological preprocessing program creates two files that are used by AERMOD (i.e., surface and profile files). The surface file contains boundary layer parameters including friction velocity, Monin-Obukhov length, convective velocity scale, temperature scale, convectively generated boundary layer height, stable boundary layer height, and surface heat flux. The profile file contains multilevel data of windspeed, wind direction, and temperature.

AERMET passes observed meteorological parameters to AERMOD, including wind direction and speed (at multiple heights, if available), temperature, and, if available, measured turbulence. AERMOD uses this information to calculate concentrations in a manner that accounts for a dispersion rate that is a continuous function of meteorology.

The AERMET meteorological processor requires the determination of three surface characteristics: surface roughness length (z_o), albedo (r), and Bowen ratio (B_o). Surface roughness length is related to the height of obstacles to the wind flow and is the height at which the mean horizontal wind speed is zero based on a logarithmic profile. Surface roughness length influences the surface shear stress and is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer. Albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio, an indicator of surface moisture, is the ratio of sensible heat flux to latent heat flux and, together with albedo and other meteorological observations, is used for determining planetary boundary layer parameters for convective conditions driven by the surface sensible heat flux. The EPA AERSURFACE program was developed to aid users in obtaining realistic and reproducible surface characteristic values, including albedo, Bowen ratio, and surface roughness length, for input to AERMET. The program uses publicly available national land

cover datasets and look-up tables of surface characteristics that vary by land cover type and season.

The meteorological data proposed for use in the air quality modeling consists of the most recent five years of NWS data from the from Baltimore/Washington International Thurgood Marshall Airport (BWI) surface meteorological station and the Sterling, Virginia, upper air station. The surface meteorological NWS site (Weather-Bureau-Army-Navy [WBAN] Station No. 93721) is located at the BWI approximately 32 km southeast of the project site. ECT would like to request that MDE provide the processed meteorological data files, if possible. If not, ECT will contract Lakes Environmental to provide the processed (AERMOD ready) meteorological data files.

8.0 Representative Background Ambient Concentrations

Background concentrations representative of the Project modeling domain were obtained from the most recent years of certified monitoring data (2014 through 2016) from the EPA Air Data website (https://www.epa.gov/outdoor-air-quality-data). Background concentrations of NO_2, SO_2, CO, and $PM_{2.5}$ are based on the Essex monitor data, whereas background concentrations of PM_{10} are based on the Glen Burnie monitor data and lead background concentrations are based on the Beltsville monitor data. The CO 1-hour and 8-hour background concentration is the highest concentration from the three years of monitor values. The NO_2 1-hour background concentration is the average of the three-year 98th percentile monitor value. The NO_2 annual background concentration is the highest concentration from the three years of monitor values. The SO_2 1-hour background concentration is the average of the three-year 99th percentile monitor value. The SO_2 3-hour background concentration is the highest concentration from the three years of monitor values. The PM_{10} 24-hour background concentration is the highest concentration from the three years of monitor values. The $PM_{2.5}$ 24-hour background concentration is the three-year average of the 98th percentile. The $PM_{2.5}$ annual background concentration value is the three-year average of the weighted arithmetic mean monitor value. For lead, since the only Maryland monitor was reporting 0.0 for the maximum 3-month average, the average of the fourth maximum monitor value is being conservatively used. A summary of the ambient background concentrations to be used in the NAAQS compliance assessment is provided in Table 8-1.

Table 8-1. Proposed Background Concentrations

Pollutant	Averaging Period	Proposed Background Concentration ($\mu g/m^3$)
NO_2	1 hour	90.24
	Annual	29.92
$PM_{2.5}$	24-hour	22.67
	Annual	9.47
PM_{10}	24-hour	35.00
CO	1 hour	5,257.14
	8-hour	1,888.89
SO_2	1-hour	49.65
	3-hour	114.92
Lead	Rolling 3-Month	0.004

Source: EPA Air Data Website (https://www.epa.gov/outdoor-air-quality-data)
ECT, 2018.

9.0 Model Results

9.1 Presentation of Model Results

The primary objective of the analysis is to demonstrate that the post-project emissions from the facility will demonstrate compliance with the NAAQS. Refined modeling results obtained from the AERMOD system will be summarized in tabular format. For the NAAQS analysis, the model results tables will indicate, for each pollutant, the year of meteorology, applicable averaging period, modeled impact, background concentration, and total analysis impact (modeled impact plus background concentration).

The ambient impact analysis report will include methods and data used in conducting the dispersion modeling study. Building downwash, dispersion model input and output, and meteorological data files will be provided (on digital media) with the analysis.

10.0 References/Bibliography

U.S. Environmental Protection Agency (EPA). 1985. Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations [Revised]). EPA 450/4 80 023R. Research Triangle Park, North Carolina.

———. 2016. User's Guide for the American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD). EPA-454/B-03-001. Research Triangle Park, North Carolina.

———. 2016. User's Guide for the AERMOD Meteorological Preprocessor (AERMET). EPA-454/B-03-002. Research Triangle Park, North Carolina.

———. 2015. Addendum User's Guide for AERMOD. EPA-454/B-03-001. Research Triangle Park, North Carolina.

———. 2011. Addendum User's Guide for AERMAP. EPA-454/B-03-003. Research Triangle Park, North Carolina.

———. 2015. Addendum User's Guide for AERMET. EPA-454/B-03-002. Research Triangle Park, North Carolina.

———. 2017. Guideline on Air Quality Models (GAQM) (Revised). (Appendix W, 40 CFR 51).

Appendix

Conceptual Site Layout

EQUIPMENT LEGEND

PLANT EQUIPMENT	
1	COMBUSTION TURBINE
2	COMBUSTION TURBINE GENERATOR
3	CTG INLET AIR HOUSING
4	STACK
5	HP WATER INJECTION SKID
6	AUXILIARY SKID
7	OIL WATER SEPARATOR
8	FUEL GAS COMPRESSOR
9	CTG FIN FAN COOLERS
10	LP WATER INJECTION SKID
11	WASTE OIL / WATER EQUIPMENT
12	FUEL OIL TRANSFER PUMPS
13	LIQUID FUEL BOOST, DUPLEX, HEATER SKIDS
14	SPRINT SKID
PLANT TANKS	
15	RAW / FIREWATER TANK
16	DEMIN WATER TANK
17	FUEL OIL TANK
ELECTRICAL EQUIPMENT	
18	GSU TRANSFORMER
19	UAT TRANSFORMER 13.8–480
20	GENERATOR BREAKER, 13.8KV SWITCHGEAR
21	CABLE BUS
22	480V SWITCHGEAR
23	UAT TRANSFORMER 13.8–4160
24	4160 SWITCHGEAR
25	480V SWITCHGEAR
TIE–INS	
26	FUEL GAS TIE–IN
27	WATER TIE–IN
PLANT BUILDINGS / LOCATIONS	
28	CTG ELECTRICAL (PDC)
29	FIRE PUMP HOUSE
30	LIQUID FUEL UNLOADING
31	CONTROL ROOM
32	UNDERGROUND GAS LINE

0' 10' 20' 30' 40' 50' 60'

SCALE: 1"=30'-0"

PRELIMINARY NOT FOR CONSTRUCTION

12/15/2017

NO.	DATE	BY	APP'D	DESCRIPTION

REVISIONS

DRAWN
CHECK
DESIGN
ENGINEER
PROJ MGR
QA MGR
SCALE
SIZE D

ProEnergy SERVICES

ProEnergy EPC Services, LLC

CONCEPTUAL LAYOUT IN SIMPLE CYCLE – 3 X GE LM6000

JOB. NO. | DWG NO. | SH NO. | REV

Maryland Department of the Environment

Comments on C.P. Crane, LLC

C.P. Crane Combustion Turbine Repowering Project

Air Quality Impact Analysis Modeling Protocol, dated February 2018

March 29, 2018

1. Emission Source Summary

Please provide a list of emission sources that will be included in the dispersion modeling. This list will be preliminary due to the uncertainties with regard to what emission sources might remain operational at the site.

2. Start-up and Shut-down Conditions

Since the CTs are allowed to have relatively frequent start-ups and shut-downs by design, please include descriptions of start-up and shut-down conditions for the CTs and how these emission scenarios will be accounted for in modeling.

3. Section 3.1 Models Proposed

In the modeling report include analysis to demonstrate rural is the proper land use classification.

4. Section 3.2 NO2 Ambient Impact Analysis – Intermittent Sources

Please also include a statement of what emission sources would be considered intermittent sources and would be excluded from 1-hour NO2 modeling.

5. Section 4.0 Terrain Consideration – NED Data Resolution

Please specify the resolution of the NED terrain data that will be used in association with AERMAP.

6. Section 8.0 Representative Background Ambient Concentrations

Include AQS # of any monitors being discussed in the modeling report.

May 4, 2018
ECT No.: 170604.0300

Ms. Susan Gray
Deputy Director, Power Plant Assessment Division
Department of Natural Resources
580 Taylor Avenue, B-3
Annapolis, Maryland 21401

Re: Response to MDE Comments on Air Dispersion Modeling Protocol
C.P. Crane Combustion Turbine Repowering Project
Baltimore County, MD

Dear Ms. Gray:

On behalf of C.P. Crane, please accept the following responses to your technical questions received March 29, 2018. For ease of understanding, your questions are repeated and followed by our response.

1. **Emission Source Summary:**
Please provide a list of emission sources that will be included in the dispersion modeling. This list will be preliminary due to the uncertainties with regard to what emission sources might remain operational at the site.

Response:
The following emission sources will be included in the dispersion modeling:

Proposed Project
- Three (3) proposed General Electric LM6000 combustion turbines
- One (1) proposed black start generator (See Project Design Update Below)

Existing, On-site Emission Sources
- One (1) existing combustion turbine
- One (1) existing emergency generator
- One (1) existing fire water pump

2. **Start-up and Shut-down Conditions:**
Since the CTs are allowed to have relatively frequent start-ups and shut-downs by design, please include descriptions of start-up and shut-down conditions for the CTs and how these emission scenarios will be accounted for in modeling.

7208 Falls of Neuse Road, Suite 102
Raleigh, NC 27615

(919) 861-8888

FAX
(919) 615-2102

Response:

Startup/shutdown modeling will be conducted for the short-term pollutants and averaging periods that have the potential for elevated emissions combined with lower plume rise during startup/ shutdown conditions. Since emissions are higher for startup operations than shutdown, the more conservative startup emissions will be modeled. Also, only NO_x and CO emissions will be modeled during startup, since emissions of SO_2, PM_{10} and $PM_{2.5}$ are higher during normal operation. Therefore, the pollutants and averaging periods that will be evaluated include 1-hour NO_2, 1-hour CO and 8-hour CO.

For purposes of modeling ambient impacts from startups, short-term emissions rates developed for startup operations for the proposed CTs take into account the time from ignition to compliance. The startup of the CTs has a duration of approximately 10 minutes. The emissions are calculated per startup event. Therefore, to conservatively quantify short-term average emissions rates for startup events, it has been assumed the CTs are at 100-percent load for the balance of the averaging period when it is not in startup mode. The startup event and the balance of the averaging period at 100-percent will be modeled as separate stacks which will be source grouped together to get the overall concentration. The table below summarizes the maximum short-term average emissions rates developed in this manner.

An example calculation for the 1-hour NO_2 100-percent load emission rate for the balance of the averaging period when it is not in startup mode is provided below.

NO_x Emission Rate at 100-percent load: 35.45 lb/hr
Remaining time in averaging period (after startup): 50 minutes

*35.45 lb/hr * 50/60 = 29.54 lb/hr*

Annual emissions resulting from startup/shutdown operations for the proposed CTs are based on 250 startups per year, of which 25 startups could be on ULSD.

Scenario	Units	Startup			100% Load	
			Per Hour		Per Hour	
		One Unit (per event)	1-hour Average	8-hour Average	1-hour Average	8-hour Average
Natural Gas						
Time from ignition until compliance	minutes	10				
Estimated exit velocity	fps		88.15	88.15	100.78	100.78
Estimated stack temperature	ºF		717.00	717.00	837.00	837.00
NOx	lb		3.60	N/A	29.54	N/A
CO	lb		3.20	0.80	21.58	24.81
Fuel Oil						
Time from ignition until compliance	minutes	10				
Estimated exit velocity	fps		86.88	86.88	102.04	102.04
Estimated stack temperature	ºF		722.00	722.00	833.00	833.00
NO_x	lb		12.80	N/A	49.16	N/A
CO	lb		11.60	2.90	25.65	29.50

3. **Section 3.1 Models Proposed:**
   In the modeling report include analysis to demonstrate rural is the proper land use classification.

<u>Response:</u>
This information will be provided in the modeling report.

4. Section 3.2 NO_2 Ambient Impact Analysis – Intermittent Sources:
Please also include a statement of what emission sources would be considered intermittent sources and would be excluded from 1-hour NO_2 modeling.

Response

Due to their limited (non-emergency) operations, and their random schedule that cannot be controlled, the emergency generator and fire water pump are considered intermittent sources with regards to the 1-hour NO_2 modeling. Similarly, the existing combustion turbine has demonstrated historical limited usage and its expected future operation is random and not predictive. As a result, these sources will be excluded from the 1-hour NO_2 modeling analysis.

5. Section 4.0 Terrain Consideration – NED Data Resolution:
Please specify the resolution of the NED terrain data that will be used in association with AERMAP.

Response:

This information will be provided in the modeling report.

6. Section 8.0 Representative Background Ambient Concentrations:
Include AQS # of any monitors being discussed in the modeling report.

Response:

This information will be provided in the modeling report.

Project Design Update:

The project design has been updated to include a black start generator. The black start generator will not be used to produce electricity for the grid and will only be used to start the proposed combustion turbines when there is no electricity on the grid. Since its operation will be random and not predictive the black start generator will be considered an intermittent source with regards to the 1-hour NO_2 modeling and excluded from the 1-hour NO_2 modeling analysis.

Upon completion of your review of the responses provided, please do not hesitate to contact us at (919) 861-8888 if you have any additional questions or comments.

Sincerely,

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.

Joshua Ralph
Staff Engineer III
jralph@ectinc.com

Thomas Pritcher
National Air Quality Service Line Director
tpritcher@ectinc.com

Appendix D

Dispersion Modeling Files

(Provided in electronic format)

Appendix E

Acid Rain Permit Application

United States
Environmental Protection Agency
Acid Rain Program

OMB No. 2060-0258
Approval expires 11/30/2018

Acid Rain Permit Application

For more information, see instructions and 40 CFR 72.30 and 72.31.

This submission is: X new revised for ARP permit renewal

STEP 1

Identify the facility name, State, and plant (ORIS) code.

Facility (Source) Name:	State:	Plant Code:
C.P. Crane, LLC	MD	1552

STEP 2

Enter the unit ID# for every affected unit at the affected source in column "a."

a	b
Unit ID#	Unit Will Hold Allowances in Accordance with 40 CFR 72.9(c)(1)
CPC - Unit 3	Yes
CPC - Unit 4	Yes
CPC - Unit 5	Yes

STEP 3

Read the standard requirements.

Permit Requirements

(1) The designated representative of each affected source and each affected unit at the source shall:
   (i) Submit a complete Acid Rain permit application (including a compliance plan) under 40 CFR part 72 in accordance with the deadlines specified in 40 CFR 72.30; and
   (ii) Submit in a timely manner any supplemental information that the permitting authority determines is necessary in order to review an Acid Rain permit application and issue or deny an Acid Rain permit;
(2) The owners and operators of each affected source and each affected unit at the source shall:
   (i) Operate the unit in compliance with a complete Acid Rain permit application or a superseding Acid Rain permit issued by the permitting authority; and
   (ii) Have an Acid Rain Permit.

Monitoring Requirements

(1) The owners and operators and, to the extent applicable, designated representative of each affected source and each affected unit at the source shall comply with the monitoring requirements as provided in 40 CFR part 75.
(2) The emissions measurements recorded and reported in accordance with 40 CFR part 75 shall be used to determine compliance by the source or unit, as appropriate, with the Acid Rain emissions limitations and emissions reduction requirements for sulfur dioxide and nitrogen oxides under the Acid Rain Program.
(3) The requirements of 40 CFR part 75 shall not affect the responsibility of the owners and operators to monitor emissions of other pollutants or other emissions characteristics at the unit under other applicable requirements of the Act and other provisions of the operating permit for the source.

Sulfur Dioxide Requirements

(1) The owners and operators of each source and each affected unit at the source shall:
   (i) Hold allowances, as of the allowance transfer deadline, in the source's compliance account (after deductions under 40 CFR 73.34(c)), not less than the total annual emissions of sulfur dioxide for the previous calendar year from the affected units at the source; and
   (ii) Comply with the applicable Acid Rain emissions limitations for sulfur dioxide.
(2) Each ton of sulfur dioxide emitted in excess of the Acid Rain emissions limitations for sulfur dioxide shall constitute a separate violation of the Act.
(3) An affected unit shall be subject to the requirements under paragraph (1) of the sulfur dioxide requirements as follows:
   (i) Starting January 1, 2000, an affected unit under 40 CFR 72.6(a)(2); or
   (ii) Starting on the later of January 1, 2000 or the deadline for monitor certification under 40 CFR part 75, an affected unit under 40 CFR 72.6(a)(3).
(4) Allowances shall be held in, deducted from, or transferred among Allowance Tracking System accounts in accordance with the Acid Rain Program.
(5) An allowance shall not be deducted in order to comply with the requirements under paragraph (1) of the sulfur dioxide requirements prior to the calendar year for which the allowance was allocated.
(6) An allowance allocated by the Administrator under the Acid Rain Program is a limited authorization to emit sulfur dioxide in accordance with the Acid Rain Program. No provision of the Acid Rain Program, the Acid Rain permit application, the Acid Rain permit, or an exemption under 40 CFR 72.7 or 72.8 and no provision of law shall be construed to limit the authority of the United States to terminate or limit such authorization.
(7) An allowance allocated by the Administrator under the Acid Rain Program does not constitute a property right.

Nitrogen Oxides Requirements

The owners and operators of the source and each affected unit at the source shall comply with the applicable Acid Rain emissions limitation for nitrogen oxides.

STEP 3, Cont'd.

Excess Emissions Requirements

(1) The designated representative of an affected source that has excess emissions in any calendar year shall submit a proposed offset plan, as required under 40 CFR part 77.
(2) The owners and operators of an affected source that has excess emissions in any calendar year shall:
   (i) Pay without demand the penalty required, and pay upon demand the interest on that penalty, as required by 40 CFR part 77; and
   (ii) Comply with the terms of an approved offset plan, as required by 40 CFR part 77.

Recordkeeping and Reporting Requirements

(1) Unless otherwise provided, the owners and operators of the source and each affected unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Administrator or permitting authority:
   (i) The certificate of representation for the designated representative for the source and each affected unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation, in accordance with 40 CFR 72.24; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission of a new certificate of representation changing the designated representative;
   (ii) All emissions monitoring information, in accordance with 40 CFR part 75, provided that to the extent that 40 CFR part 75 provides for a 3-year period for recordkeeping, the 3-year period shall apply.
   (iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the Acid Rain Program; and,
   (iv) Copies of all documents used to complete an Acid Rain permit application and any other submission under the Acid Rain Program or to demonstrate compliance with the requirements of the Acid Rain Program.
(2) The designated representative of an affected source and each affected unit at the source shall submit the reports and compliance certifications required under the Acid Rain Program, including those under 40 CFR part 72 subpart I and 40 CFR part 75.

Liability

(1) Any person who knowingly violates any requirement or prohibition of the Acid Rain Program, a complete Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7 or 72.8, including any requirement for the payment of any penalty owed to the United States, shall be subject to enforcement pursuant to section 113(c) of the Act.
(2) Any person who knowingly makes a false, material statement in any record, submission, or report under the Acid Rain Program shall be subject to criminal enforcement pursuant to section 113(c) of the Act and 18 U.S.C. 1001.
(3) No permit revision shall excuse any violation of the requirements of the Acid Rain Program that occurs prior to the date that the revision takes effect.
(4) Each affected source and each affected unit shall meet the requirements of the Acid Rain Program.
(5) Any provision of the Acid Rain Program that applies to an affected source (including a provision applicable to the designated representative of an affected source) shall also apply to the owners and operators of such source and of the affected units at the source.
(6) Any provision of the Acid Rain Program that applies to an affected unit (including a provision applicable to the designated representative of an affected unit) shall also apply to the owners and operators of such unit.
(7) Each violation of a provision of 40 CFR parts 72, 73, 74, 75, 76, 77, and 78 by an affected source or affected unit, or by an owner or operator or designated representative of such source or unit, shall be a separate violation of the Act.

C.P. Crane, LLC

STEP 3, Cont'd.

Effect on Other Authorities

No provision of the Acid Rain Program, an Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7 or 72.8 shall be construed as:

(1) Except as expressly provided in title IV of the Act, exempting or excluding the owners and operators and, to the extent applicable, the designated representative of an affected source or affected unit from compliance with any other provision of the Act, including the provisions of title I of the Act relating to applicable National Ambient Air Quality Standards or State Implementation Plans;

(2) Limiting the number of allowances a source can hold; provided, that the number of allowances held by the source shall not affect the source's obligation to comply with any other provisions of the Act;

(3) Requiring a change of any kind in any State law regulating electric utility rates and charges, affecting any State law regarding such State regulation, or limiting such State regulation, including any prudence review requirements under such State law;

(4) Modifying the Federal Power Act or affecting the authority of the Federal Energy Regulatory Commission under the Federal Power Act; or,

(5) Interfering with or impairing any program for competitive bidding for power supply in a State in which such program is established.

STEP 4

Read the certification statement, sign, and date.

Certification

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Name Mark Kubow	
Signature	Date May 24, 2018