FERC Pre-Filing Review
Draft Resource Report 9 – Air and Noise Quality
AES Sparrows Point LNG Terminal & Mid-Atlantic Express Pipeline

Submitted November 2006

SUMMARY OF REQUIRED FERC REPORT INFORMATION		
TOPIC	**FERC Reference**	**Report Reference or Not Applicable**
1. Describe existing air quality in the vicinity of the project • Identify criteria pollutants that may be emitted above EPA-identified significance levels.	§ 380.12(k)(1)	Section 9.3.1
2. Quantify the existing noise levels (day-night sound level (L_{DB}) and other applicable noise parameters) at noise sensitive areas and at other areas covered by relevant state and local noise ordinances. • If new LNG terminal sites are proposed, measure or estimate the existing ambient sound environment based on current land uses and activities. • For existing LNG terminals (operated at full load), include the results of a sound level survey at the site property line and nearby noise-sensitive areas. • Include a plot plan that identifies the locations and durations of noise measurements • All surveys must identify the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement.	§ 380.12(k)(2)	Section 9.4.3 Existing noise levels at the LNG terminal and noise sensitive areas will be quantified per the requirements in the formal filing in January 2007, including a plot plan and survey condition notes.
3. Quantify existing and proposed emissions of compressor equipment, plus construction emissions, including nitrogen oxides (NO_x) and carbon monoxide (CO), and the basis for these calculations. Summarize anticipated air quality impacts for the project. • Provide the emission rate of NO_x from existing and proposed facilities, expressed in pounds per hour and tons per year from maximum operating conditions, include supporting calculations, emissions factors, fuel consumption rate, and annual hours of operation.	§ 380.12(k)(3)	Section 9.3.2 Table 9.3-7 And Appendix 9A
4. Describe the existing compressor units at each station where new, additional, or modified compressor units are proposed, including the manufacturer, model number, and horsepower of the compressor units. For proposed new, additional or modified compressor units include the horsepower, type and energy source.	§ 380.12(k)(4)	N/A
5. Identify any nearby noise-sensitive area by distance and direction from the proposed compressor unit building/enclosure.	§ 380.12(k)(4)	Section 9.4.3
6. Identify any applicable state or local noise regulations. • Specify how the facility will meet the regulations	§ 380.12(k)(4)	Section 9.4.2
7. Calculate the noise impact at noise-sensitive areas of the proposed compressor unit modifications or additions, specifying how the impact was calculated, including manufacturer's data and proposed noise control equipment.	§ 380.12(k)(4)	Section 9.4.4

Additional Information

Provide copies of application for state air permits and agency determinations, as appropriate	To be Appended as available, in the formal filing in January 2007.
For Major Stationary Sources of air emissions (as defined by EPA), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations.	To be Appended, as available, in the formal filing in January 2007.
Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emissions control systems, installation of filters, mufflers, or insulation of piping and building, and orientation of equipment away from noise-sensitive areas.	To be provided as they become available during the detailed design by the 2nd Quarter of 2008.

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9. AIR AND NOISE QUALITY

9.1 Introduction

AES Sparrows Point LNG, LLC (Sparrows Point LNG) proposes to construct, own, and operate a new liquefied natural gas (LNG) import, storage, and regasification terminal (LNG Terminal) at the Sparrows Point Industrial Complex situated on the Sparrows Point peninsula east of the Port of Baltimore in Maryland. LNG will be delivered to the LNG Terminal via ship, offloaded from the ship to shoreside storage tanks, regasified on the LNG Terminal site (Terminal Site), and transported to consumers via pipeline. The LNG Terminal will have a regasification capacity of 1.5 billion standard cubic feet of natural gas per day (bscfd), with potential to expand to 2.25 bscfd. Regasified natural gas will be delivered to markets in the Mid-Atlantic Region and northern portions of the South Atlantic Region through an approximately 87-mile, 30-inch outside diameter natural gas pipeline (Pipeline) to be constructed and operated by Mid-Atlantic Express, LLC (Mid Atlantic Express). The Pipeline will extend from the LNG Terminal to interconnections with existing natural gas pipeline systems near Eagle, Pennsylvania. Together the LNG Terminal and Pipeline projects are referred to as the Sparrows Point Project or Project. Both AES Sparrows Point LNG and Mid-Atlantic Express (hereinafter collectively referred to as AES) are subsidiaries of The AES Corporation.

The Project footprint is located in the counties of Baltimore, Harford, and Cecil in Maryland and the counties of Lancaster and Chester in Pennsylvania. The Terminal Site, which is located entirely within Baltimore County, is a parcel located within a former shipyard. The route proposed for the Pipeline (Pipeline Route), which crosses all of the listed counties, includes industrial, commercial, agricultural, and residential lands. Together, the Terminal Site and the Pipeline Route comprise the Project Area.

As described in Section 1.10 of the Second Preliminary Draft Resource Report 1, *General Project Description*, the AES Corporation is considering the possibility of building a combined cycle cogeneration power plant (Power Plant) on the Terminal Site. The Power Plant would be configured with one F-Class combustion gas turbine, one steam turbine, and associated auxiliaries. It would operate only on natural gas and would produce approximately 300 megawatts (MW) of clean electric power within an area of high energy demand. The Power Plant would be connected to the local utility electric system via an overhead transmission line. For purposes of this Resource Report, the Power Plant will be considered a non-jurisdictional facility that is related to the Project.

9.2 Objective and Applicability

This Resource Report discusses the existing air and noise quality within the vicinity of both the LNG Terminal and the Pipeline, the potential impacts to air and noise quality associated with construction and operation of the Project, and the proposed measures to avoid or minimize those impacts. For the purpose of this Resource Report, Project area also refers to all temporary and permanent construction work spaces, including the construction rights-of-way, storage yards, staging areas, dredging areas, and any additional work spaces that are required to construct the Project.

With respect to the General Conformity Rule (Title I, Section 176(c) of the Clean Air Act (CAA), codified in 40 CFR Part 51, Subpart W and 40 CFR Part 93, Subpart B), the portions

of the Project considered Federal Actions are the Pipeline (subject to Federal Energy Regulatory Commission (FERC) Section 7 Certificate of Public Convenience and Necessity), the LNG Terminal (subject to a FERC Section 3 authorization), and dredging activities associated with the LNG Terminal (subject to a U.S. Army Corps of Engineers (COE) permits pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act). However, as further discussed in Section 9.3.3, the portions of the LNG Terminal and the Power Plant that will be subject to New Source Review permitting under the CAA (i.e., the auxiliary boilers, emergency engines, combustion turbines, and vent heater) are not subject to the General Conformity Review process. Therefore, only direct and indirect emissions from construction and operation of the Pipeline and vessel activity emissions during operation of the LNG Terminal are subject to General Conformity Review.

9.3 Air Quality

9.3.1 Existing Air Quality

9.3.1.1 Climate/Meteorology

The Chesapeake Bay, Delaware Bay and the Atlantic Ocean farther to the east generally give mild winters and summers to the portion of the Project area encompassing the LNG Terminal and much of the Pipeline. Although some of the Pipeline is located further inland and would be less moderated by the effects of the Chesapeake and Delaware Bays, climatologically statistics for Baltimore are considered generally representative of the climate of the Project Area.

According to the National Oceanic and Atmospheric Administration (NOAA), typical January daily temperatures range from a minimum of 23.4 degrees Fahrenheit (°F) to a maximum of 40.2°F. July temperatures typically range from a minimum of 66.8°F to a maximum of 87.2°F. The record minimum and maximum temperatures are -7°F and 105°F, respectively. Typical morning relative humidity ranges from a low of about 70 percent in the winter to a high of about 85 percent in the early fall. Afternoon relative humidity is generally about 55 percent. The annual average precipitation is about 41 inches and is evenly distributed throughout the year. About one-third of the days have precipitation totaling 0.01 inches or more. Winter precipitation is generally associated with sub-mesoscale weather systems. The average snowfall is about 20 inches per year. Summer precipitation tends to be associated with thunderstorms. During the summer, the region is generally under the influence of the Bermuda high-pressure system. High-pressure systems are typically associated with low winds and increased potential for air quality problems.

The prevailing wind direction is generally from the west northwest in the Baltimore area. A southwest component becomes evident in winds during the warmer months while a northwest component is characteristic of the colder months. Figure 9.3-1 is a wind rose plot that represents wind direction and wind speed data compiled by the Baltimore-Washington International Airport for 1992, the most recent year for which a dataset is readily available (U.S. Environmental Protection Agency (EPA) SCRAM Surface Archived Data (TD-1440)).

9.3.1.2 Ambient Air Quality Standards

EPA has established primary and secondary national ambient air quality standards for certain air pollutant emissions, including carbon monoxide (CO), lead, nitrogen dioxide (NO_2), ozone, particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$) and sulfur dioxide (SO_2), which are referred to under the CAA as "criteria pollutants." National Ambient Air Quality Standards (NAAQS) have been established for each of the criteria pollutants. Standards are designated as primary or secondary. Primary standards are set at levels designed to protect public health. Secondary standards are set to protect welfare values such as vegetation, visibility and property values. States are free to adopt standards more stringent than the NAAQS. Maryland and Pennsylvania have adopted all of the NAAQS. Table 9.3-1 summarizes the NAAQS as well as the corresponding Maryland and Pennsylvania Ambient Air Quality Standards.

9.3.1.3 Ambient Air Quality Attainment Status

The LNG Terminal is proposed to be located in Baltimore County, Maryland. The Pipeline Route is proposed to be located within portions of the Maryland counties of Baltimore, Harford and Cecil and the Pennsylvania counties of Lancaster and Chester. Baltimore County and Harford County are contained in the Metropolitan Baltimore Intrastate Air Quality Control Region (AQCR 115). Cecil County is contained in the Eastern Shore Intrastate AQCR (114). Lancaster County and Chester County are located in two different AQCRs, the South Central Pennsylvania Intrastate AQCR (196) and the Metropolitan Philadelphia Interstate AQCR (045), respectively. The EPA has designated all four of these AQCRs as being either in attainment with the NAAQS or unclassifiable/attainment for certain criteria air pollutants, including SO_2, CO, and NO_2. With respect to the one-hour ozone (O_3) standard, the Metropolitan Baltimore, Eastern Shore AQCR and the Metropolitan Philadelphia AQCR are classified as severe-15 non-attainment, whereas the South Central Pennsylvania AQCR is classified as marginal non-attainment. With respect to the new 8-hour ozone standard, both of the Maryland AQCRs and the Metropolitan Philadelphia AQCR are classified as moderate non-attainment. The South Central Pennsylvania AQCR is classified as marginal non-attainment for the new 8-hour ozone standard. All four Project area AQCRs have either not been classified or are unclassifiable/attainment for particulate matter less than 10 micrometers (PM_{10}) and lead (Pb). For $PM_{2.5}$, all of the Project Area AQCRs have been classified as non-attainment, with the exception of the Eastern Shore AQCR, which is unclassifiable/attainment. For Total Suspended Particulate (TSP), portions of the Metropolitan Baltimore AQCR that potentially include part of the Pipeline route have been classified as nonattainment. Although portions of both Project-affected AQCRs in Pennsylvania have been classified as not meeting secondary standards or cannot be classified, the Pipeline will not pass through those portions of the PA AQCRs. The Eastern Shore AQCR in Maryland has been classified as better than national standards with respect to TSP. Although TSP attainment designations are listed in 40 CFR 81, there no longer are TSP NAAQS and TSP-directed State Implementation Plan (SIP) programs. EPA revised the primary and secondary NAAQS for particulate matter on July 1, 1987 by eliminating TSP as the indicator for the NAAQS and replacing it

with the PM_{10} indicator. Table 9.3-2 summarizes the attainment status for each of the AQCRs included in the Project Area.

Because each of the Project Area AQCRs is classified as non-attainment with respect to the old one-hour ozone standard, they are categorized as "subpart 1" non-attainment with respect to the new 8-hour ozone standard. As such, each of the AQCRs is subject to specific requirements that must be incorporated into State Implementation Plans (SIP) for attaining the national ozone air quality standards. In addition, Maryland and Pennsylvania are considered part of the Ozone Transport Region (OTR). The OTR encompasses eleven northeast states and the District of Columbia, all of which have at least some areas not meeting the NAAQS for ozone. Because ozone attainment is a region-wide problem involving interstate transport of ozone precursors, projects locating in all areas within the OTR must meet more stringent non-attainment new source review requirements. The applicable emissions thresholds triggering major new source review in the Metropolitan Baltimore Intrastate AQCR are 25 tons per year (TPY) for either volatile organic compounds (VOC) or nitrogen oxides (NO_x). New stationary sources with the potential to emit VOC or NO_x above these thresholds would be classified as Major Stationary Sources subject to more stringent Non-attainment New Source Review (NNSR) requirements.

9.3.1.4 Existing Ambient Air Quality Monitoring Data

Maryland Department of the Environment (MDE) and Pennsylvania Department of Environmental Protection (PDEP) monitor ambient concentrations of certain criteria pollutants at a number of monitoring stations located in the Project Area AQCRs. The monitored data, which are available from EPA's AirData website (http://www.epa.gov/air/data/reports.html), were evaluated to determine representative air quality levels for the Project Area. Monitoring stations with closest proximity to the Project Area are located in Baltimore County, Harford County, and Cecil County in Maryland and in Lancaster, Chester, Delaware and Montgomery Counties in Pennsylvania. Table 9.3-3 summarizes the most recent three-year averages of the data available from monitoring stations with the most representative locations within the Project Area. The assumptions used in developing the most representative three-year average concentrations are also detailed in Table 9.3-3. The monitoring data demonstrates that all monitored pollutants are meeting the NAAQS, with the exception of one-hour and 8-hour average ozone concentrations in all four Project Area AQCRs and annual average PM-2.5 concentrations in Baltimore County in Maryland and Chester and Lancaster Counties in Pennsylvania.

9.3.2 Estimated Emissions from the Project

Air pollutant emissions will result from construction of the proposed Pipeline facilities, and from construction and operation of the proposed LNG Terminal and nonjurisdictional facilities related to the LNG Terminal (Power Plant). Emissions due to construction activities associated with the Pipeline and LNG Terminal would result in temporary increases in fugitive dust (PM_{10} and $PM_{2.5}$) from disturbed soils as well as criteria pollutants (CO, NO_x, SO_2, PM_{10}, $PM_{2.5}$ and VOCs) and some hazardous air pollutants (HAPs) from diesel and gasoline powered construction equipment.

Because EPA estimates that $PM_{2.5}$ composes 97 percent of particulate matter from diesel and gasoline powered construction equipment and mobile sources, $PM_{2.5}$, PM_{10} and TSP are assumed to be equivalent for regulatory applicability determination purposes. The same conservative assumption was used to estimate $PM_{2.5}$ emissions from combustion sources proposed for the operational phase of the LNG Terminal and Power Plant, based on similar EPA estimates ($PM_{2.5}$ typically composes greater than 90 percent of combustion source PM_{10} and TSP emissions). In addition, ammonia emissions have been estimated for construction and operational phase equipment based on available emission factors as a $PM_{2.5}$ precursor, in order to address the potential that future SIP revisions to establish control measures in $PM_{2.5}$ nonattainment areas may require use of precursor ammonia emissions for New Source Review and General Conformity determinations.

Additional construction emissions, which are addressed separately in this section, would result from dredging activities needed to expand the LNG ship approach channel and turning basin to support proposed marine terminal operations and from construction of the nonjurisdictional Power Plant that AES is considering both to provide heat to the LNG vaporizers and generate electricity for the local utility electric system. Fugitive dust and other emissions from construction activities generally do not pose a significant increase in regional pollutant levels; however, the effects will be addressed in the General Conformity Analysis, if applicable (see Section 9.3.3.10), to ensure compliance with the respective SIPs in Maryland, Pennsylvania, and Virginia.

There will be no significant emissions resulting from the operation of the proposed Pipeline because no compression will be installed. Emissions from operation of the LNG Terminal would primarily involve criteria pollutants and HAPs from operation of the High Temperature Fluid (HTF) heating system used to provide heat to the LNG vaporizers and LNG ship auxiliary power systems used during offloading of LNG to the Terminal. Emissions will also result from operation of emergency diesel engine powered fire water pumps, a diesel engine powered standby electricity generator and other minor auxiliary combustion equipment. Maintenance dredging activities would result in infrequent emissions, typically over approximately one month at a frequency of every three years during the operational phase of the Project. Additional operational emissions would also result from the nonjurisdictional Power Plant, which would involve operation of an approximate 300 MW combined cycle cogeneration power plant at the Terminal Site. Descriptions of construction activities and operational phase stationary sources associated with each Project component are provided below along with summaries of estimated emissions. Mobile source emissions associated with marine vessels used during the LNG Terminal operation, including LNG ship movements and hoteling, tug boats and U.S. Coast Guard (USCG) escort boats are also estimated and discussed under LNG Terminal operations. Assumptions and detailed emissions calculations are provided in Appendix 9A.

Emissions from construction and operation of the LNG Terminal, dredging activities and Power Plant will occur entirely in Maryland. Emissions from construction of the Pipeline will occur both in Maryland and Pennsylvania. The distribution between Pipeline construction emissions in Maryland and Pennsylvania is discussed in Section 9.3.2.1. The potential for emissions from operation of the LNG Terminal and Power

Plant to result in ambient air quality impacts in Pennsylvania and other states is evaluated in Section 9.3.5.

9.3.2.1 Pipeline

A. Construction Emissions

The use of equipment to construct the Pipeline will result in temporary, short-term emissions of certain air pollutants. These emissions will be restricted to the construction period for the Pipeline and will terminate once construction has been completed. Fugitive dust emissions also may occur during construction, post-construction mitigation and maintenance activities. These emissions will not result in significant adverse impacts to the air quality within the vicinity of the Project Area, and AES will not be required to obtain any federal, state, or local authorizations for the temporary, short-term air pollutant emissions that will be associated with construction of the Project. Fugitive dust control measures, if required, will be implemented and are discussed in Section 9.3.6.

During construction of the Pipeline, the use of internal combustion engines in trucks, dozers, trenchers, cranes, generators, compressors, drilling rigs, pumps, other miscellaneous heavy construction equipment, and worker commuting vehicles will result in emissions of NO_X, SO_2, CO, PM_{10}, $PM_{2.5}$, VOC and HAPs. These emissions will not be concentrated within any particular location of the Project Area. The duration of the main construction period for the Pipeline will be about ten to twelve months; therefore the period during which air pollutant emissions will occur in any particular location of the Project Area will be substantially less than the total construction period. For example, AES anticipates that Pipeline construction will progress at a rate of approximately six to eight weeks per mile (from clearing through final restoration). From a receptor basis, exposure to emissions from Pipeline construction activities would occur at any one location for only the limited period when construction is active in the vicinity of the receptor.

Fugitive dust emissions from activities such as grading, trenching, backfilling, and vehicle traffic, will occur during construction periods. Prior to re-vegetation of disturbed soil areas within the Project Area, wind erosion of displaced soil may also generate fugitive dust emissions. AES will use the mitigation measures identified in Section 9.3.6 of this Resource Report to minimize the fugitive dust emissions associated with construction of the Pipeline. These measures may include the application of water or dust suppressants, covering of haul trucks, use of paved roads to the extent possible, limiting vehicle speed and stabilizing disturbed areas.

AES has estimated the actual emissions of criteria air pollutants that will be associated with construction of the Pipeline based on the assumptions and detailed calculations provided in Appendix 9A of this Resource Report. AES's assumptions concerning the types, numbers and operating schedules for the various construction equipment and activities are based on information provided by construction contractors being considered for the Pipeline. Construction equipment will typically include various combinations of cranes,

backhoes, dozers, trenching machines, graders, etc. Horizontal drilling rigs will also be used for pipeline installation at river and stream crossings. Emissions were estimated based on the typical maximum number of major equipment types that may be in operation at any one time. For the purpose of this analysis, all equipment was assumed to be powered by diesel compression ignition (CI) engines, as is typical for this type of equipment. Use of low-sulfur diesel oil with a sulfur content of 0.05 weight percent (500 ppm) was assumed, due to the fact that construction would begin after the effective date (June 2007) for EPA's nonroad engine diesel fuel sulfur standards applicable to all land-based nonroad, locomotive and marine engine diesel fuel. Emission factors (grams of pollutant per brake horsepower-hour) were derived using EPA procedures in "Exhaust Emission Factors for Nonroad Engine Modeling–Compression Ignition" (15 June 1998 and revised April 2004), which also is the basis for EPA's "NONROAD Emissions Inventory Model" (draft 8 June 2000). Emission factors were multiplied by typical in-use adjustment factors, also based on EPA's non-road model, and by the estimated horsepower ("HP") for each type of equipment that will be used to construct the Pipeline.

AES has calculated conservatively high estimates of the actual emissions that will be associated with construction of the Pipeline. The emissions estimates were calculated using emissions factors that are based on 1988-1996 model year engines. Engines for those years are anticipated to have higher actual emissions than current model year engines because the older engines are not subject to Tier 1, 2 or 3 emissions standards.[1]

Indirect emissions were also estimated from motor vehicles associated with workers commuting to and from the construction locations of the Pipeline. Some commuting will also occur from inspection and maintenance crews traveling to and from the Project Area during the Project's operational phase, but will be significantly less than during the construction phase. Emissions were conservatively estimated based on the assumptions and calculations presented in Appendix 9A. A total of 80 workers conservatively were assumed to commute to the Pipeline construction sites (two pipeline construction spreads) each day for a total of 180 days. Emission factors were obtained from EPA AP-42, Appendix J (1998) for light duty gasoline vehicles and trucks.

Table 9.3-4 summarizes the estimated emissions from construction equipment including indirect emissions from material hauling trucks and commuting construction workers. Emissions are summarized in total tons during each year of the construction period by AQCR in the Maryland and Pennsylvania portions of the Pipeline, by state, and for the entire Pipeline construction project. As is typical of emissions from diesel engines, actual emissions rates for pollutants SO_2, PM_{10}, $PM_{2.5}$ and VOC are significantly lower than NO_2 and CO emissions.

[1] The first Federal standards (Tier 1) for off-road diesel engines were adopted in 1994 for engines over 50 hp to be phased in from 1996 to 2000. Tier 2/Tier 3 standards were adopted in 1998 with phase-in of increasingly more stringent standards between 2000 and 2008.

Based on this analysis, direct emissions from construction equipment, indirect emissions from commuting construction workers and fugitive dust emissions are not expected to significantly affect ambient air quality in the Project Area. These emissions and impacts will be restricted to the construction period, approximately 12-months, for the Pipeline, and will terminate once construction has been completed. In addition, the emissions will not be concentrated for any extended period within any particular location along the Pipeline Route.

B. Operational Emissions

The operation of the Pipeline also will not result in any adverse impacts to local ambient air quality, and AES will not be required to obtain any federal, state, or local air quality authorizations for the operation of the Pipeline. As previously stated, the Pipeline will not involve the construction of new or modification of existing stationary sources of air pollutant emissions in Maryland or Pennsylvania, such as a compressor station. Limited fugitive dust emissions may occur during periodic inspection or maintenance of the pipeline, particularly where maintenance vehicles will travel on unpaved access roads. However, these fugitive dust emissions will be minimal and will not have an adverse impact on the local ambient air quality.

9.3.2.2 LNG Terminal

A. Construction Emissions

The use of equipment to construct the LNG Terminal will result in temporary, short-term emissions of air pollutants that will be restricted to the construction period for the LNG Terminal and will terminate once construction has been completed. These emissions will not result in significant adverse impacts to the air quality within the vicinity of the Project Area and AES will not be required to obtain any federal, state, or local authorizations for the temporary, short-term air pollutant emissions that will be associated with construction of the LNG Terminal. Fugitive dust control measures, if required to be implemented are discussed in Section 9.3.6.

LNG Terminal construction activities can generally be categorized into demolition, site preparation, terminal process construction, LNG tank construction, and marine pier rehabilitation activities. Dredging and reclamation activities associated with expansion of the LNG ship approach channel and turning basin are also associated with LNG Terminal construction, but are described separately in Section 9.3.2.3. During construction activities associated with the LNG Terminal, the use of internal combustion engines in various cranes, backhoes, dozers, loaders, pavers, trucks, welders, generators, air compressors, pumps, pile drivers, other miscellaneous heavy construction equipment, and worker commuting vehicles will result in emissions of NO_X, SO_2, CO, PM_{10}, $PM_{2.5}$, VOC and HAPs. The duration of the main construction period for the LNG Terminal will be about 32 to 36 months.

Fugitive dust emissions from activities such as demolition, site preparation, grading and vehicle traffic, will occur during construction periods. Prior to

paving or re-vegetation of disturbed soil areas within the Project Area, wind erosion of displaced soil may also generate fugitive dust emissions. AES will use the mitigation measures identified in Section 9.3.6 of this Resource Report to minimize the fugitive dust emissions associated with construction of the LNG Terminal. These measures may include the application of water or dust suppressants, covering of haul trucks, use of paved roads to the extent possible, limiting vehicle speed and stabilizing disturbed areas.

AES has estimated the actual emissions of criteria air pollutants and HAPs that will be associated with construction of the LNG Terminal based on the assumptions and detailed calculations provided in Appendix 9A of this Resource Report and as summarized in Section 9.3.2.1. AES's assumptions concerning the types, numbers and operating schedules for the various construction equipment and activities are based on information provided by construction contractors being considered for the Project.

Indirect emissions were also estimated from motor vehicles associated with workers commuting to and from the LNG Terminal construction site. Emissions were conservatively estimated based on the assumptions and calculations presented in Appendix 9A. A total of 200 workers were assumed to commute to the LNG Terminal construction site by light duty gasoline vehicles each day for a total of 32 months. Four school buses were also assumed to transport workers from a parking area located within 1.5 miles from the site for a duration of 36 months. Emission factors were obtained from EPA AP-42, Appendix J (1998) for light duty gasoline vehicles and trucks.

Table 9.3-4 summarizes the estimated emissions from construction equipment including indirect emissions from commuting construction workers associated with LNG Terminal construction. Emissions are summarized in total tons during each year of the construction period. All emissions will occur in Baltimore County in AQCR 115.

Based on this analysis, direct emissions from construction equipment, indirect emissions from commuting construction workers and fugitive dust emissions are not expected to significantly affect ambient air quality in the Project area. These emissions and impacts will be restricted to the construction period for the LNG Terminal, approximately 36-months, and will terminate once construction has been completed.

B. Operational Emissions

As discussed in Section 9.3.2, the HTF heating system used to provide heat to the LNG vaporizers is the primary component associated with the operating phase of the LNG Terminal with the potential to impact air quality in the vicinity of Sparrows Point. The HTF heating system will consist of four installed firetube and waterwall auxiliary boilers. Under normal operation, three boilers will be operating and one will be placed in hot standby condition using a heating coil. The boilers will typically be rotated once per week to obtain even run time for each boiler throughout the year. Other minor and intermittent emission sources, which will only operate in the event of an emergency or outage of the HTF heating system, include several small diesel reciprocating engines used for emergency fire water pumping and

standby electricity generation and a heated vent stack, which will be used to heat boil off vapors from the LNG Terminal if a power failure renders the vapor handling systems inoperable. If AES decides to construct and operate the Power Plant both to provide heat to the LNG vaporizers and generate electricity for the local utility electric system, the combined cycle Power Plant would operate in lieu of or in conjunction with the auxiliary boilers, depending on the operating scenario. Operational emissions associated with the nonjurisdictional Power Plant are addressed separately in Section 9.3.2.4. Another minor source of PM_{10} and $PM_{2.5}$ emissions only associated with the Power Plant is a cooling tower that would run intermittently when there is insufficient LNG gas flow (sendout) to provide cooling for the Power Plant Rankine cycle.

Based on the results of preliminary engineering design, four firetube and waterwall auxiliary boilers are proposed for installation at the LNG Terminal to provide heat required for LNG vaporization as part of the HTF heating system. Three of the boilers would normally be operated for the equivalent of up to 8,760 hours per year at up to 95 percent load with the fourth boiler operated in hot standby using a heating coil. Each boiler would be rated at 350 million British termanl units per hour (MMBtu/hr) maximum heat input and will be fueled exclusively with natural gas. It was assumed that there would be two catalyst malfunctions per boiler per year, lasting 48 hours each, resulting in uncontrolled emissions. Furthermore, it was assumed that each boiler would undergo three cold iron startups per year, each lasting one hour at an average of 15 percent load before controls were effective. This was the operating scenario used as a basis for the estimated short-term and annual potential emissions. Table 9.3-5 summarizes maximum emission rates for the auxiliary boilers based on these assumptions. Criteria pollutant emissions factors were based on a review of recent Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) determinations for similar types and sizes of natural gas fired auxiliary boilers, and from preliminary emissions guarantees from potential vendors. The emissions control systems would include low-NO_x burners and/or flue gas recirculation for preliminary NO_x control, selective catalytic reduction (SCR) for final NO_x control, and oxidation catalysts for CO control.

Minor and intermittent emission sources at the LNG Terminal, which will only operate in the event of an emergency or electrical power interruption, include several small diesel reciprocating engines used for emergency fire water pumping and standby electricity generation. Based on preliminary engineering, one 375 HP diesel engine driven freshwater fire water pump and six 700 HP diesel engine driven salt water fire water pumps are specified. In addition, one 2,000 kW diesel engine driven emergency generator set is specified, capable of providing 100 percent standby power to maintain LNG circulation via operation of one low pressure (LP) pump, terminal lighting, and all control systems, and provide for the operation of all other necessary auxiliary systems. The assumed worst-case operating scenario for these emergency standby engines is 36 hr/yr per engine to conduct periodic testing and to allow for an emergency event. Emissions were estimated based on EPA AP-42 emission factors for the diesel engine fire water pumps and on performance data supplied by Caterpillar, Inc. for the standby generator (see

Appendix 9A). Short term and annual emissions rates for the diesel engines are summarized in Table 9.3-5.

In addition to the auxiliary boilers, fire water pumps and emergency standby generator, a heated vent stack will be installed at the LNG Terminal, which will only be used to heat boil off vapors from the LNG Terminal if a power failure renders the vapor handling systems inoperable. The heated vent stack will be a small (5.5 MMBtu/hr) natural gas-fired combustion source and is assumed to operate no more than 50 hours/year. Emissions from the heated vent stack were estimated based on vendor emission factors (see Appendix 9A) and are summarized in Table 9.3-5.

Emissions from each of the LNG Terminal sources are summarized in Table 9.3-5 in comparison to major stationary source thresholds. For the purposes of the major stationary source applicability determination, as further discussed in Section 9.3.3.1, total potential emissions associated with operation of the LNG Terminal include the combination of emissions from stationary sources at the LNG Terminal with emissions from LNG ships associated solely with LNG offloading activities while the LNG ships are at berth. Assumptions used in estimating emissions from LNG ships during offloading activities are further described in Section 9.3.2.2.C. This analysis demonstrates that potential emissions will be less than EPA major stationary source thresholds for each regulated pollutant, with the exception of ozone precursor NO_x emissions. Therefore, as discussed in Section 9.3.3.1, the LNG Terminal will be a major source with respect to NO_x emissions in an ozone nonattainment area, and will be subject to NNSR permitting requirements. The LNG Terminal will be considered a minor source with respect to VOC and all attainment pollutants and, therefore, will not be subject to NNSR for VOC or Prevention of Significant Deterioration (PSD) review for any attainment pollutants.

As discussed in Section 9.3.3.1, AES will seek MDE permits for construction of the emission sources and for NNSR approvals, as applicable, to obtain enforceable limitations on potential emissions. AES will seek permit limits on the number of operating hours and annual diesel consumption for the emergency fire pumps and standby generator. AES will also seek enforceable limitations through permits to construct and/or the NNSR approval for the boilers to limit annual operations and emissions from LNG ship offloading activities. AES will work with MDE during the permitting process to develop permit conditions that that practically enforceable with LNG shippers.

C. Marine Vessel Emissions

Marine vessels used during LNG Terminal operation include LNG ships, tugboats, security boats and USCG escort boats. The estimated annual emissions from these mobile sources are based on up to 208 LNG ship arrivals; two tug boats, and two security or escort boats participating in each arrival, berthing and departure of each LNG ship; and emissions during LNG offloading and idling while stationary at berth. AES estimates that LNG ships will arrive at the Terminal Site with a maximum frequency of four LNG ships per week, depending on the capacity of the ship (average will be two to three ships per week). Each ship will remain stationary at the berth for a

maximum of 24 hours, about 12 to 18 hours (13.25 hours on average) of which for transferring of fuels, depending on the capacity of the ship and an average unloading rate of about 12,000 cubic meters per hour.

As discussed in Sections 9.3.2.3.B and 9.3.3.1, emissions from LNG ship offloading operations have been combined with potential emissions from stationary sources at the LNG Terminal for purposes of determining PSD and NNSR permit applicability. Therefore, emissions from LNG offloading operations were calculated separately from all other LNG ship and associated marine vessel activity.

Information was obtained by AES from LNG ship owners on the type of propulsion, power generation, fuel types, operating scenarios and other parameters necessary to estimate emissions during transit in Virginia and Maryland state waters, and during berthing, hoteling and unloading activities at the LNG Terminal. Currently, tanker ships typically include conventional steam-electric power plants fired with boil-off fuel, distillate or residual fuel oil; diesel engines, diesel engine generator sets, or combinations of the these technologies both for propulsion and to power fuel transfer pumps and other auxiliary loads while stationary at port. Because AES will not own or operate the LNG ships that will deliver LNG to the LNG Terminal, a number of different power plant and fuel scenarios were evaluated in order to estimate the range of emissions to be expected from LNG ship movements and transfer operations. The scenarios evaluated ranged from natural gas fired steam-electric power plants to diesel engines firing 2.5 percent sulfur No. 6 fuel oil. An assumed mix of technologies and fuels was then used to estimate annual emissions, based on AES's evaluation of the representative levels of technologies and fuels currently in use in the LNG shipping industry. Natural gas fired boilers were assumed to be used in 50 percent of the LNG ships, diesel engines using 0.5 percent sulfur diesel fuel were assumed for 40 percent of the shipments, and diesel engines using 2.5 percent sulfur No. 6 oil were assumed for 10 percent of the shipments on an annual basis. EPA's nonroad engine diesel fuel sulfur standards were not factored into this analysis because the standards are not applicable to non-US flagged ocean going vessels. AES believes these are conservative assumptions; however, the assumptions may need to be refined in the future based on actual shipping assignments and/or availability, actual ship operating conditions, and trends in the industry for the various sizes of LNG ships.[2]

The emission estimates based on the current assumptions and EPA emission factors are presented in Appendix 9A, and the results are summarized in Table 9.3-5. As discussed above, emissions from LNG ship unloading operations are summed with LNG Terminal stationary sources for the major source applicability determination. Estimates of annual emissions from all marine vessel movements associated with LNG ship arrival, berthing, and departure are separately summarized in Table 9.3-5, including a breakdown

[2] AES will make attempts to negotiate fuel transport contracts in which tankers will operate preferably with natural gas and alternately with low sulfur marine diesel while stationary at the LNG Terminal, in order to minimize emissions and air quality impacts. At this time, AES cannot predict the success it will have in negotiating such contracts. Accordingly, the conservative assumptions outlined above are even more appropriate at this time.

by state for LNG ship and associated marine vessel movements in Maryland and Virginia state waters for determining General Conformity applicability.

9.3.2.3 Dredging and Reclamation

A. Construction Emissions

The LNG Terminal construction includes widening and deepening the existing approach channel and turning basin at Sparrows Point to accommodate the LNG ships. Dredging related construction activities include both onshore and offshore equipment and processing. Onshore activities include start-up and dredged material transfer and processing operations, involving typical construction equipment, such as cranes, backhoes, excavators, loaders, trucks and sweepers. Internal combustion engines used to power this equipment will result in temporary emissions of NO_X, SO_2, CO, PM_{10} and VOC. A dredged material recycling facility (DMRF), as described in Section 1.5.1.2.A of Resource Report 1, *General Project Description*, will also be constructed and operated at the construction site, involving use of hoppers, conveyors, pug mills for mixing additives, and stacking equipment. Pug mills and the additive delivery system will be equipped with separate baghouse dust collectors to control PM_{10} and $PM_{2.5}$ emissions. Marine vessels and equipment used for offshore dredging activities will include a clamshell dredge or suitable alternative required by permit, in addition to tug boats, survey/work boats, crew boats and inspecting/diving vessels. Diesel engines used to power these vessels and the dredge will result in temporary emissions of NO_X, SO_2, CO, PM_{10} and VOC. Indirect emissions will also result from transfer of the dredged and processed material offsite with dump trucks and from workers commuting to the site. The duration of the dredging activities at the LNG Terminal has been estimated at about two years.

AES will use the mitigation measures identified in Section 9.3.6 of this Resource Report to minimize the fugitive dust emissions associated with dredged material transfer and processing. These measures may include the application of water or dust suppressants, covering of haul trucks, use of paved roads to the extent possible, limiting vehicle speed and stabilizing disturbed areas.

AES has estimated the actual emissions of criteria air pollutants associated with dredging related activities at the LNG Terminal based on the assumptions and calculations provided in Appendix 9A of this Resource Report and as summarized in Section 9.3.2.1. AES's assumptions concerning the types, numbers and operating schedules for the various construction equipment, marine vessels and activities are based on information provided by construction contractors being considered for the Project.

Indirect emissions were also estimated from motor vehicles associated with workers commuting to and from the LNG Terminal construction site associated with dredging activities and from haul trucks and additive supply trucks. Emissions were conservatively estimated based on the assumptions and calculations presented in Appendix 9A. A total of 15 workers were assumed to commute to the LNG Terminal construction site by light duty

gasoline vehicles each day for a total of 24 months. A total of 218 haul trucks and 27 additive supply trucks per day were assumed for 276 days per year during the 2 year dredging duration. Emission factors were obtained from EPA AP-42, Appendix J (1998) for light duty gasoline vehicles and trucks and heavy duty diesel haul and supply trucks.

Table 9.3-4 summarizes the estimated emissions from construction equipment, marine vessels, and material processing and indirect emissions from dredge hauling and commuting construction workers associated with dredging activities. Emissions are summarized in total tons during the construction period. The estimated actual emissions of NO_2 and CO from the use of diesel CI engines in dredging related equipment over the construction period are 268 and 83 tons, respectively. As is typical of emissions from diesel engines, actual emissions rates for other pollutants (SO_2, PM_{10} and VOC) are significantly lower than NO_2 and CO emissions.

The potential for odors and inhalation of dredged sediments due to dredging and processing of contaminated sediments can also be a concern from marine dredging and onshore processing activities. To assess qualitatively the potential for these impacts, AES obtained information from Clean Earth Dredging Technologies Inc. (CEDTI), with whom AES is considering contracting for the dredging work associated with the LNG Terminal. In CEDTI's experience, the dredged material may appear (visually) to have a high organic content. However, typical Total Organic Carbon results are around three to five percent. Further, the odor of raw dredged material is minimal and not pervasive. At the dredging site, the processing site and the storage/end use sites there is very little odor. The potential for ammonia odors exists at the DMRF due to the addition of alkaline materials into the dredged sediments, but this odor dissipates rapidly and is only noticeable within feet of the processed material. For example, CEDTI operates its Jersey City, New Jersey processing facility within 1,000 feet of high-end condominiums near Manhattan and has never received a complaint or even a comment from neighbors or local regulators. Likewise, no complaints have been made at any of CEDTI's end use sites. CEDTI does not employ any odor suppression techniques at any of its current facilities. Furthermore, CEDTI indicates that it is not aware of any quantitative information available to estimate ammonia emissions from operation of the DMRF. Therefore, the potential for ammonia emissions from the proposed DMRF could not be evaluated quantitatively.

As discussed in Section 9.3.3.1.C, an Air Quality Permit to Construct will be required prior to construction of the DMRF materials storage, transfer, mixing and dust control equipment. The majority of materials handled in the DMRF will be high moisture-content dredged materials with little potential for dust emissions. Dry additive filling, storage and transfer equipment will be contained in enclosed structures with baghouse dust collectors for high-efficiency dust control. As a result, $PM_{2.5}/PM_{10}$ emissions from the DMRF will be negligible.

Based on this analysis, direct emissions from dredging activities, indirect emissions from haul trucks and commuting construction workers, and fugitive dust emissions, are not expected to significantly affect ambient air quality in

the Project area. These emissions and impacts will be restricted to the construction period, approximately 36-months, for the LNG Terminal and will terminate once construction has been completed.

B. Operational Emissions

Based on information provided by CEDTI, maintenance dredging activities after construction of the LNG Terminal is completed would result in infrequent emissions, typically occurring over approximately one month at a frequency of every three years during the operational phase. Estimates of emissions from maintenance dredging activities is included in Appendix 9A and summarized in Table 9.3-5. In addition, for a period of approximately 12 months following completion of the LNG Terminal construction, emissions from transport of dredge material to disposal sites will occur. This transportation was factored into the overall emissions estimates for the DMRF.

9.3.2.4 Nonjurisdictional Facilities – Power Plant

A. Construction Emissions

Any construction activities, equipment and emissions associated with the Power Plant will be similar to those described in Section 9.3.2.2.A for construction of the LNG Terminal. The use of equipment to construct the Power Plant would result in temporary, short-term emissions of air pollutants that would be restricted to the construction period for the Power Plant and that would terminate once construction has been completed. These emissions would not result in significant adverse impacts to the air quality within the vicinity of the Project Area, and AES would not be required to obtain any federal, state, or local authorizations for the temporary, short-term air pollutant emissions that will be associated with construction of the Power Plant. Fugitive dust control measures, if required to be implemented, are discussed in Section 9.3.6.

As with construction of the LNG Terminal, construction activities associated with the Power Plant would involve the use of internal combustion engines in various cranes, backhoes, dozers, loaders, pavers, trucks, welders, generators, air compressors, pumps, pile drivers, and other miscellaneous heavy construction equipment. These engines and worker commuting vehicles would result in emissions of NO_X, SO_2, CO, PM_{10} and VOC. The duration of the main construction period for the Power Plant would be about 20 to 24 months.

The potential for fugitive dust emissions during construction periods would be the same as discussed for the LNG Terminal construction. AES would use the mitigation measures identified in Section 9.3.6 of this Resource Report to minimize the fugitive dust emissions associated with construction of the LNG Terminal.

AES has estimated the actual emissions of criteria air pollutants and HAPs that would be associated with construction of the Power Plant, based on the assumptions and detailed calculations provided in Appendix 9A of this Resource Report and as summarized in Section 9.3.2.1. AES's assumptions concerning the types, numbers and operating schedules for the various

construction equipment and activities are based on information provided by construction contractors being considered for the Power Plant.

Table 9.3-4 summarizes the estimated emissions from construction equipment potentially associated with the Power Plant construction. Emissions are summarized in total tons during each year of the construction period. All emissions would occur in Baltimore County in AQCR 115.

Based on this analysis, direct emissions from construction equipment, indirect emissions from commuting construction workers, and fugitive dust emissions, are not expected to significantly affect ambient air quality in the Project Area. These emissions and impacts would be restricted to the construction period, approximately 24-months, for the Power Plant and would terminate once construction has been completed.

B. Operational Emissions

If AES decides to construct and operate the Power Plant both to provide heat to the LNG vaporizers and generate electricity for the local utility electric system, the combined cycle Power Plant would operate in lieu of or in conjunction with the auxiliary boilers, depending on the operating scenario. The Power Plant would be configured with one combustion gas turbine (CGT) with a duct-fired heat recovery steam generator (HRSG), which would operate only on natural gas, and associated steam electric turbine and other auxiliary facilities that are not sources of potential emissions.. The output of the Power Plant would be approximately 300 MW. The Power Plant would require a gas supply from the LNG Terminal and transmission lines leaving the site to tie into the local utility system. Another minor source of PM_{10} and $PM_{2.5}$ emissions only associated with the Power Plant is a cooling tower, which would run intermittently when there is insufficient LNG gas flow (sendout) to provide cooling for the Power Plant Rankine cycle.

AES is currently evaluating two alternate gas turbine vendors for supply of major Power Plant components. Based on the results of preliminary engineering design, a General Electric (GE) 7FA and a Siemens SGT6-5000 CGT are being considered. While performance specifications, emissions, and controls are similar for each CGT, the GE 7FA was assumed so as to estimate emissions more conservatively for the purposes of this Resource Report. The base case operating scenario involves operation of the CGT with auxiliary duct firing in the HRSG at 100 percent loads for 8,760 hours per year and one of the LNG Terminal auxiliary boilers running at idle standby (25 percent load). The alternate operating scenario involves the CGT at 100 percent load, unfired HRSG, one auxiliary boiler at 100 percent load, and one auxiliary boiler at idle standby for 20 percent of the year with the base case operating scenario for 80 percent of the year. The CGT and auxiliary burner in the HRSG would be rated at maximums of 1,771 and 271 MMBtu/hr (LHV), respectively. It is assumed that there would be two catalyst malfunctions per year in the HRSG and auxiliary boiler, lasting 48 hours each, resulting in uncontrolled emissions. Furthermore, it was assumed that the CTG/HRSG and auxiliary boilers would undergo three cold iron startups per year, each lasting one hour at an average of 15 percent load before controls were effective. These operating scenarios were used as the basis for the estimated short-term and annual potential emissions from the Power Plant.

Table 9.3-5 summarizes maximum emission rates for the Power Plant based on these assumptions. Criteria pollutant emissions factors were based on a review of recent BACT and LAER determinations for similar types and sizes of natural gas fired CTGs with HRSGs and from preliminary emissions guarantees from potential vendors. The proposed emissions control systems would include dry low-NO_x combustors (DLN) for initial NO_x control in the CTG, SCR for final NO_x control and oxidation catalysts for CO control. The emissions analysis demonstrates that potential emissions from the Power Plant with the LNG ship offloading operations will be greater than EPA major stationary source thresholds for NO_x, CO and VOC. Accordingly, the total premise will be required to undergo NNSR for NO_x and VOC and PSD review for CO.

The same minor and intermittent emission sources identified in Section 9.3.2.2.B associated with the LNG Terminal will still be associated with the LNG Terminal if the Power Plant is constructed. Again, these sources will only operate in the event of an emergency or electrical power interruption and include several small diesel reciprocating engines used for emergency fire water pumping and standby electricity generation. In addition, the heated vent stack discussed in Section 9.3.2.2.B will still be associated with the LNG Terminal if the Power Plant is constructed.

9.3.3 Air Quality Regulatory Requirements

The proposed Project would generate air emissions through both short-term construction activities and long-term operation of the stationary sources associated with the LNG Terminal and Power Plant. Emissions from all phases of construction and operation of the Project would be subject to applicable federal and state air regulations. This section evaluates applicability of specific air regulations to emissions units and activities associated with the Project.

9.3.3.1 New Source Review Requirements

The New Source Review (NSR) provisions of the CAA apply to new Major Stationary Sources or Major Modifications to Major Stationary Sources under two separate programs. For sources located in areas designated as attaining the Ambient Air Quality Standards, with respect to a specific regulated criteria pollutant, the requirements of the PSD program (40 CFR § 52.21) apply. For Major Stationary Sources located that do not attain the Ambient Air Quality Standards, the requirements of the NNSR Program (40 CFR Parts 51 and 52) apply to each non-attainment pollutant. The LNG Terminal and Power Plant will involve construction and operation of a new stationary source in Maryland. Evaluation of the applicability of NSR regulations to these sources is discussed below. Administration of NSR programs in Maryland is provided by MDE's SIP-approved regulations promulgated under Code of Maryland Regulations (COMAR) Section 26.11 with respect to the LNG Terminal. There will be no modification of existing or construction of new stationary sources associated with the Pipeline construction or operation in Maryland or Pennsylvania, or dredging activities in Maryland. Therefore, NSR regulations are not applicable to the Pipeline or dredging activities.

As discussed in Section 9.3.2.2.B., for the purposes of the major stationary source applicability determinations under PSD and NNSR rules, total potential emissions associated with operation of the LNG Terminal are assumed to include the combination of emissions from stationary emission units at the Terminal with those emissions from LNG ships associated solely with LNG offloading activities while the LNG ships are at berth. The offloading activities are included in the major source applicability determination because the transferring of fuels from LNG ships is directly connected to the function of the LNG Terminal. This conservative approach was taken because this procedure is consistent with EPA guidance provided in the 1990 Draft New Source Review Workshop Manual as well as several EPA policy documents on this subject[3] [4].

A. PSD Requirements

MDE's approved SIP provides the authority to issue air permits in accordance with federal PSD regulations (40 CFR § 52.21), which are designed to ensure that the air quality in current attainment areas does not significantly deteriorate beyond baseline concentration levels. The PSD regulations specifically apply to the construction of EPA-defined Major Stationary Sources and Major Modifications to existing Major Stationary Sources in areas designated as attainment for at least one of the following criteria pollutants: SO_2, NO_2, PM_{10}, CO, O_3, and lead. In addition, pursuant to EPA's proposed implementation of $PM_{2.5}$ standards, states are in the process of developing SIP revisions that would include applicability criteria for $PM_{2.5}$ emissions. In the meantime, EPA guidance to the states is to utilize the PM10 requirements as a surrogate for PM2.5. For PSD purposes, a Major Stationary Source is defined as one of 26 listed source categories with the potential to emit 100 TPY or more of any pollutant regulated under the CAA. A non-listed Major Stationary Source is defined as a source with the potential to emit 250 TPY or more of any regulated pollutant. PSD applies on a pollutant-specific basis at Major Stationary Sources for each pollutant with the potential to be emitted at greater than EPA-defined Significant Emission Rates: 100 TPY CO; 40 TPY NO_x, SO_2 or VOC; 25 TPY TSP; 15 TPY PM_{10}; 0.6 TPY Pb. For $PM_{2.5}$, EPA currently applies a Significant Emission Rate of 10 TPY of direct $PM_{2.5}$ emissions and 40 TPY of precursor SO_2 emissions. If other precursors are included for determination of major source applicability to $PM_{2.5}$, a 40 TPY Significant Emission Rate would be used for precursor NO_2 emissions and other Significant Emission Rate thresholds may apply to precursor VOC and ammonia emissions, as determined by the state's SIP.

Fossil fuel boilers (or combination of them) totaling more than 250 million Btu per hour heat input, such as the four auxiliary boilers proposed by the Project at the LNG Terminal, and fossil fuel-fired steam electric plants of more than 250 million Btu per hour heat input, such as the CTG with auxiliary fired HRSG proposed for the combined cycle Power Plant, are

[3] Letter from John Calcagni, EPA AQMD to Ken Waid, January 8, 1990 re: clarification on questions concerning "secondary emissions" as defined in 40 CFR 52.21(b).
[4] Leter from Charles Sheehan, EPA Regional Counsel to Michael Cathey, October 28, 2003.

included in the 26 listed source categories subject to PSD review. Therefore, the applicable PSD threshold for the LNG Terminal and combined cycle Power Plant is 100 TPY of any regulated attainment pollutant, including $PM_{2.5}$. Once PSD review is triggered, all stationary sources at the premise must demonstrate compliance with PSD requirements for each pollutant with potential premises emissions above Significant Emission Rates. Based on the attainment status of the area (see Section 9.3.1.3) and on projected emission levels (see Sections 9.3.2.2 and 9.3.2.4), the LNG Terminal will not be considered a Major Stationary Source with respect to the PSD regulations and is not subject to PSD review. However, if AES decides to construct and operate the Power Plant, it will be subject to PSD review for any regulated pollutants emitted above EPA-defined Significant Emission Rates. As summarized in Table 9.3-5, potential premise emissions, including those from the Power Plant, LNG Terminal and LNG offloading activities, are estimated to exceed Significant Emission Rates for NO_2, CO, VOC, PM_{10} and $PM_{2.5}$. Therefore, PSD review requirements would apply to the LNG Terminal, and to the Power Plant for these pollutants (if the Power Plant is constructed).

PSD review for Major Stationary Sources and Major Modifications includes the following: an assessment of the existing air quality; the use of analytic dispersion models to demonstrate compliance with the NAAQS and applicable PSD Increments; a demonstration that Best Available Control Technology (BACT) has been applied to the subject emission sources; and an assessment of the impact of new emissions on the environmental resources such as soils and vegetation. If the source is located within 100 km (62 miles) of a federal Class I area, the impacts must be evaluated at these areas based on the more stringent Class I PSD increments. The PSD permit would contain emission limits and other operating, monitoring, record keeping, and reporting requirements.

The air quality modeling includes emissions from the proposed Major Stationary Source or Major Modification and other sources in the area to ensure protection of the NAAQS and to prevent emission increases beyond a specified amount, called a PSD Increment. Because the LNG Terminal and associated LNG ship unloading operations, without the Power Plant, will not be a Major Stationary Source subject to PSD review, an air quality modeling demonstration is not required by MDE or EPA PSD regulations specifically for that Project configuration. However, the potential Power Plant with LNG Terminal configuration will trigger PSD review, including the air quality modeling demonstrations. If AES proceeds with development of the Power Plant option, the results of the air quality dispersion modeling analysis demonstrating compliance with the NAAQS and PSD Increments will be included in the PSD permit application submitted to the Maryland Public Service Commission (MPSC) for review by that agency with input from MDE (see Section 9.3.3.1.C). If AES proceeds with the Power Plant option, it is anticipated that the PSD permit application for the Power Plant will be submitted to MPSC by April, 2007, with copies provided to FERC. Regardless of potentially applicable PSD modeling requirements, a preliminary air quality modeling analysis of both LNG Terminal options (with and without the Power Plant) is currently being performed to satisfy the FERC's Resource Report 9 requirement to summarize anticipated air quality

impacts for the Project. This modeling analysis will include an analysis of impacts from the LNG Terminal with and without the Power Plant, and include impacts from LNG ship offloading operations. A separate model run will also be performed including the effects of marine vessels associated with LNG ship movements in the Project Area. Specific ship/marine vessel movements to be included in the model are being reviewed with the FERC staff. AES anticipates that a summary of this modeling analysis will be available for submittal to the FERC in January, 2007.

The emission limits contained in the PSD permit are required to represent the BACT. BACT is determined on a case-by-case basis, taking into account energy, environmental, and economic impacts and costs. Based on a review of previous BACT and LAER determinations for other combined cycle power plants, the proposed controls and emissions limits for the Power Plant are considered representative of BACT. Further, based on a review of previous BACT and LAER for boiler equipment, the proposed controls and emission limits for the LNG Terminal are also considered representative of BACT.

The PSD program was designed to protect air quality in areas where existing air quality was considerably better than the NAAQS. The program established a set of increments of new air pollution that would be allowed over a baseline level for three classes of areas. Class I areas are areas of special national or regional value from a natural, scenic, recreational, or historic perspective and include such areas as National Parks, Fish and Wildlife Service Areas and National Wilderness Areas. In addition to restrictive Class I PSD increments for SO_2, PM and NO_2, select Class I areas were additionally protected through adoption of visibility protection requirements. For a project meeting the PSD regulatory definition of a Major Stationary Source or Major Modification and with emission source(s) typically located within 100 km (62 miles) of a Class I area, an impact analysis must be performed to demonstrate that stringent Class I PSD increments will not be exceeded and that other air quality related values (AQRVs) are not adversely impacted. The nearest PSD Class I areas to the LNG Terminal and Power Plant site are the Shenandoah National Park in Virginia (about 145 km southwest of the LNG Terminal and Power Plant) and Brigantine National Wilderness Area in southeastern New Jersey (about 193 km east of the site). The Power Plant would be located more than 100 km (62 miles) from the nearest Class I area and, as such, a Class I area impact analysis would not be automatically triggered in this case. However, as part of the PSD review process, the MDE will likely provide information on the Project's estimated emissions and impacts to the Federal Land Manager responsible for overseeing the nearest Class I areas.

B. Non-attainment New Source Review Requirements

The CAA Amendments (CAAA) of 1990 established more stringent provisions for New Source Review of Major Stationary Sources proposed to be located in non-attainment areas. MDE regulations implementing those provisions are codified in COMAR 26.11.17. Because the LNG Terminal and Power Plant will be located in Baltimore, the Project is potentially subject to certain NNSR requirements if potential emissions of NO_x or VOC will be

greater than 25 TPY. In addition, the MDE may establish requirements under NNSR for emissions of PM-2.5, which has also been classified as non-attainment for Baltimore.

Based on the attainment status of the area (see Section 9.3.1.3) and on projected emission levels (see Section 9.3.2), the Power Plant will be subject to NNSR for NO_x and VOC emissions. Applicable requirements include an emission limitation that represents LAER for the source, obtaining NO_x equivalent emission reductions (offsets) from existing sources in the area in the ratio of 1.3 to 1 for sources located in Baltimore (although the one-hour standard has been rescinded at the federal level, the area continues to be subject to the severe nonattainment rules in Maryland's approved SIP, COMAR 26.11.17.03.B(3)(a)), and an alternatives analysis to demonstrate that the benefits of the proposed source significantly outweigh the environmental and social impacts.

C. State Permit to Construct Requirements

Pursuant to COMAR 26.11.02.09, all air pollution sources subject to PSD, NNSR, NSPS, and National Emissions Standards for Hazardous Air Pollutants (NESHAPS) requirements and all other sources, except those specifically exempted in COMAR 26.11.02.10, are required to apply for and obtain a permit to construct. Maryland is authorized by EPA through its approved SIP to implement both the PSD and NNSR programs. Therefore, in addition to the permit to construct, sources subject to PSD and/or NNSR are required to obtain additional PSD and NNSR permits, called Approvals. The purpose of the permit to construct is to ensure that any new, modified, replaced or relocated source of air pollution complies with all applicable State and federal air quality regulatory requirements. The NNSR and PSD Approvals are required to enforce applicable PSD and NNSR requirements. Therefore, the four auxiliary boilers, six of the emergency fire water pumps, emergency generator, and vent stack heater at the LNG Terminal will require permits to construct. In addition, the Dredged Materials Recycling Facility (DMRF), which will include materials transfer, storage and mixing equipment to be used during the construction phase of the LNG Terminal, will be included in a permit to Construct.

In the case of the Power Plant, which will be rated at greater than 70 MW and, as such, will be subject to review by the MPSC, AES will be required to apply for a Certificate of Public Convenience and Necessity from the MPSC instead of the MDE. The MPSC has been authorized and SIP-approved to issue PSD and NNSR Approvals, with MDE input, for all power plants in Maryland with a generating capacity greater than 70 MW.

9.3.3.2 MDE Title V and State Operating Permit Requirements

Under MDE's Title V Facility Permit regulations (COMAR 26.11.03), a Title V permit is required for Major Stationary Sources (as defined under COMAR 26.11.02.01). For Title V applicability purposes, a Major Stationary Source is defined differently than a Major Stationary Source under PSD review, with potential emissions thresholds established at 10 TPY for

any individual HAP, 25 TPY for any combination of HAPs, 25 TPY for NO_x or VOC in Baltimore and 100 TPY for any other regulated air pollutant. Based on the estimated potential emissions from the LNG Terminal as presented in Section 9.3.2, the Project will be a Major Stationary Source subject to Title V permitting. The owner or operator of a source that becomes subject to the requirement to obtain a Part 70 permit must submit an application not later than 12 months after the date that the source commences operations or becomes subject to the requirements for a Part 70 permit, whichever is later (COMAR 26.11.03.02.B(4)). The purpose of the Title V operating permit is to combine, into a single document, all the State and federal air quality requirements applicable to all sources located on the same premise. Title V does not impose new substantive requirements above and beyond the State requirements.

9.3.3.3 New Source Performance Standards Requirements

As natural gas-fired boilers with heat inputs greater than 100 MMBtu/hr, the four proposed auxiliary boilers at the LNG Terminal are subject to Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units (NSPS, 40 CFR Part 60, Subpart Db). Although Subpart Db contains emissions standards and/or control requirements for SO_2 and PM from boilers combusting coal, oil, wood and other fuels, it contains no SO_2 or PM standards applicable to natural gas fired boilers. The most stringent Subpart Db NO_x emission standard applicable to gas fired boilers with a low heat release rate is 0.1 pounds per million British thermal unit (lb/MMBtu). The auxiliary boilers associated with the LNG Terminal will be designed and operated in accordance with the applicable Subpart Db NO_x emission standard. The proposed NO_x emission rate (less than 0.004 lb/MMBtu) would easily meet the applicable emission standard. AES will also comply with the applicable monitoring, record keeping and reporting requirements consistent with Subpart Db.

The proposed CTG at the Power Plant would have a heat input greater than 10 MMBtu/hr and would be constructed after February 18, 2005. Therefore, the CTG and associated HRSG would be subject to Standards of Performance for Stationary Combustion Turbines (Subpart KKKK), which was promulgated July 6, 2006 and is applicable to combustion turbines with a heat load input greater than or equal to 10 MMBtu/hr and constructed, modified or reconstructed after February 18, 2005. Stationary combustion turbines subject to Subpart KKKK are exempt from requirements of Subpart GG, which is applicable to combustion turbines constructed, modified, or reconstructed after October 3, 1977. In addition, HRSGs subject to Subpart KKKK are exempt from the requirements in Subparts Da, Db and Dc. Subpart KKKK sets emission limits for NO_x and SO_2. For new CTGs firing natural gas at a heat input rate of greater than 850 MMBtu/hr, such as the CTG proposed for the Power Plant, the applicable NO_x emission limit would be 15 ppmvd at 15 percent O_2. The proposed NO_x emission limit, which will also be proposed to meet BACT and LAER, is two ppmvd at 15 percent O_2 and will easily meet the applicable limit in Subpart KKKK. The continuous emission monitoring system (CEMS) proposed for the Power Plant would also comply with the Subpart KKKK NO_x monitoring requirements. The

Subpart KKKK SO_2 limit applicable to all CTGs regardless of size or fuel type is 0.58 lb/MWh gross energy output or fuel sulfur content of 0.05 percent by weight. The proposed CTG with HRSG would be fueled exclusively with natural gas and will meet the fuel sulfur content specification.

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, was reviewed for applicability to the LNG storage tanks at the LNG Terminal. This subpart applies to storage vessels above 75 cubic meters capacity used to store Volatile Organic Liquids (VOL). VOL is defined as any organic liquid which can emit VOC as defined in 40 CFR § 51.100. The only organic compounds with the potential to be emitted in trace amounts from LNG storage tanks are methane and ethane, both of which are specifically exempted in 40 CFR § 51.100 from the definition of VOC. Therefore, this subpart is not applicable to the LNG storage tanks.

Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, promulgated July 11, 2006, will apply to emergency fire pump engines and the emergency standby generator proposed for the LNG Terminal. The rule requires manufacturers of such engines to meet emission standards that are phased in for the size, type of engine application and model year of the engine. Owners and operators of covered engines are required to configure, operate and maintain the engines according to specifications and instructions provided by the engine manufacturer and to maintain records demonstrating compliance.

9.3.3.4 National Emissions Standards for Hazardous Air Pollutants Requirements

The NESHAPs, codified in 40 CFR Part 61, regulate HAP emissions. Part 61 was promulgated prior to the 1990 CAAA and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride). The proposed LNG Terminal and Power Plant do not fall under one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable to the Project.

9.3.3.5 National Emissions Standards for Hazardous Air Pollutants for Source Categories Requirements

Boilers and process heaters that are located at new or existing Major Stationary Sources of HAPs must meet NESHAPs for Source Categories, Subpart DDDDD - National Emission Standards for Industrial / Commercial / Institutional Boilers and Process Heaters, commonly referred to as Boiler Maximum Achievable Control Technology (MACT) standards. Subpart DDDDD emission limitations applicable to "large" (greater than 10 MMBtu/hr) gas fired boilers and process heaters include PM (0.03 lb/MMBtu), hydrogen chloride (0.0009 lb/MMBtu) and CO (400 ppm at three percent O_2). The auxiliary boilers at the LNG Terminal would be classified as a large boiler or process heater under the regulations and

estimated emissions would easily comply with these limitations based on vendor data and/or EPA emissions factors as summarized in Appendix 9A. The HRSG at the Power Plant would be classified as a waste heat boiler, which is not subject to the regulation, because the supplemental burners to the HRSG would not be 50 percent or more of the total heat input to the HRSG based on preliminary engineering design. Based on estimated potential emissions of federal HAPs summarized in Table 9.3-6 and Appendix 9A, the LNG Terminal and the Power Plant are not classified as Major Stationary Sources of HAPs (i.e., those that have the potential to emit 10 TPY or more of a single HAP or 25 TPY or more of a combination of HAPs that are specifically listed in or pursuant to section 112(b) of the CAA). Therefore, the proposed LNG Terminal and Power Plant will not be subject to Subpart DDDDD.

Other NESHAPs for Source Categories, or MACT standards, potentially applicable to Project stationary sources include Subpart ZZZZ (NESHAP for Stationary Reciprocating Internal Combustion Engines) and Subpart YYYY (NESHAP for Stationary Combustion Turbines). Both of these NESHAPs are only applicable to Major Stationary Sources of HAPs. Based on estimated potential HAP emissions, neither the proposed LNG Terminal nor the Power Plant will be Major Stationary Sources of HAPs. Therefore, these NESHAPs do not apply to the Project. Moreover, with regard to Subpart YYYY, based on EPA's August 18, 2004 stay of effectiveness with regard to applicability of this NESHAP to lean premix gas-fired turbines and diffusion flame gas-fired turbines, Subpart YYYY would not apply to the CTG proposed for the Power Plant, as the proposed CTG will be a lean premix dry low-NO_x design.

9.3.3.6 Acid Rain Program Requirements and Clean Air Interstate Rule (CAIR)

The Acid Rain Program is codified in 40 CFR Parts 72 through 78. This program aims to reduce acid rain by reduction of SO_2 and NO_x from utility units that have a nameplate electricity generation capacity greater than 25 MW. A "unit" is defined as a "fossil fuel-fired combustion device" and "fossil fuel-fired" is defined as "the combustion of fossil fuel, alone or in combination with any other fuel, independent of the percentage of fossil fuel consumed in any calendar year". The auxiliary boilers at the LNG Terminal will not be used to generate electricity; however, the combined cycle Power Plant would have a generation capacity greater than 25 MW and will be subject to Acid Rain program requirements. If the Power Plant is constructed, the Acid Rain permit application must be filed at least 24 months before the unit commences operation. An affected unit is required to follow the continuous emissions monitoring requirements of 40 CFR Part 75 and to hold sufficient SO_2 allowances to cover expected emissions of SO_2 when operation commences. In the event that the Power Plant is constructed, AES would apply for the Acid Rain Permits; install, certify and operate the required monitoring systems; and comply with the required emissions allowances, monitoring, and recordkeeping requirements.

The Clean Air Interstate Rule (CAIR), 40 CFR Parts 96 and 97, established a new cap and trade program for SO_x and NO_x emissions across 28 eastern

states and the District of Columbia. The CAIR program has the same applicability criteria as the Acid Rain Program. Therefore, the LNG Terminal without the Power Plant will not be subject to the requirements. However, if the Power Plant is constructed, AES would need to apply for a CAIR permit, hold sufficient allowances for actual SO_x and NO_x emissions, and comply with additional monitoring, recordkeeping and reporting requirements. Since the new units will incorporate state-of-the art natural gas fired combined cycle technology, AES may be provided sufficient set-aside allowances under the state's CAIR budget to offset actual emissions.

9.3.3.7 MDE Emission Standards

In addition to MDE permit to construct, permit to operate and PSD and NNSR Approval requirements, the following state emission standards and other requirements were evaluated for applicability to the LNG Terminal and Power Plant emission sources:

- COMAR 26.11.05: Air Pollution Episode System – This chapter requires sources designated by the Secretary or the Secretary's designee to submit standby emission reduction plans and to implement such plans if a designated level of air pollution is reached. Designated sources primarily include coal and oil fired electric power generating facilities, coal and oil fired steam producing facilities, large manufacturing industries and refuse incinerators. Any other source of air pollutants not specifically designated in the regulation may be required to submit standby plans, upon written request of the MDE, describing emission cutbacks to be taken if an air pollution Alert is called. Because the LNG Terminal and Power Plant do not involve emission sources specifically designated by regulation to prepare and submit standby plans, AES would not be subject to this requirement unless specifically requested by MDE.

- COMAR 26.11.06: General Emission Standards, Prohibitions and Restrictions – This chapter contains emissions standards and other requirements applicable to certain air pollution sources. Specific requirements pertain to visible emissions, emissions of particulate matter, CO, SO_2, VOC and fluorides, and to odors and other nuisance air pollution. The proposed auxiliary boilers, diesel engines and vent stack heater at the LNG Terminal and the CTG with HRSG at the Power Plant will be designed to meet all applicable standards and operate in compliance with applicable limitations.

- COMAR 26.11.06.03.D: Particulate Matter from Materials Handling and Construction. This regulation requires reasonable precautions to prevent particulate matter from becoming airborne due to material handling, transport, or storage, or due to construction or demolition activities, use of roads and other activities. Reasonable precautions specified in the regulation include, but are not be limited to:

- Use of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land.
- Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can create airborne dusts.
- Installation and use of hoods, fans, and dust collectors to enclose and vent the handling of dusty materials. Adequate containment methods shall be employed during sandblasting of buildings or other similar operations.
- Covering, at all times when in motion, open-bodied vehicles transporting materials likely to create air pollution. Alternate means may be employed to achieve the same results as would covering the vehicles.
- The paving of roadways and their maintenance in clean condition.
- The prompt removal from paved streets of earth or other material which has been transported there by trucks or earth moving equipment or erosion by water.

AES will require its contractors to use the mitigation measures identified in Section 9.3.6 of this Resource Report to minimize the fugitive dust emissions associated with construction of the Pipeline, LNG Terminal, Power Plant, and during dredging activities. These measures may include the application of water or dust suppressants, covering of haul trucks, use of paved roads to the extent possible, limiting vehicle speed and stabilizing disturbed areas.

- COMAR 26.11.09: Control of Fuel-Burning Equipment, Stationary Internal Combustion Engines, and Certain Fuel-burning Installations – This chapter contains emissions standards and other requirements applicable to certain fuel-burning equipment, including boilers, vent heater, and diesel engines at the LNG Terminal and CTG with HRSG at the Power Plant. Specific requirements pertain to visible emissions, emissions of particulate matter, SO_2 and Major Stationary Sources of NO_x. The proposed combustion equipment at the LNG Terminal and Power Plant will be designed to meet all applicable standards and operate in compliance with applicable limitations.

- COMAR 26.11.15 and 26.11.16: Toxic Air Pollutants – Fuel burning equipment as defined in COMAR 26.11.09.01, such as boilers and stationary internal combustion engines associated with the LNG Terminal and the CTG with HRSG associated with the Power Plant, are exempt from the requirements of this chapter.

- COMAR 26.11.17: Requirements for Major New Sources and Modifications – This chapter applies to Major Stationary Sources and Major Modifications with respect to non-attainment pollutants NO_x, VOC and CO. Based on estimated potential emissions from the LNG Terminal emission units, the requirements of this chapter do not apply to NO_x or VOC, as the LNG Terminal will not be a Major Stationary

Source of NO_x or VOC emissions. In addition, the LNG Terminal will not be located in a non-attainment area for CO. Based on estimated potential emissions, the Power Plant will be a Major Stationary Source of NO_x and VOC and, therefore, will be subject to the NNSR requirements in this chapter. The applicable requirements for sources subject to NNSR are summarized in section 9.2.3.1.2.

- COMAR 26.11.29 and 26.11.30: NO_x Reduction and Trading Program – These chapters apply to affected trading sources, which are defined as fossil fuel fired electric generating units that serve a generator with a name plate capacity greater than 25 MW or non-electric generating units that have a maximum design heat input greater than 250 MMBtu/hr. Each of the proposed auxiliary boilers at the LNG Terminal are fossil fuel fired stationary boilers with a maximum design heat input of 350 MMBtu/hr and are, therefore, classified as non-electric generating units subject to the requirements. The CTG with HRSG at the proposed Power Plant would be a fossil fuel fired electric generating unit that would serve a generator with a name plate capacity of approximately 300 MW and will sell electricity. Therefore, the combined cycle Power Plant would also be subject to Maryland's NO_x Reduction and Trading Program. In general, COMAR 26.11.29 requires an affected trading source to acquire sufficient NO_x allowances for the control period each year at least equal to the affected trading source's NO_x emissions for the control period. Allowances from a "set-aside pool" are made available by the MDE to accommodate new affected trading sources or "clean air projects", defined as a new or modified fossil fuel electric generator with state-of-the-art NO_x controls demonstrated to be more efficient than existing electric generation. An affected trading source must also install, operate, maintain, and certify a NOx CEM or other approved monitoring method in accordance with 40 CFR Part 75, Subpart H and comply with the monitoring requirements in 40 CFR Part 96, Subpart H. COMAR 26.11.30 is referenced throughout Chapter 26.11.29 and establishes procedural requirements to implement Maryland's NO_x Reduction and Trading Program. The proposed auxiliary boilers at the LNG Terminal and combined cycle Power Plant will be designed to meet all applicable standards and operate in compliance with applicable monitoring and NO_x emissions trading requirements.

9.3.3.8 PDEP Emission Standards

The Pipeline will not involve the construction of new or modification of existing stationary sources of air pollutant emissions in Pennsylvania, such as a compressor station. Therefore, the portion of the Pipeline in Pennsylvania will not be subject to PDEP air quality control regulations with the exception of those concerning prohibition of certain fugitive emissions (25 Pa.C.S. § 123.1). These requirements are similar in scope and applicability to those Maryland regulations referenced in Section 9.3.3.7 for control of fugitive emissions (COMAR 26.11.06.03.D).

9.3.3.9 Control of Air Pollutant Emissions from Mobile Sources

As discussed in Section 9.3.2, during construction of the Project, AES's contractors will use construction equipment that will result in mobile source emissions of TSP, PM_{10}, NO_X, SO_2, CO, and VOC. These mobile sources would be subject to federal and state regulations and standards applicable to the manufacturer, owner, or operator of the equipment.

A. EPA Regulations for Mobile Source Emissions

EPA has adopted regulations for the control of air pollutant emissions from non-road, mobile source engines (See 40 CFR Parts 89, 90, 91, and 94 for requirements applicable to non-road compression-ignition, spark-ignition, marine spark-ignition and marine compression-ignition engines, respectively). These regulations potentially apply to the manufacturer, owner, or operator of certain of the equipment that will be used to construct and operate the Project. AES will not manufacture, own, or operate any construction equipment and, therefore, is not required to obtain any authorizations from EPA for the air pollutant emissions that will be associated with the use of equipment to construct and operate the Project. In addition, the standards applicable to marine compression-ignition engines (40 CFR Part 94) do not apply to engines on foreign vessels. Any U.S. flagged or registered vessels equipped with affected compression ignition engines manufactured after January 1, 2004 would meet all applicable requirements of this subpart; however, there are currently no U.S. flagged LNG vessels.

B. MDE Regulations for Mobile Source Emissions

MDE also has adopted regulations for the control of air pollutant emissions from certain mobile sources (See COMAR 26.11.20). The MDE regulations include visible emissions standards applicable to ships, motor vehicle emissions control requirements, motor vehicle fuel specifications, diesel vehicle emissions control requirements, heavy duty diesel engine emissions standards and other requirements applicable to certain mobile sources offered for sale or lease in Maryland. AES will not sell or lease any mobile source equipment that may be used to construct and operate the Project and, therefore, is not required to obtain any authorizations from MDE for the air pollutant emissions that will be associated with the use of equipment associated with the Project. AES's contractors will be required to make an assessment of the applicability of these requirements to their equipment and operations.

C. PDEP Regulations for Mobile Source Emissions

25 Pa.C.S. § 126.50 adopt and incorporate by reference certain provisions of the California Exhaust Emission Standards and Test Procedures for Heavy-Duty Diesel Engines and Vehicles. However, the Pennsylvania Heavy-Duty Diesel Emissions Control Program specifically exempts heavy duty diesel engines for offroad use. The PDEP regulations include heavy duty diesel engine emissions standards, testing and other requirements applicable to certain mobile sources offered for sale or lease in Pennsylvania. AES will

not sell or lease any mobile source equipment that may be used to construct and operate the Pipeline in Pennsylvania and, therefore, is not required to obtain any authorizations from PDEP for the air pollutant emissions that will be associated with the use of mobile source equipment associated with the Pipeline construction in Pennsylvania. AES's contractors will be required to make an assessment of the applicability of these requirements to their equipment and operations.

9.3.3.10 General Conformity of Federal Actions

Under the CAA, a general conformity determination is required for any project constituting a federal action that is not otherwise subject to NSR permitting and will be undertaken in a nonattainment or maintenance area, and for which the emissions of certain air pollutants will exceed applicable threshold rates. The portions of the LNG Terminal and the Power Plant that will be subject to NSR permitting are not subject to the general conformity review process. Therefore, only direct and indirect emissions from construction and operation of the Pipeline and from vessel activity, and indirect emissions during operation of the LNG Terminal, are potentially subject to general conformity review. These portions of the Project will be undertaken in Air Quality Control Regions in Maryland, Pennsylvania, and Virginia (LNG ship movements in State of Virginia waters only) that have been designated moderate or marginal ozone nonattainment areas with respect to the 8-hour ozone standard, and will be considered federal actions. As such, these portions of the Project will require a general conformity determination if the estimated actual emissions of NO_x or VOCs, both ozone precursors, will exceed 100 tons per year of NO_x or 50 tons per year of VOC. Based on the estimated emissions summarized in Table 9.3-4, the portions of the Project subject to general conformity review will have NO_x emissions originating both in Maryland and Pennsylvania that will exceed these thresholds during each year of construction of the Project, except 2010 in Pennsylvania. In addition, VOC emissions from construction of the Project in Maryland during 2009 are estimated to exceed the 50 TPY threshold. As summarized in Table 9.3-5, marine vessel emissions originating in Maryland during operation of the Project will also exceed these thresholds for NO_x. Therefore, separate conformity determinations must be made for Maryland and Pennsylvania. Emissions originating in the State of Virginia waters during operation of the Project are estimated not to exceed the applicability thresholds. Therefore, a general conformity review is not required for Virginia for NO_x or VOC.

According to section 176(c)(1) of the CAA (40 CFR § 51.853 and Part 93, Subpart B)[5], a federal agency cannot approve or support any activity that does not conform to an approved SIP. A conformity analysis must show that the emissions would not cause or contribute to new violations of the NAAQS in any area, increase the frequency or severity of any existing violation of any NAAQS, or delay timely attainment of any NAAQS or interim emission reductions. Draft general conformity analyses for Maryland and

[5] Maryland and Pennsylvania have approved general conformity regulations (COMAR 26.11.26.09 and 25 Pa.C.S. § 127.802, respectively), which adopt and incorporate 40 CFR Part 93, Subpart B by reference.

Pennsylvania are currently being performed. AES anticipates that they will be available for submittal to the FERC by April, 2007.

The LNG Terminal facilities and the Pipeline are also within areas designated as non-attainment for $PM_{2.5}$. Applicability is evaluated for direct emissions of $PM_{2.5}$ as well as precursor emissions, which include SO_2, NO_X, VOC and ammonia. As such, the Project will require a general conformity determination if the estimated actual direct $PM_{2.5}$ or SO_2 emissions will exceed 100 TPY, or if emissions of NO_X (unless determined not to be a significant precursor), VOC or ammonia (if determined to be significant precursors) will exceed 100 TPY, or if Pb emissions will exceed 25 TPY. Neither $PM_{2.5}$ or SO_2 emissions from those portions of the Project subject to conformity review will exceed these thresholds in Maryland, Pennsylvania, or Virginia during construction or operation of the Project. However, if $PM_{2.5}$ precursor emissions are required by the applicable SIP to be included in the threshold determination, then NO_X emissions from construction of the Project in Maryland and Pennyslvania (only for 2009), and for operation of the Project in Maryland, will trigger a $PM_{2.5}$ general conformity determination. In that case, separate conformity determinations for $PM_{2.5}$ must be made for Maryland and Pennsylvania.

9.3.3.11 EPA Chemical Accident Prevention Provisions and OSHA Process Safety Management

40 CFR Part 68, Chemical Accident Prevention Provisions, are Federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize impacts when releases do occur. The regulation contains a list of substances and threshold quantities for determining applicability of the rule to a facility. If a facility stores, handles or processes one or more substances on this list and at a quantity equal or greater than specified in the regulation, the facility must prepare and submit a risk management plan (RMP). If a facility does not have a listed substance on-site, or the quantity of a listed substance is below the applicability threshold, the facility is not required to prepare an RMP. However, it still must comply with requirements of the general duty provisions in Section 112(r)(1) of the 1990 CAAA if it has any regulated substance of other extremely hazardous substance on-site. The general duty of the provision is as follows:

> "The owners and operators of stationary sources producing, processing, handling and storing such substances have a general duty to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur."

With the exception of natural gas constituents (*e.g.*, methane, ethane, propane, etc.), no regulated substance would be handled or stored in quantities greater than the applicability threshold. Natural gas pipelines are not covered if they are regulated by the U.S Department of Transportation (USDOT) or an equivalent state natural gas program certified by USDOT in accordance with 49 U.S.C § 60105. In addition, storage of natural gas

incidental to transportation (*e.g.*, gas taken from a pipeline during non-peak periods and placed in storage, then returned to the pipeline when needed) is not covered. Consequently, an RMP is not required for any portion of the Project. AES would be required to maintain awareness of hazard issues and meet the goals of the above-listed general duty provisions.

The applicability of the Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals (PSM), to the Project was also evaluated. Based on standard interpretations published by OSHA in response to questions on PSM applicability to LNG facilities, OSHA has concluded that current USDOT regulations in 49 CFR Parts 192 and 193 and enforced by the Pipeline and Hazardous Materials Safety Administration cover LNG and gas transmission and distribution processes, and that OSHA is precluded from enforcing the PSM standard with respect to working conditions associated with fire and explosion hazards of these processes. Therefore, the Pipeline and LNG Terminal, which are subject to 49 CFR Parts 192 and 193, respectively, are not subject to the PSM regulations.

9.3.4 Potential Air Quality Impacts of Proposed Project Due to Construction

Emissions due to construction of the Pipeline, LNG Terminal, dredging activities and the nonjurisdictional Power Plant were separately analyzed in Section 9.3.2 of this Resource Report, and the estimated construction emissions are summarized by Project component, by state, by AQCR, by year and for the entire Project in Table 9.3-4. Construction emissions and impacts will be restricted to the construction period, approximately three years in total, and will terminate once construction has been completed. In addition, emissions from Pipeline construction will not be concentrated for any extended period within any particular location along the Pipeline route. Based on this analysis, direct emissions from combustion equipment, indirect emissions from commuting construction workers and from haul trucks, and fugitive dust emissions are not expected to significantly impact ambient air quality in the Project Area.

Project construction emissions will need to be further assessed to support this conclusion in accordance with the General Conformity requirements. As discussed in Section 9.3.3.10, the general conformity determination for non-exempt federal actions must demonstrate compliance with applicable provisions of the Maryland and Pennsylvania SIPs, such that construction and operation of the proposed Project will not delay attainment of the ozone and $PM_{2.5}$ NAAQS. Mitigation measures required to comply with general conformity include a demonstration of consistency with applicable control measures and regulations that are relied upon in the applicable SIP, a demonstration that direct and indirect emissions have been identified and accounted for in the SIP attainment demonstration or the emissions must be offset through a SIP revision or other enforceable measure so that there is no net increase in emissions. In addition, mitigation measures to suppress fugitive dust generation during Project construction will be implemented as discussed in Section 9.3.6.

9.3.5 Potential Impact of Proposed Project Due to Facility Operation

As discussed in Section 9.3.2, the LNG Terminal and nonjurisdictional Power Plant will have permanent stationary sources of air pollution resulting in long term air pollutant emissions. The Pipeline and dredging activities associated with the LNG Terminal will not involve the construction of new or modification of existing stationary sources of air pollutant emissions and, therefore, will not have any long term air quality impacts. The primary air emissions sources at the proposed LNG Terminal will include natural gas fired auxiliary boilers controlled with state-of-the art emissions control systems to meet applicable LAER requirements for NO_x, as described in Section 9.3.6. Use of these controls to meet stringent emissions limitations will minimize ambient impacts from the LNG Terminal. The LNG Terminal will also include a number of small diesel engines used for emergency fire water pumping and standby electricity generation that will only operate during emergency conditions or electrical power interruptions..

If AES decides to construct the Power Plant, a CTG with HRSG would be added to the LNG Terminal and provide different operating scenarios for the auxiliary boilers. Estimated premise emissions with the Power Plant would classify the premise as a Major Stationary Source under EPA and MDE regulations and emissions from all sources at the LNG Terminal and Power Plant would be required to meet LAER for NO_x and VOC emissions and BACT for CO and SO_2 emissions. The proposed CTG with HRSG and the LNG Terminal boilers would each be equipped with state-of-the-art emission controls to meet stringent LAER or BACT requirements, as applicable and as described in Section 9.3.6, to minimize ambient impacts from the Power Plant and LNG Terminal.

Regardless of potentially applicable PSD modeling requirements, a preliminary air quality modeling analysis of both LNG Terminal options (with and without the Power Plant) is currently being performed to satisfy the FERC's Resource Report 9 requirement to summarize anticipated air quality impacts for the Project. This modeling analysis will include an analysis of impacts from the LNG Terminal with and without the Power Plant, and an analysis of impacts from LNG ship offloading operations. A separate model run will also be performed including the effects of marine vessels associated with LNG ship movements in the Project Area. Specific ship/marine vessel movements to be included in the model are being reviewed with the FERC staff. AES anticipates that a summary of this modeling analysis will be available for submittal to the FERC in January 2007.

9.3.6 Mitigation of Air Quality Impacts

9.3.6.1 Construction Air Quality Impacts Mitigation

The construction of the Project will result in minor, short-term impacts to local ambient air quality. The following actions may be used to minimize these impacts:

- Require contractors to meet all federal, state and local air quality regulations and emission standards applicable to their equipment;
- Apply water or dust suppressants to disturbed areas, as necessary, to reduce vehicle traffic dust;
- Cover open hauling trucks with tarps, as necessary;

- Use paved roads for construction vehicle traffic, wherever practical;
- Limit vehicle speeds as required to reduce dust generation;
- Respond promptly to any significant particulate emission concerns that occur during construction by evaluating the source of emissions and ensuring all practicable mitigation measures are being implemented; and
- Upon completion of construction activity, stabilize disturbed areas.

In addition, mitigation measures required to comply with general conformity will be implemented. These measures include a demonstration of consistency with applicable control measures and regulations that are relied upon in the SIP, a demonstration that direct and indirect emissions have been identified and accounted for in the SIP attainment demonstration or the emissions must be offset through a SIP revision or other enforceable measure so that there is no net increase in emissions.

9.3.6.2 Operational Air Quality Impacts Mitigation

The emissions control systems proposed for the auxiliary boilers at the LNG Terminal would include low-NO_x burners and/or flue gas recirculation for preliminary NO_x control, SCR for final NO_x control and oxidation catalysts for CO control. The proposed emissions controls and stringent emissions limitations were determined from a preliminary review of recent BACT and LAER determinations for similar boilers and preliminary vendor guarantees; they are considered to be state-of-the-art for these types of sources. A tabular summary of a more complete review of BACT/LAER determinations (Table 9.3-7) is being generated and will be included with the formal filing in January 2007. The proposed NO_x, CO, and VOC emissions levels from the auxiliary boilers are 3, 10, and 10 ppmvd at three percent O_2, respectively. As discussed in Section 9.3.3, these emissions levels will easily comply with applicable federal and state emission standards. The exclusive use of natural gas in these combustion sources will also minimize emissions and impacts of SO_2 and $PM_{10}/PM_{2.5}$.

The emissions control systems proposed for the CTG with HRSG at the Power Plant would include dry low-NO_x combustors (DLN) for initial NO_x control in the CTG, SCR for final NO_x control and oxidation catalysts for CO control. The proposed emissions controls and stringent emissions limitations were determined from a preliminary review of recent BACT and LAER determinations for similar combined cycle power plants (see Table 9.3-8) and preliminary vendor guarantees; they are considered to be state-of-the-art for these types of sources. A tabular summary of a more complete review of BACT/LAER determinations (Table 9.3-8) for combined cycle power plants is being generated and will be included with the formal filing in January 2007. The proposed NO_x, CO, and VOC emissions levels from the CTG with HRSG are 2, 3, and 5 ppmvd at three percent O_2, respectively. As discussed in Section 9.3.3, these emissions levels will easily comply with applicable federal and state emission standards. The exclusive use of natural

gas in these combustion sources will also minimize emissions and impacts of SO_2 and $PM_{10}/PM_{2.5}$.

9.4 Noise Quality

The construction and operations of the Project will generate noise. AES will utilize noise control measures, as necessary, to reduce the Project's potential adverse effects to surrounding areas and to ensure compliance with federal, state, and local regulations. This section:

- Outlines applicable federal, state, and local noise standards;
- Identifies noise sensitive areas (NSAs) and areas of concern identified in the applicable standards;
- Quantifies existing background noise levels;
- Assesses construction and operational noise and its effects; and,
- Outlines potential mitigation.

9.4.1 Noise Overview

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies according to the type and characteristics of the noise source, distance between source and receiver, and receiver sensitivity. Sound levels are expressed in units of decibels. The term decibel (dB) implies a logarithmic ratio of the measured pressure to a reference pressure. This reference pressure refers to a pressure just barely detectable by the human ear. The human ear responds differently to sounds at different frequencies. To adjust for the different "loudness" levels as perceived by humans, a standard "A" weighting curve (dBA) is applied to measured sound levels.

Because noise levels can vary over a given time period, they are further quantified using different time weighted sound metrics. Two of these metrics commonly used to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (Leq) and the day-night sound level (Ldn). Leq is an average of sound energy over a given time expressed in dB. Ldn is a weighted 24-hour average of sound energy that takes into account the time of day the noise is encountered. Late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are adjusted by 10 dB, to account for people's greater sensitivity to sound during the nighttime hours.

9.4.2 Regulatory Overview

In 1974, EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" (EPA 1974). This publication evaluates the effects of environmental noise with respect to health and safety. The document provides information to help agencies develop noise standards and regulations. EPA recommends that Ldn should not exceed 55 dBA to protect public welfare. FERC has adopted the EPA's recommendations and requires

that the sound attributable to new facilities not exceed an Ldn of 55 dBA at the nearest NSA (18 CFR § 380.12(k)(4)(v)); unless such NSAs are established after facility construction. FERC guidelines also require that a project not result in a perceptible increase in vibration at any NSA.

The State of Maryland's Environmental Noise Act of 1974 limits noise to that level which will protect the health, general welfare, and property of the people of the State. The State of Maryland limits both the overall noise environment and the maximum allowable noise level in residential, industrial, and commercial areas. For residential activities the overall noise level are the same as the FERC standard (55 dBA Ldn). Construction and demolition activities are exempt from the limits outlined in Table 9.4-1 and 9.4-2 during the daytime hours. For construction and demolition activities a person may not cause or permit noise levels which exceed 90 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) or levels specified in table 9.4-2 during nighttime hours. In addition, a maximum allowable noise levels associated with pile driving activities are specifically exempted from the regulations between the hours of 8:00 a.m. and 5:00 p.m. (COMAR 26.02.03).

The State of Maryland's noise standard also states a person may not cause or permit, beyond the property line of a source, vibration of such direct intensity to cause another person to be aware of the vibration by such direct means as sensation of touch or visual observation of moving objects. This is consistent with the Federal regulation.

Although Baltimore County, Maryland maintains a planning noise ordinance, the local code does not set strict noise levels or standard not to be exceeded. It does prohibit the establishment of a facility or activity that will generate noise as to interfere with the welfare of other nearby land uses (Baltimore County 2006). Both the federal and the state noise regulations are more restrictive and concise than the local ordinance.

9.4.3 Existing Noise Levels

<Preparer's note: A more comprehensive analysis (including modeling utilizing available manufacturer specifications for major sheltered and unsheltered equipment) will be developed to adequately predict noise levels for the LNG project, and provide results of that analysis will be available for the formal filing in January 2007. Specifics as to the ambient environment (weather conditions, times of day, and other noise sources present) will be provided with the noise measurements or predictions. >

FERC identifies residences, schools, hospitals, churches, and similar uses as NSAs. Figure 9.4-1 identifies the nearest NSAs and land uses near the Terminal Site. There are no NSAs within one mile of the proposed LNG Terminal. The nearest NSA (NSA#1) is a Dundalk residence approximately 5,450 feet north of the proposed Terminal Site. The other NSA identified includes an Edgemere residence (NSA#2) (9,400 feet away).

No existing baseline noise level measurements are known for the Terminal Site. Several significant existing sources of noise near the proposed Terminal Site currently exist including local road traffic, water-based traffic, maintenance dredging activities, and other industrial activities. Existing noise levels (Ldn and Leq(24)) were

quantified at the nearest NSA (NSA#1) and areas covered by the State of Maryland's noise control regulations (Table 9.4-3). The existing noise climate was estimated using the techniques specified in the "American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound. Part 3: Short-term measurements with an observer present"; Section 9.3.2 "Table look-up method to determine the long-term background sound level", ANSI S 12.9-1993 (R2003)/Part 3.

9.4.4 Noise Impacts

Construction and operation of the Project will have no significant impacts on any NSA. Noise levels will be below both the federal and state noise control standards. AES intends to comply with all applicable local and state noise regulations outlined in Section 9.4.3. The noise impact at noise-sensitive areas will be calculated, including information on how the impact was calculated, equipment manufacturer's data and proposed noise control equipment (as available). Noise impacts for the following activities were assessed:

- LNG Terminal and Power Plant construction and Pipeline construction along the construction right-of-way - including heavy machinery and HDD operations;
- Operation of Pipeline facilities including mainline valve facilities and interconnection tie-in locations;
- Operation of the LNG Terminal and Power Plant (including major sheltered and unsheltered noice producing equipment) ; and,
- Dredging operations.

9.4.4.1 Construction

The most likely sources of noise generation during the construction phase of the Project are trenching and pipelaying activities, construction of the LNG Terminal, and HDD operations at waterbody crossings. The specific impact of construction activities on the nearest receptors will vary during the construction period depending on the type, number, and loudness of equipment in use at any given time.

Individual pieces of construction equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet. With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of active construction sites. The zone of relatively high construction noise levels typically extends to distances of 400 to 800 feet from the site of major equipment operations. Locations more than 1,000 feet from construction sites seldom experience substantial levels of construction noise. Table 9.4-4 presents typical noise levels (dBA at 50 feet) that EPA has estimated for the main phases of outdoor construction.

Trenching and pipelaying activities will cause temporary increases in ambient noise levels near the construction areas. The majority of the trenching and pipelaying activities will be conducted during daytime hours. At certain locations where traffic and/or road-use restrictions will affect the construction

schedule, construction will proceed during late evening hours. Equipment will not be fixed in one location for long durations, but will progress along the construction right-of-way. Trenching and pipelaying noise will be temporary, and will subside at any particular location as construction progresses to subsequent segments of the Pipeline.

As outlined in Resource Report 8, *Land Use, Recreation and Aesthetics*, AES will file a site-specific Residential Mitigation Plan for properties where construction will occur within 25 feet of a residence. These plans will outline reporting, monitoring, and mitigation procedures to address specifically noise issues. Mitigation measures, as summarized in Resource Report 8, will also be employed for all residences within 50 feet of the construction right-of-way. The period of construction near the residences will be compressed as much as possible to reduce adverse noise effects to nearby residents.

Construction of the LNG Terminal and Power Plant will similarly cause temporary increases in ambient noise levels. The majority of the construction will be conducted during daytime hours and will be temporary in nature. Pile driving for the LNG storage tank foundations and the pier will generate the most intense noise at approximately 98 dBA (WCB 2000). Assuming a 4.5 dB reduction per doubling of distance (HUD 1985), the noise levels associated with the pile driving activities at the nearest NSA will be approximately 67 dBA. This does not exceed the 90 dBA daytime threshold outlined in the State of Maryland noise regulations. In addition, pile-driving activities are specifically exempted from the noise regulation between the hours of 8:00 a.m. and 5:00 p.m. Pile driving activities are be intermittent by nature and will not be conducted during nighttime hours (10:00 p.m. to 7:00 a.m.). The other NSA is farther away from the construction site and across land. Therefore, noise levels due to the Project at the other NSA and associated effects will be less than that at NSA#1. All other construction activities will be quieter than the pile driving activities, and subsequently will not have an adverse effect on near-by land uses or NSAs.

Construction of the Pipeline will likely involve the installation of HDD segments. HDD activities will proceed according to a 24-hour schedule. Although this will introduce nighttime noise at HDD sites, the 24-hour construction schedule will limit the overall duration (in months) of noise associated with these activities. The specific locations of the entry point and exit point for the HDDs have not yet been finalized. The expected noise impacts from the HDD operations will be quantified and proposed means to control construction noise from HDD operations will be established once the design has been finalized and the distances to NSAs can be established. AES is currently in the process of evaluating potential mitigation measures if they become necessary including, but not limited to the use of mufflers, sound barriers, and equipment and work area enclosures. Any adverse effects that will occur during HDD operations will be of a temporary nature and cease with completion of construction activities. AES will evaluate potential noise levels associated with the HDD installed pipeline segments as the design becomes more refined. AES will submit a summary evaluation for potential noise impacts of proposed HDD locations by the first quarter of 2007.

9.4.4.2 Pipeline Facilities Operation

The aboveground facilities proposed for the Project include an estimated four to six mainline valve facilities, and three interconnection tie-in locations with the Columbia, Transco and Tetco systems. The mainline valve facilities and interconnection tie-in locations will not have loud equipment and will not generate substantial noise during their operation. The Project will not involve the operation of any compressor facilities; therefore, the only detectable noise that will result from operation of the Pipeline facilities will be that associated with intermittent maintenance activity or pressure regulation equipment. Adverse noise effects associated with maintenance activities will be short-term and generally will not be considered significant. AES will evaluate potential impacts and implement mitigating measures (as necessary) associated with the pressure regulating equipment during the detailed engineering.

9.4.4.3 LNG Terminal Facilities Operation

The proposed site for the LNG Terminal is in a historically industrial area. Previous and current land uses at, or directly adjacent to, the site include industrial shipyard repair, the former steel mill, ship decommissioning activities, and a existing power generation facility. These types of activities typically generate industrial noise similar to those associated with the proposed facility. There will be no change in the associated land use category (industrial) and no significant change in the overall noise environment when compared to historical use of the site.

Equipment noise levels for the proposed LNG Terminal were combined with the ambient noise levels to estimate future noise levels. Noise levels were subsequently assessed with regard to FERC and the State of Maryland noise standards. The LNG Terminal and Power Plant are in the design stages. Therefore, an exact equipment list and associated manufacturers specifications are not available at this time. However, the major noise producing equipment associated with the LNG Terminal will include heaters, pumps, compressors, and emergency generator(s). All major noise producing equipment will be contained inside shelters, which will be fabricated with noise reducing material. Other potential noise sources such as the LNG sendout equipment, booster air compressor, and nitrogen compressor will not be contained inside shelters; however, their noise levels are not expected to be significant.

Most of the equipment associated with the LNG Terminal and Power Plant (if constructed) is commonly designed for noise levels not to exceed 85 dBA in the near field. Specifications are based on sound power measurements of individual pieces of equipment taken in an enclosed space. They are specifically used for designing spaces and facilities with multiple pieces of sound generating equipment. Therefore, 95 dBA is conservative estimate of noise being generated by many pieces of equipment running at full load simultaneously. Assuming a 20-dBA noise reduction from the shelters and site berm interference and using the 4.5-dB reduction per doubling of distance (HUD 1985), the operation noise level at the nearest NSA will be approximately 43 dBA. Combining the operation noise with ambient noise

levels (51 dBA) results in an Ldn of 52 dBA at the nearest NSA. The Ldn at the nearest NSA with this additional noise will be 52.4 dBA, which is below the applicable regulatory standards. This initial calculation and comparison will be updated based on a more comprehensive analysis to adequately predict noise levels for the LNG project (results of that analysis will be available for the formal filing in January 2007). This represents a negligible (unnoticeable) noise increase. The other NSAs are farther away from the Terminal Site and will be less affected by Project-related operation noise. Based on similar assumptions, the maximum Leq just outside the boundaries of the Terminal Site will be approximately 75 dBA. Therefore, the noise at the property boundary will not exceed the maximum allowable or overall noise standards outlined in the State of Maryland noise control regulation. This analysis is very conservative in that it assumes that many pieces of equipment are running at full power, simultaneously, 24 hours a day. It also does not account for noise attenuation due to ground effects, intervening vegetation or masking due to other industrial noises present. Specifically, as shown on Figure 9.4-1, there is a large interstate highway (I-695) located north between the LNG Terminal Site and NSA #1 and industrial (steel mill) operations located northeast between the LNG Terminal Site and NSA #2.

9.4.4.4 Dredging Operations

<Preparer's Note: Since dredging will likely be a 24-hour operation, and it is the construction activity that appears to be closest to noise sensitive area (NSA) 1, a more detailed noise analysis will be performed and included in the formal filing in January 2007. This analysis will incorporate new and maintenance dredging activities.>

The Project includes widening and deepening the existing approach channel and turning basin at Sparrows Point to accommodate the larger ships expected at the LNG Terminal than have utilized the existing shipyard, floating dry dock and graving yard/coal channel (south of the proposed Terminal Site). The approach channel expansions will be performed primarily by use of mechanical clamshell dredge or an environmental bucket technology, if required, with some limited areas near shore excavated by backhoe dredge. Noise levels associated to the dredging activities are expected to similar to the construction activities (Section 9.4.4.1). Although, dredging activities will most likely be closer to the NSA#1, levels at NSA#1 will be equal to or less than with on-shore construction. Even with the dredging activities taking place, the pile driver is anticipated to be the loudest source of noise at NSA#1. Therefore, dredging activities (both during the construction phase and as may be associated with any maintenance dredging) are not anticipated to exceed either the federal, or state noise control standard.

9.4.5 Noise Mitigation Measures

AES is currently evaluating noise control measures to be implemented at the LNG Terminal and construction activities associated with the proposed Project. The following is a list of some of the noise control measures AES is evaluating. This list of noise mitigation measures is not an exhaustive list. AES proposes to avoid and minimize noise effects from the Project by:

- Limiting construction primarily to normal weekday daylight or business hours, specifically in areas adjacent to noise sensitive land uses such as residential areas, recreational areas, and any off-post areas, with the exception of HDDs;
- Ensuring construction equipment mufflers will be properly maintained and in good working order;
- Coordinating with residence owners and/or tenants prior to unavoidable construction activities in residential areas;
- Designing the HDD to minimize potential noise and duration of construction;
- Designing the LNG Terminal and Power Plant, through building and other equipment specifications (such as silencers, mufflers, engineered sound enclosures, etc), to mitigate noise and meet or exceed both FERC and the State of Maryland noise standards (information to be incorporated in noise analysis, as available, with formal filing in January 2007 and submitted to FERC as the final project detailed design is completed);
- Enclosing most major noise generating equipment within suitable shelters at the LNG Terminal and Power Plant; and
- Within 60 days of completion, performing a post-construction sound survey at the Terminal Site. If the noise attributable to the operation of the terminal or power generation facility does not fully comply with federal, state and local noise regulations, additional noise controls will be installed within one year of the in-service date to meet this level.

9.5 References

1. National Climatic Data Center (NCDC), surface meteorological data for National Weather Service station located at Baltimore-Washington International Airport.

2. USEPA AirData website: http://www.epa.gov/air/data/reports.html

3. Title 26, Subtitle 11 of the Code of Maryland Regulations:

   Chapter 01 – General Administrative Provisions
   Chapter 02 – Permits, Approvals and Registration
   Chapter 03 – Permits, Approvals and Registrations – Title V Sources
   Chapter 04 – Ambient Air Quality Standards
   Chapter 05 – Air Pollution Episode System
   Chapter 06 – General Emission Standards, Prohibitions and Restrictions
   Chapter 09 – Control of Fuel-Burning Equipment, Stationary Internal Combustion Engines and Certain Fuel-Burning Installations
   Chapter 15 – Toxic Air Pollutants
   Chapter 17 – Requirements for Major New Sources and Modifications
   Chapter 20 – Mobile Sources
   Chapter 26 – Conformity

4. 40 CFR § 52.21 - Prevention of Significant Deterioration

5. 40 CFR Part 60, Subpart A - General Provisions

6. 40 CFR Part 60, Subpart Db - Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

7. 40 CFR Part 60, Subpart KKKK - Standards of Performance for Stationary Combustion Turbines

8. 40 CFR Part 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

9. 40 CFR Part 63, Subpart DDDDD - National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters

10. 40 CFR Part 68 – Chemical Accident Prevention Provisions

11. 40 CFR Part 72 - Permits Regulation (Acid Rain Program)

12. 40 CFR Part 75 - Continuous Emission Monitoring (Acid Rain Program)

13. Baltimore County (2006). 1998 Baltimore County Zoning Regulations Edition, v15 Updated 02-15-2006.
14. Code of Maryland Regulations (COMAR). Title 26 Subtitle 02 Chapter 03 Control of Noise Pollution

15. U.S. Environmental Protection Agency (USEPA). 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. Publication NTID300.1. Washington, D.C.

16. U.S. Environmental Protection Agency (USEPA), 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, EPA-550/9-74-004. Office of Noise Abatement and Control, Washington, D.C.

17. American National Standard Institute (ANSI). 2003. American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound. Part 3: Short-term measurements with an observer present. ANSI S 12.9-1993 (R2003)/Part 3.

18. U.S. Department of Housing and Urban Development (HUD). 1985. The Noise Guidebook. HUD 953-DPC.

19. Worker's Compensation Board of British Columbia (WCB). 2000. Construction Noise. ARCS Reference No: 0135-20

TABLES

Resource Report 9- Air and Noise Quality
Table 9.3-1
National and Maryland Ambient Air Quality Standards [a]
AES Sparrows Point Project

Pollutant	Averaging Period	National AAQS		Maryland AAQS	Pennsylvania AAQS
		Primary ($\mu g/m^3$)	Secondary ($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
SO_2	3-Hour	---	1300	1300	1300
	24-Hour	365	---	365	365
	Annual	80	---	80	80
NO_2	Annual	100	100	100	100
O3 (ppm)	1-Hour[b]	0.12	0.12	0.12	0.12
	8-Hour	0.08	0.08	0.08	0.08
$PM_{2.5}$	24-Hour	65	65	65	65
	Annual	15	15	15	15
PM_{10}	24-Hour	150	150	150	150
	Annual	50	50	50	50
TSP	Annual	---	---	---	---
CO	1-Hour	40,000	40,000	40,000	40,000
	8-Hour	10,000	10,000	10,000	10,000
Lead	3-Month[c]	1.5	---	1.5	1.5
Gaseous Fluorides [d]	24-Hour	---	---	1.2	5
	72-Hour	---	---	0.4	

Notes:

(a) All short-term (24 hours or less) values are not to be exceeded more than once per year, except $PM_{2.5}$, for which the 3-year average of the 98th percentile of 24-hour concentrations must not exceed the listed value. All long-term values are not to be exceeded, except for $PM_{2.5}$, for which the 3-year average of the annual arithmetic mean is not to exceed the listed value. To attain the 8-hr ozone standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured over each year must not exceed 0.08 ppm. Standards for fluorides, beryllium, and hydrogen sulfide are not to be exceeded.

(b) The 1-hour ambient air quality standard for ozone no longer applies after June 15, 2005, or on such later date as the revocation of the 1-hour standard is effective.

(c) Maximum arithmetic mean averaged over a calendar year quarter.

(d) MDE also has a standard for total fluorides in and on field crops, forage for consumption by grazing ruminants and trees, grases, herbs, etc.

Resource Report 9- Air and Noise Quality
Table 9.3-2
Intrastate Air Quality Control Regions Attainment Status
AES Sparrows Point Project

Criteria Pollutant	Metro. Baltimore Intrastate AQCR 115 (Baltimore and Harford Counties, MD)	Eastern Shore Intrastate AQCR 114 (Cecil County, MD)	Metro. Philadelphia Interstate AQCR 045 (Chester County, PA)	South Central PA Intrastate AQCR 196 (Lancaster County, PA)
Sulfur Dioxide (SO_2)	Better than National Standards	Better than National Standards	Better than National Standards	Better than National Standards
Carbon Monoxide (CO)	Unclassifiable / Attainment	Unclassifiable / Attainment	Unclassifiable / Attainment	Unclassifiable / Attainment
Ozone, 1-Hour ($O_{3)}$	Nonattainment (severe 15)	Nonattainment (severe-15)	Nonattainment (severe-15)	Nonattainment (marginal)
Ozone, 8-Hour ($O_{3)}$	Nonattainment (moderate)	Nonattainment (moderate)	Nonattainment (moderate)	Nonattainment (marginal)
Nitrogen Dioxide (NO_2)	Cannot be classified or better than National Standards	Cannot be classified or better than National Standards	Cannot be classified or better than National Standards	Cannot be classified or better than National Standards
Total Suspended Particulate (TSP)	Nonattainment (portions of AQCR)	Better than National Standards	Does not meet secondary standards or cannot be classified (depending on location)	Does not meet secondary standards or cannot be classified (depending on location)
PM-2.5	Nonattainment	Unclassifiable / Attainment	Nonattainment	Nonattainment
PM-10	Unclassifiable / Attainment	Unclassifiable / Attainment	Unclassifiable / Attainment	Unclassifiable / Attainment

Resource Report 9- Air and Noise Quality
Table 9.3-3
Ambient Monitor Data for Project Area Air Quality Control Regions
AES Sparrows Point Project

Ambient Data from Monitoring Stations As Noted In Applicable MD and PA AQCRs [a]

Pollutant	Averaging Period	MDE Air Quality Monitoring Data (2003-2005)		PADEP Air Quality Monitoring Data (2003-2005)		NAAQS		
		AQCR 115	AQCR 114	AQCR 045	AQCR 196	Standard	Units	Standard Type[a]
PM-2.5	24-hour	38.6	33.3	40.7	50.0	65	$\mu g/m^3$	Primary and Secondary
	Annual	15.1	13.2	15.3	17.5	15	µg/m3	Primary and Secondary
PM-10	24-hour	50.7	48.7	65.0	56.7	150	µg/m3	Primary and Secondary
	Annual	23.3	21.3	21.7	20.0	50	µg/m3	Primary and Secondary
NO_2	Annual	0.02	0.006	0.018	0.014	0.053	ppmv	Primary and Secondary
SO_2	3-hour	0.066	0.066	0.043	0.044	0.5	ppmv	Secondary
	24-hour	0.017	0.017	0.022	0.019	0.14	ppmv	Primary
	Annual	0.005	0.005	0.006	0.005	0.03	ppmv	Primary
CO	1-hour	5.9	2.5	2.1	2.8	35	ppmv	Primary
	8-hour	2.7	1.6	1.5	1.6	9	ppmv	Primary
Pb	Quarterly	ND	ND	0.04	0.04	1.5	µg/m3	Primary and Secondary
Ozone	1-hour	0.103	0.119	0.109	0.106	0.12	ppmv	Primary and Secondary
	8-hour	0.08	0.089	0.087	0.083	0.08	ppmv	Primary and Secondary

Monitoring Sites (IDs) Used to Represent Background Ambient Concentrations:

Pollutant	MDE Air Quality Monitoring Data		PADEP Air Quality Monitoring Data	
	AQCR 115	AQCR 114	AQCR 045	AQCR 196
PM-2.5	240053001, 245100008 and 245100035	240150003	420290100	420710007
PM-10	240053001, 245100008 and 245100035	240053001	420450002	420770007
NO_2	240053001 and 245100040	240259001	420910013 and 420450002	420710007
SO_2	240053001	240053001	420910013 and 420450002	420710007
CO	245100040	240051007	420910013	420710007
Pb			420450002	420450002
Ozone	240051007 and 240130001	240251001 and 240259001	420290100	420710007

[a] Three-year average concentrations (2003-2005) from monitoring locations as noted. Short-term values based on second highest monitored values. Annual averages based on maximum values for monitoring location and year.

[b] Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limit to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

Resource Report 9- Air and Noise Quality
Table 9.3-4
Construction Phase Emissions Summary
AES Sparrows Point Project

AQCRs 115, 114, 196, and 045 Construction Emissions Summary (Annual Emissions in Tons)
All Emissions From LNG Terminal Construction Activities in AQCR 115
All Emissions From Pipeline Construction Activities in AQCR 114, 196 and 045

AQCR-115 (MD)	2008	2009	2010
PM10/PM2.5	20.12	46.83	11.06
NOX	389.76	774.70	195.29
SO2	7.22	21.48	7.16
CO	216.71	499.02	127.84
VOC	39.19	95.48	21.57
NH3	0.34	0.33	0.14
Acetaldehyde	2.08	5.06	1.14
Acrolein	0.12	0.29	0.06
Benzene	0.78	1.91	0.43
1,3-Butadiene	0.08	0.19	0.04
Formaldehyde	4.62	11.27	2.54

AQCR-196 (PA)	2008	2009	2010
PM10/PM2.5		4.27	0.54
NOX		60.45	7.75
SO2		2.67	0.33
CO		45.06	6.60
VOC		8.95	1.20
NH3		0.06	0.01
Acetaldehyde		0.47	0.06
Acrolein		0.03	0.00
Benzene		0.18	0.02
1,3-Butadiene		0.02	0.00
Formaldehyde		1.06	0.14

General Conformity Applicability Thresholds
(TPY)
100
100
100
50
*

AQCR-114 (MD)	2008	2009	2010
PM10/PM2.5		4.84	0.22
NOX		65.41	3.23
SO2		1.98	0.14
CO		49.88	2.83
VOC		10.52	0.51
NH3		0.07	0.00
Acetaldehyde		0.56	0.03
Acrolein		0.03	0.00
Benzene		0.21	0.01
1,3-Butadiene		0.02	0.00
Formaldehyde		1.24	0.06

AQCR-045 (PA)	2008	2009	2010
PM10/PM2.5		16.77	2.11
NOX		237.23	30.42
SO2		10.49	1.31
CO		176.83	25.88
VOC		35.12	4.71
NH3		0.23	0.03
Acetaldehyde		1.86	0.25
Acrolein		0.11	0.01
Benzene		0.70	0.09
1,3-Butadiene		0.07	0.01
Formaldehyde		4.14	0.56

(TPY)
100
100
100
50
*

Total MD	2008	2009	2010
PM10/PM2.5	20.12	51.67	11.28
NOX	389.76	840.11	198.53
SO2	7.22	23.46	7.30
CO	216.71	548.89	130.67
VOC	39.19	106.00	22.07
NH3	0.34	0.39	0.15
Acetaldehyde	2.08	5.62	1.17
Acrolein	0.12	0.32	0.07
Benzene	0.78	2.12	0.44
1,3-Butadiene	0.08	0.21	0.04
Formaldehyde	4.62	12.51	2.60

Total PA	2008	2009	2010
PM10/PM2.5	0	21.05	2.64
NOX	0	297.69	38.17
SO2	0	13.16	1.64
CO	0	221.90	32.48
VOC	0	44.06	5.91
NH3	0	0.29	0.04
Acetaldehyde	0	2.34	0.31
Acrolein	0	0.13	0.02
Benzene	0	0.88	0.12
1,3-Butadiene	0	0.09	0.01
Formaldehyde	0	5.20	0.70

(TPY)
100
100
100
50
*

* Pending determination whether PM-2.5 precursors will be included in the SIP.

Resource Report 9- Air and Noise Quality
Table 9.3-5
Operating Phase Emissions Summary - Criteria Pollutants
AES Sparrows Point Project

	(Tons/year)					
	NOX	**CO**	**VOC**	**PM-10/2.5**	**SOX**	**NH3**
LNG Terminal						
Auxiliary Boilers w/out Power Plant	18.7	34.2	21.2	43.7	0.5	10.0
1 Fire Pump (Fresh Water)	0.1	0.05	0.003	0.01	0.01	0.002
6 Fire Pumps (Salt Water)	1.0	0.4	0.02	0.03	0.6	0.003
1 Standby Generator	0.8	0.06	0.02	0.004	0.4	0.01
1 Vent Stack Heater	0.001	0.003	0.003	0.001	0.001	0.0004
Total LNG Terminal w/out LNG Ship Offloading (w/out Power Plant)	**20.5**	**34.8**	**21.3**	**43.7**	**1.6**	**10.0**
LNG Ship Offloading Operations	132.1	30.6	3.5	3.7	33.5	1.78
Total LNG Terminal + LNG Ship Offloading (w/out Power Plant)	**152.6**	**65.4**	**24.8**	**47.5**	**35.1**	**11.8**
Power Plant						
CTG + HRSG (Scenario 1)	90.2	130.5	46.9	71.0	1.1	150.1
CTG + HRSG (Scenario 2)	80.2	116.0	14.0	57.8	1.0	133.5
Auxiliary Boilers (Scenario 1)	1.6	3.2	1.9	3.8	0.04	0.9
Auxiliary Boilers (Scenario 2)	8.7	15.5	9.3	19.2	0.2	4.4
Cooling Tower				2.5		
Total Power Plant (Worst-Case Scenario)	**91.8**	**133.6**	**48.7**	**79.5**	**1.2**	**151.0**
Total Stationary Sources + LNG Ship Offloading (w/ Power Plant)	**225.7**	**164.8**	**52.3**	**83.2**	**35.8**	**152.8**
PSD Thresholds	100	100	100	100	100	NA
NNSR Thresholds	25	NA	25	100	NA	**
Marine Emissions						
LNG Ship Maneuvering/Berthing, hoteling, incl. tugs, security and escort vessels (total)	348.1	64.4	6.3	9.3	60.2	3.29
In State of MD Waters	277.9	47.9	4.4	7.3	43.1	2.33
In State of VA Waters	70.2	16.5	1.8	1.9	17.2	0.96
Dredge Maintenance Activities ***	28.77	7.91	1.52	1.07	0.49	0.02
Indirect Commuting Emissions	0.83	7.33	0.60	0.008		0.006
Total Marine, Maint. Dredging and Indirect Emissions *	**377.7**	**79.6**	**8.4**	**10.3**	**60.7**	**3.31**
In State of MD	307.5	63.2	6.6	8.4	43.5	2.36
In State of VA	70.2	16.5	1.8	1.9	17.2	0.96
General Conformity Applicability Thresholds	100		50	100	100	**

* Annual emissions during the operational phase of the Project are currently not estimated to vary from year to year.
** Pending determination whether PM-2.5 precursors will be included in the SIP.
*** Represents worst-case annual emissions as dredge maintenance activities assumed to occur approximately one month every threee years.

Resource Report 9- Air and Noise Quality
Table 9.3-6
Operating Phase Emissions Summary - Hazardous Air Pollutants
AES Sparrows Point Project

Tons/Year			
Pollutant	**Total Stationary Sources + LNG Offloading w/out Power Plant**	**Total Stationary Sources + LNG Offloading w/ Power Plant**	**Major Source Threshold**
PAH	4.0E-04	1.9E-02	10
Acetaldehyde	9.9E-04	3.4E-01	10
Acrolein	3.0E-04	3.0E-04	10
Benzene	3.9E-02	1.4E-01	10
1,3-Butadiene	1.8E-06	3.7E-03	10
Dichlorobenzene	5.3E-03	2.3E-03	10
Formaldehyde	3.3E-01	6.3E+00	10
Hexane	7.9E+00	3.5E+00	10
Naphthalene	7.6E-03	1.7E-02	10
Toluene	2.6E-02	1.1E+00	10
Xylenes	7.3E-03	5.6E-01	10
Arsenic	8.8E-04	3.9E-04	10
Beryllium	5.3E-05	2.3E-05	10
Cadmium	4.8E-03	2.1E-03	10
Chromium	6.1E-03	2.7E-03	10
Cobalt	3.7E-04	1.6E-04	10
Lead	2.2E-03	9.7E-04	10
Manganese	1.7E-03	7.4E-04	10
Mercury	1.1E-03	5.0E-04	10
Nickel	9.2E-03	4.1E-03	10
Selenium	1.1E-04	4.6E-05	10
Total HAPs	8.3	12.0	25

Resource Report 9- Air and Noise Quality
Table 9.4-1
State of Maryland Overall Environmental Noise Standards
AES Sparrows Point Project

Zoning District	Level (dBA)	Measure
Industrial	70	Leq(24)
Commercial	64	Ldn
Residential	55	Ldn

Source: Code of Maryland Regulations (COMAR), Title 26.02.03

Resource Report 9- Air and Noise Quality
Table 9.4-2
Maximum Allowable Noise Level (dBA) For Receiving Land Use Categories
AES Sparrows Point Project

Day/Night	Industrial	Commercial	Residential
Day	75	67	65
Night	75	62	55

Source: Code of Maryland Regulations (COMAR), Title 26.02.03
Note: Daytime construction noise limits are 90 dBA for all land use catagories.

Resource Report 9- Air and Noise Quality
Table 9.4-3
Existing Noise Levels (dBA) at NSA and Adjacent Land Uses
AES Sparrows Point Project

Location	Leq(Daytime)	Leq(Nighttime)	Leq(24)	Ldn
NSA#1	51	45	48.3	53
Industrial Area to Adjacent to Proposed LNG Terminal	69	61	65.8	69.9

Source: ANSI S 2003

Resource Report 9- Air and Noise Quality
Table 9.4-4
Noise Levels Associated with Outdoor Construction
AES Sparrows Point Project

Construction Phase	Leq (dBA) at 50 feet from Source
Ground Clearing	84
Excavation, Grading	89
Foundations	78
Structural	85
Finishing	89

Source: USEPA 1971

FIGURES

Resource Report 9 – Air and Noise Quality
Figure 9.3-1
Wind Rose Plot for Baltimore-Washington International Airport NWS Station 93721 (1992)

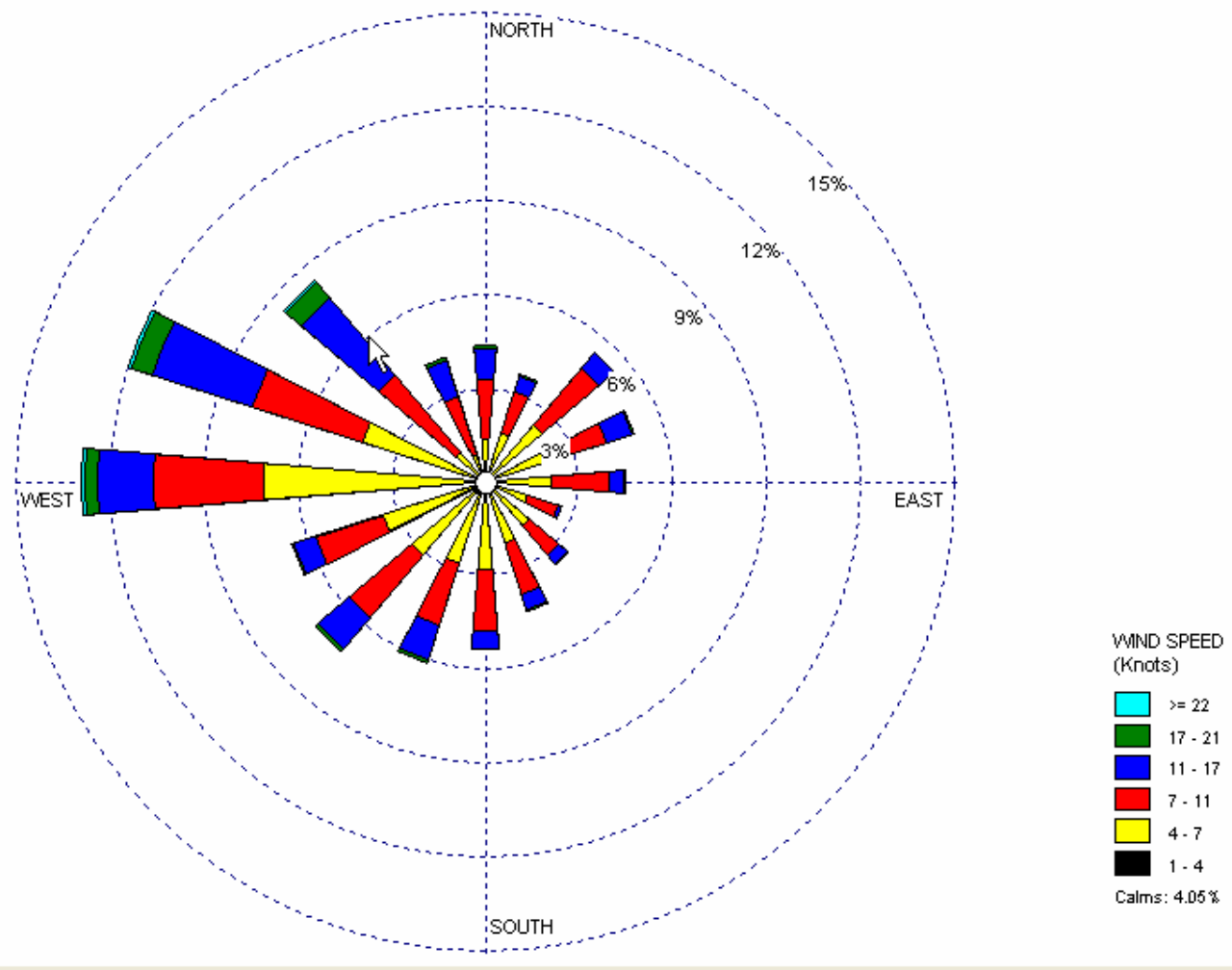

Figure 9.4-1 is not being resubmitted with the November Resource Report submittal because no content has changed from the previously submitted version. The final version will be submitted to the FERC with the formal project filing.

APPENDIX 9A

Air Quality Impact Analysis Calculations

TABLE 9A-1: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Auxiliary Boiler Emissions

Parameter	Value
Fuel	Nat. Gas
MMBtu/hr, MCR, ea. Boiler	350
Btu/CF	1,000
CF/hr Nat. Gas	350,000
CF/yr Nat. Gas	3.1E+9
Max. hrs/yr	8,760
MMBtu/yr ea. Boiler @ MCR	3,066,000
Stack Temp., deg. F	300
Flue gas rate ea. boiler, ACFM	103,179
Flue gas rate ea. boiler, DSCFM	58,910
Stack Height, ft.	TBD
Stack diameter (ea. flue[1]), ft.	4.7
Stack exit velocity, ft/s	99.1

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	1 Boiler @ 95% MCR[2], lb/hr	3 Boilers[3] @ 95% MCR, TPY	Catalyst Malfunctions[4] TPY	Startup Emissions[5], TPY	Total Boilers, TPY
NOX	3	ppmvd @ 3% O_2	Mfg. guarantee	1.28	16.85	1.85	0.012	18.71
CO	10	ppmvd @ 3% O_3	Mfg. guarantee	2.47	32.46	1.78	0.011	34.25
VOC	10.33	ppmvd @ 3% O_4	Mfg. guarantee	1.62	21.22			21.22
PM-10/PM-2.5	3.50	lb/hr	Mfg. guarantee	3.33	43.69			43.69
SOX	0.07	ppmvd @ 3% O_3	Mfg. guarantee	0.04	0.50			0.50
NH3	5	ppmvd @ 3% O_3	Mfg. guarantee	0.76	10.02			10.02
POM/PAH	8.8E-05	lb/MMSCF	AP-42, T1.4-3 (7/98)	2.9E-05	3.9E-04			3.9E-04
Benzene	2.1E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	7.0E-04	9.2E-03			9.2E-03
Dichlorobenzene	1.2E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	4.0E-04	5.2E-03			5.2E-03
Formaldehyde	7.5E-02	lb/MMSCF	AP-42, T1.4-3 (7/98)	2.5E-02	3.3E-01			3.3E-01
Hexane	1.8	lb/MMSCF	AP-42, T1.4-3 (7/98)	6.0E-01	7.9E+00			7.9E+00
Naphthalene	6.1E-04	lb/MMSCF	AP-42, T1.4-3 (7/98)	2.0E-04	2.7E-03			2.7E-03
Toluene	3.4E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.1E-03	1.5E-02			1.5E-02
Arsenic	2.00E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	6.7E-05	8.7E-04			8.7E-04
Beryllium	1.20E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	4.0E-06	5.2E-05			5.2E-05
Cadmium	1.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	3.7E-04	4.8E-03			4.8E-03
Chromium	1.40E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	4.7E-04	6.1E-03			6.1E-03
Cobalt	8.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	2.8E-05	3.7E-04			3.7E-04
Lead	5.00E-04	lb/MMSCF	AP-42, T1.4-2 (7/98)	1.7E-04	2.2E-03			2.2E-03
Manganese	3.80E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.3E-04	1.7E-03			1.7E-03
Mercury	2.60E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	8.6E-05	1.1E-03			1.1E-03
Nickel	2.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	7.0E-04	9.2E-03			9.2E-03
Selenium	2.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	8.0E-06	1.0E-04			1.0E-04

Total HAPs 8.3E+00

Notes:
1. Two stacks serving 4 boilers, independent (per boiler basis) flues within shared stack
2. Annual emissions based on annual average boiler capacity rating limited to 95% of Maximum Capacity Rating (MCR).
3. Assumes spare (4th) boiler is kept in hot standby using a heating coil, not by firing gas at low load. Also assumes all boilers are rotated once per week to obtain even run time throughout the year.
4. Two SCR and/or oxidation catalyst malfunctions per year, per boiler times 3 boilers, 48 hours duration each malfunction. Only NOX and CO emissions are controlled and, therefore, would be increased as a result of control system malfunction.
5. Three cold iron startups per year per boiler at average 15% load, uncontrolled for duration of 1 hour per startup.

TABLE 9A-2: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Diesel Fire Water Pump (Fresh Water) Emissions

Parameter	Value
Fuel	Diesel
BHP, MCR	375
MMBtu/hr[1]	2.625
Max. hrs/yr	36
Stack Temp., deg. F	
Exhaust Rate, ACFM	
Exhaust Rate, DSCFM	
Stack Height, ft.	TBD
Stack diameter, ft.	
Stack exit velocity, ft/s	

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	100% Load, lb/hr	TPY
NOX	0.0112	lb/hp-hr	Mfg. data	4.20	7.6E-02
CO	0.00668	lb/hp-hr	AP-42, T3.3-1(10/96)	2.51	4.5E-02
VOC	0.0004	lb/hp-hr	Mfg. data	0.15	2.7E-03
PM-10/PM-2.5	0.0022	lb/hp-hr	AP-42, T3.3-1(10/96)	0.83	1.5E-02
SOX	0.00205	lb/hp-hr	AP-42, T3.3-1(10/96)	0.77	1.4E-02
NH3	6.62	lb/1000 gal	2	0.12	2.2E-03
Acetaldehyde	7.67E-04	lb/MMBtu	AP-42, T 3.3-2(10/96)	2.0E-03	3.6E-05
Acrolein	9.25E-05	lb/MMBtu	AP-42, T 3.3-2(10/96)	2.4E-04	4.4E-06
Benzene	9.33E-04	lb/MMBtu	AP-42, T 3.3-2(10/96)	2.4E-03	4.4E-05
1,3-Butadiene	3.91E-05	lb/MMBtu	AP-42, T 3.3-2(10/96)	1.0E-04	1.8E-06
Formaldehyde	1.18E-03	lb/MMBtu	AP-42, T 3.3-2(10/96)	3.1E-03	5.6E-05
Naphthalene	8.48E-05	lb/MMBtu	AP-42, T 3.3-2(10/96)	2.2E-04	4.0E-06
POM/PAH	1.68E-04	lb/MMBtu	AP-42, T 3.3-2(10/96)	4.4E-04	7.9E-06
Toluene	4.09E-04	lb/MMBtu	AP-42, T 3.3-2(10/96)	1.1E-03	1.9E-05
Xylene	2.85E-04	lb/MMBtu	AP-42, T 3.3-2(10/96)	7.5E-04	1.3E-05

Total HAPs 1.9E-04

Notes:
1. Estimated - 7,000 Btu/hp-hr

2. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

TABLE 9A-3: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Diesel Fire Water Pump (Salt Water) Emissions

Parameter	Value
Fuel	Diesel
Number of units	6
BHP, MCR	700
MMBtu/hr[1]	4.9
Max. hrs/yr	36
F	
ACFM	
DSCFM	
Stack Height, ft.	TBD
Stack diameter, ft.	
velocity, ft/s	

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	1 Engine, 100% Load, lb/hr	1 Engine, TPY	6 Engines, TPY
NOX	0.01272	lb/hp-hr	Mfg. data	8.90	0.16	0.96
CO	0.0055	lb/hp-hr	AP-42, T3.4-1	3.85	0.07	0.42
VOC	0.000264	lb/hp-hr	Mfg. data	0.18	0.00	0.020
PM-10/PM-2.5	0.0004	lb/hp-hr	AP-42, T3.4-2	0.28	0.01	0.030
SOX	0.00809	lb/hp-hr	AP-42, T3.4-1	5.66	0.10	0.61
NH3	6.62	lb/1000 gal	2	0.23	5.7E-04	3.4E-03
Benzene	7.76E-04	lb/MMBtu	AP-42 T 3.4-3 (10/96)	3.8E-03	6.8E-05	4.1E-04
Toluene	2.81E-04	lb/MMBtu	AP-42 T 3.4-3 (10/96)	1.4E-03	2.5E-05	1.5E-04
Xylene	1.93E-04	lb/MMBtu	AP-42 T 3.4-3 (10/96)	9.5E-04	1.7E-05	1.0E-04
Formaldehyde	7.89E-05	lb/MMBtu	AP-42 T 3.4-3 (10/96)	3.9E-04	7.0E-06	4.2E-05
Acetaldehyde	2.52E-05	lb/MMBtu	AP-42 T 3.4-3 (10/96)	1.2E-04	2.2E-06	1.3E-05
Acrolein	7.88E-06	lb/MMBtu	AP-42 T 3.4-3 (10/96)	3.9E-05	7.0E-07	4.2E-06
Naphthalene	1.30E-04	lb/MMBtu	AP-42 T 3.4-4 (10/96)	6.4E-04	1.1E-05	6.9E-05
POM/PAH	2.57E-07	lb/MMBtu	AP-42 T 3.4-4 (10/96)	1.3E-06	2.3E-08	1.4E-07

Total HAPs 7.9E-04

Notes:
1. Estimated - 7,000 Btu/hp-hr

2. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

TABLE 9A-4: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Standby Generator Emissions

Parameter	Value
Fuel	Diesel
Number of units	1
BHP, MCR	2937
MMBtu/hr[1]	20.559
Max. hrs/yr	36
Stack Temp., deg. F	
Exhaust Rate, ACFM	
Exhaust Rate, DSCFM	
Stack Height, ft.	TBD
Stack diameter, ft.	
Stack exit velocity, ft/s	

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	1 Engine, 100% Load, lb/hr	1 Engine, TPY
NOX	0.014256	lb/hp-hr	Mfg. data	41.87	0.75
CO	0.0011679	lb/hp-hr	Mfg. data	3.43	0.06
VOC	0.0003098	lb/hp-hr	Mfg. data	0.91	0.02
PM-10/PM-2.5	0.0001	lb/hp-hr	Mfg. data	0.23	0.00
SOX	0.00809	lb/hp-hr	AP-42, T3.4-1	23.76	0.43
NH3	6.62	lb/1000 gal	2	0.97	1.0E-02
Benzene	7.76E-04	lb/MMBtu	AP-42 T 3.4-3 (10/96)	1.6E-02	2.9E-04
Toluene	2.81E-04	lb/MMBtu	AP-42 T 3.4-3 (10/96)	5.8E-03	1.0E-04
Xylene	1.93E-04	lb/MMBtu	AP-42 T 3.4-3 (10/96)	4.0E-03	7.1E-05
Formaldehyde	7.89E-05	lb/MMBtu	AP-42 T 3.4-3 (10/96)	1.6E-03	2.9E-05
Acetaldehyde	2.52E-05	lb/MMBtu	AP-42 T 3.4-3 (10/96)	5.2E-04	9.3E-06
Acrolein	7.88E-06	lb/MMBtu	AP-42 T 3.4-3 (10/96)	1.6E-04	2.9E-06
Naphthalene	1.30E-04	lb/MMBtu	AP-42 T 3.4-4 (10/96)	2.7E-03	4.8E-05
POM/PAH	2.57E-07	lb/MMBtu	AP-42 T 3.4-4 (10/96)	5.3E-06	9.5E-08

Total HAPs 5.5E-04

Notes:
1. Estimated - 7,000 Btu/hp-hr

2. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

TABLE 9A-5: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Vent Stack Heater Emissions

Parameter	Value
Fuel	Nat. Gas
MMBtu/hr, MCR, ea. Boiler	5.5
Btu/CF	1,000
CF/hr Nat. Gas	5,500
CF/yr Nat. Gas	48.2E+6
Max. hrs/yr	50
MMBtu/yr ea. Boiler @ MCR	48,180
Stack Temp., deg. F	
Flue gas rate, ACFM	
Flue gas rate, DSCFM	
Stack Height, ft.	TBD
Stack diameter	
Stack exit velocity, ft/s	

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	100% Load, lb/hr	TPY
NOX	0.005	lb/MMBtu	Mfg. data	0.03	6.9E-04
CO	0.025	lb/MMBtu	Mfg. data	0.14	3.4E-03
VOC	0.025	lb/MMBtu	Mfg. data	0.14	3.4E-03
PM-10/PM-2.5	0.01	lb/MMBtu	Mfg. data	0.06	1.4E-03
SOX	0.01	lb/MMBtu	Mfg. data	0.04	9.6E-04
POM/PAH	8.8E-05	lb/MMSCF	AP-42, T1.4-3 (7/98)	4.9E-07	1.2E-08
NH3	3.2E+00	lb/MMSCF	1	1.8E-02	4.4E-04
Benzene	2.1E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.2E-05	2.9E-07
Dichlorobenzene	1.2E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	6.6E-06	1.7E-07
Formaldehyde	7.5E-02	lb/MMSCF	AP-42, T1.4-3 (7/98)	4.1E-04	1.0E-05
Hexane	1.8	lb/MMSCF	AP-42, T1.4-3 (7/98)	9.9E-03	2.5E-04
Naphthalene	6.1E-04	lb/MMSCF	AP-42, T1.4-3 (7/98)	3.4E-06	8.4E-08
Toluene	3.4E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.9E-05	4.7E-07
Arsenic	2.00E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.1E-06	2.8E-08
Beryllium	1.20E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	6.6E-08	1.7E-09
Cadmium	1.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	6.1E-06	1.5E-07
Chromium	1.40E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	7.7E-06	1.9E-07
Cobalt	8.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	4.6E-07	1.2E-08
Lead	5.00E-04	lb/MMSCF	AP-42, T1.4-2 (7/98)	2.8E-06	6.9E-08
Manganese	3.80E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	2.1E-06	5.2E-08
Mercury	2.60E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.4E-06	3.6E-08
Nickel	2.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.2E-05	2.9E-07
Selenium	2.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.3E-07	3.3E-09

Total HAPs 7.0E-04

1. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

TABLE 9A-6: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
LNG Terminal Stationary Source Emissions Summary

Potential Emissions (tons/year)								
Pollutant	Boilers	Fire Pump (Fresh Water)	6 Fire Pumps (Salt Water)	Emergency Standby Generator	Stack Vent Heater	LNG Ship Offloading	Total LNG Terminal	Major Source Threshold
NO_X	18.7	0.1	1.0	0.8	0.0007	132.07	152.6	25
CO	34.2	0.045	0.4	0.1	0.003	30.6	65.4	100
VOC	21.2	0.003	0.02	0.02	0.003	3.49	24.8	25
PM-10	43.7	0.015	0.030	0.004	0.001	3.735	47.5	100
SOX	0.5	0.014	0.61	0.43	0.001	33.54	35.1	100
NH3	10.0	0.002	0.003	0.01	0.0004	1.78	11.8	
POM/PAH	3.9E-04	7.9E-06	1.4E-07	9.5E-08	1.2E-08	1.1E-05	4.0E-04	10
1,1,1-Trichloroethane								
Acetaldehyde		3.6E-05	1.3E-05	9.3E-06		9.3E-04	9.9E-04	10
Acrolein		4.4E-06	4.2E-06	2.9E-06		2.9E-04	3.0E-04	10
Antimony								
Benzene	9.2E-03	4.4E-05	4.1E-04	2.9E-04	2.9E-07	2.9E-02	3.9E-02	10
1,3-Butadiene		1.8E-06					1.8E-06	10
Dichlorobenzene	5.2E-03				1.7E-07	2.2E-05	5.3E-03	10
Ethylbenzene								
Formaldehyde	3.3E-01	5.6E-05	4.2E-05	2.9E-05	1.0E-05	4.3E-03	3.3E-01	10
Hexane	7.9E+00				2.5E-04	3.4E-02	7.9E+00	10
Naphthalene	2.7E-03	4.0E-06	6.9E-05	4.8E-05	8.4E-08	4.8E-03	7.6E-03	10
Toluene	1.5E-02	1.9E-05	1.5E-04	1.0E-04	4.7E-07	1.0E-02	2.6E-02	10
Xylene		1.3E-05	1.0E-04	7.1E-05		7.1E-03	7.3E-03	10
Arsenic	8.7E-04				2.8E-08	3.7E-06	8.8E-04	10
Beryllium	5.2E-05				1.7E-09	2.2E-07	5.3E-05	10
Cadmium	4.8E-03				1.5E-07	2.1E-05	4.8E-03	10
Chromium	6.1E-03				1.9E-07	2.6E-05	6.1E-03	10
Cobalt	3.7E-04				1.2E-08	1.6E-06	3.7E-04	10
Lead	2.2E-03				6.9E-08	9.3E-06	2.2E-03	10
Manganese	1.7E-03				5.2E-08	7.1E-06	1.7E-03	10
Mercury	1.1E-03				3.6E-08	4.9E-06	1.1E-03	10
Nickel	9.2E-03				2.9E-07	3.9E-05	9.2E-03	10
Selenium	1.0E-04				3.3E-09	4.5E-07	1.1E-04	10
Total HAPs							8.3	25

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TABLE 9A-7A: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
LNG Tanker Ship Unloading Operations Emissions (Case 1 - Steam Boilers Powering Pumps)

Fuel	Marine Heavy Fuel Oil	Low Sulfur Heavy Fuel	Natural Gas
Sulfur content, % wt.	4	1.5	0
Number of boilers	2	2	2
No. of annual shipments	208	208	208
Total pump power requirement for LNG offloading, kW	5720	5720	5720
MMBtu/hr for offloading operation, each boiler[1]	27.1	27.1	27.1
Btu/gal	154,225	154,225	---
Btu/CF nat. gas	---	---	1,000
Operating Load while unloading	1.00	1.00	1.00
Operating Load while idle	0.00	0.00	0.00
gal/hr oil, ea. Boiler while unloading	175.9	175.9	---
gal/hr, ea. Boiler while idle	0	0	---
Hours per offload	13.25	13.25	13.25
Annual operating hours[2]	2,756	2,756	2,756
gal/yr oil, total	484,733	484,733	---
CF/hr Nat. Gas, ea. Boiler while unloading, 12-hr max.	---	---	27,126
CF/yr Nat. Gas, total	---	---	74,757,909
Stack Temp., deg. F	350	350	350
Stack Temp., deg. K	450	450	450
Flue gas rate, ACFM	7,695	7,695	8,555
Stack Height, ft.	164	164	164
Stack Height, m.	50.0	50.0	50.0
Stack diameter, ft.	5.0	5.0	5.0
Stack diameter, m.	1.5	1.5	1.5
Stack exit velocity, ft/s	6.5	6.5	7.3
Stack exit velocity, m/s	2.0	2.0	2.2

	100% Marine Heavy Fuel Oil Emissions - Each Boiler							
Pollutant	Emission Factor lb/1000 gal[3]	Emission Factor lb/MMBtu	Maximum lb/hr	Max. g/sec 1-12 hr avg.	Max. g/sec 24-hr avg.	Max. g/sec annual avg.	Potential TPY	Emission Factor Source
TSP	40.0	0.26	7.03	0.89	0.40	0.28	4.84	AP-42 T 1.3-1
PM-10	40.0	0.26	7.03	0.89	0.40	0.28	4.84	AP-42 T 1.3-1
SO_X	628.0	4.07	110.45	13.92	6.23	4.38	76.10	AP-42 T 1.3-1
NO_X	47	0.30	8.27	1.04	0.47	0.33	5.70	AP-42 T 1.3-1
VOC	0.76	0.005	0.13	0.02	0.01	0.005	0.09	AP-42 T 1.3-3
CO	5	0.03	0.88	0.11	0.05	0.03	0.61	AP-42 T 1.3-1
NH3	0.8	0.01	0.14	0.02	0.01	0.01	0.10	4
CO2	24,400	158	4,292	541	242	170	2,957	AP-42 T 1.3-12
Pb	1.51E-03	9.79E-06	2.66E-04	3.35E-05	1.50E-05	1.05E-05	1.83E-04	AP-42 T 1.3-11
POM/PAH	1.30E-03	8.43E-06	2.29E-04	2.88E-05	1.29E-05	9.06E-06	1.58E-04	AP-42 T1.3-8
1,1,1-Trichloroethane	2.36E-04	1.53E-06	4.15E-05	5.23E-06	2.34E-06	1.65E-06	2.86E-05	AP-42 T1.3-9
Benzene	2.14E-04	1.39E-06	3.76E-05	4.74E-06	2.12E-06	1.49E-06	2.59E-05	AP-42 T1.3-9
Ethylbenzene	6.36E-05	4.12E-07	1.12E-05	1.41E-06	6.31E-07	4.43E-07	7.71E-06	AP-42 T1.3-9
Formaldehyde	6.10E-02	3.96E-04	1.07E-02	1.35E-03	6.06E-04	4.25E-04	7.39E-03	AP-42 T1.3-8
Naphthalene	1.13E-03	7.33E-06	1.99E-04	2.50E-05	1.12E-05	7.88E-06	1.37E-04	AP-42 T1.3-9
Toluene	6.20E-03	4.02E-05	1.09E-03	1.37E-04	6.15E-05	4.32E-05	7.51E-04	AP-42 T1.3-9
Xylene	1.09E-04	7.07E-07	1.92E-05	2.42E-06	1.08E-06	7.60E-07	1.32E-05	AP-42 T1.3-9
Antimony	5.25E-03	3.40E-05	9.23E-04	1.16E-04	5.21E-05	3.66E-05	6.36E-04	AP-42 T1.3-11
Arsenic	1.32E-03	8.56E-06	2.32E-04	2.93E-05	1.31E-05	9.20E-06	1.60E-04	AP-42 T1.3-11
Beryllium	2.78E-05	1.80E-07	4.89E-06	6.16E-07	2.76E-07	1.94E-07	3.37E-06	AP-42 T1.3-11
Cadmium	3.98E-04	2.58E-06	7.00E-05	8.82E-06	3.95E-06	2.77E-06	4.82E-05	AP-42 T1.3-11

Chromium	8.45E-04	5.48E-06	1.49E-04	1.87E-05	8.39E-06	5.89E-06	1.02E-04	AP-42 T1.3-11
Cobalt	6.02E-03	3.90E-05	1.06E-03	1.33E-04	5.98E-05	4.20E-05	7.30E-04	AP-42 T1.3-11
Lead	1.51E-03	9.79E-06	2.66E-04	3.35E-05	1.50E-05	1.05E-05	1.83E-04	AP-42 T1.3-11
Manganese	3.00E-03	1.95E-05	5.28E-04	6.65E-05	2.98E-05	2.09E-05	3.64E-04	AP-42 T1.3-11
Mercury	1.13E-04	7.33E-07	1.99E-05	2.50E-06	1.12E-06	7.88E-07	1.37E-05	AP-42 T1.3-11
Nickel	8.45E-02	5.48E-04	1.49E-02	1.87E-03	8.39E-04	5.89E-04	1.02E-02	AP-42 T1.3-11
Selenium	6.83E-04	4.43E-06	1.20E-04	1.51E-05	6.78E-06	4.76E-06	8.28E-05	AP-42 T1.3-11

	100% Low Sulfur Heavy Fuel Oil Emissions - Each Boiler							
	Emission Factor	Emission Factor	Maximum	Max. g/sec				Emission
Pollutant	lb/1000 gal[3]	lb/MMBtu	lb/hr	1-12 hr avg.	24-hr avg.	annual avg.	Potential TPY	Factor Source
TSP	17.0	0.11	2.99	0.38	0.17	0.12	2.06	AP-42 T 1.3-1
PM-10	17.0	0.11	2.99	0.38	0.17	0.12	2.06	AP-42 T 1.3-1
SO_X	235.5	1.53	41.42	5.22	2.34	1.64	28.54	AP-42 T 1.3-1
NO_X	47	0.30	8.27	1.04	0.47	0.33	5.70	AP-42 T 1.3-1
VOC	0.76	0.005	0.13	0.02	0.01	0.005	0.09	AP-42 T 1.3-2
CO	5	0.03	0.88	0.11	0.05	0.03	0.61	AP-42 T 1.3-1
NH3	0.8	0.01	0.14	0.02	0.01	0.01	0.10	4
CO2	25,000	162	4,397	554	248	174	3,030	AP-42 T 1.3-12
Pb	1.51E-03	9.79E-06	2.66E-04	3.35E-05	1.50E-05	1.05E-05	1.83E-04	AP-42 T 1.3-11
POM/PAH	1.30E-03	8.43E-06	2.29E-04	2.88E-05	1.29E-05	9.06E-06	1.58E-04	AP-42 T1.3-8
1,1,1-Trichloroethane	2.36E-04	1.53E-06	4.15E-05	5.23E-06	2.34E-06	1.65E-06	2.86E-05	AP-42 T1.3-9
Benzene	2.14E-04	1.39E-06	3.76E-05	4.74E-06	2.12E-06	1.49E-06	2.59E-05	AP-42 T1.3-9
Ethylbenzene	6.36E-05	4.12E-07	1.12E-05	1.41E-06	6.31E-07	4.43E-07	7.71E-06	AP-42 T1.3-9
Formaldehyde	6.10E-02	3.96E-04	1.07E-02	1.35E-03	6.06E-04	4.25E-04	7.39E-03	AP-42 T1.3-8
Naphthalene	1.13E-03	7.33E-06	1.99E-04	2.50E-05	1.12E-05	7.88E-06	1.37E-04	AP-42 T1.3-9
Toluene	6.20E-03	4.02E-05	1.09E-03	1.37E-04	6.15E-05	4.32E-05	7.51E-04	AP-42 T1.3-9
Xylene	1.09E-04	7.07E-07	1.92E-05	2.42E-06	1.08E-06	7.60E-07	1.32E-05	AP-42 T1.3-9
Antimony	5.25E-03	3.40E-05	9.23E-04	1.16E-04	5.21E-05	3.66E-05	6.36E-04	AP-42 T1.3-11
Arsenic	1.32E-03	8.56E-06	2.32E-04	2.93E-05	1.31E-05	9.20E-06	1.60E-04	AP-42 T1.3-11
Beryllium	2.78E-05	1.80E-07	4.89E-06	6.16E-07	2.76E-07	1.94E-07	3.37E-06	AP-42 T1.3-11
Cadmium	3.98E-04	2.58E-06	7.00E-05	8.82E-06	3.95E-06	2.77E-06	4.82E-05	AP-42 T1.3-11
Chromium	8.45E-04	5.48E-06	1.49E-04	1.87E-05	8.39E-06	5.89E-06	1.02E-04	AP-42 T1.3-11
Cobalt	6.02E-03	3.90E-05	1.06E-03	1.33E-04	5.98E-05	4.20E-05	7.30E-04	AP-42 T1.3-11
Lead	1.51E-03	9.79E-06	2.66E-04	3.35E-05	1.50E-05	1.05E-05	1.83E-04	AP-42 T1.3-11
Manganese	3.00E-03	1.95E-05	5.28E-04	6.65E-05	2.98E-05	2.09E-05	3.64E-04	AP-42 T1.3-11
Mercury	1.13E-04	7.33E-07	1.99E-05	2.50E-06	1.12E-06	7.88E-07	1.37E-05	AP-42 T1.3-11
Nickel	8.45E-02	5.48E-04	1.49E-02	1.87E-03	8.39E-04	5.89E-04	1.02E-02	AP-42 T1.3-11
Selenium	6.83E-04	4.43E-06	1.20E-04	1.51E-05	6.78E-06	4.76E-06	8.28E-05	AP-42 T1.3-11

	100% Natural Gas Firing Emissions - Each Boiler							
	Emission Factor	Emission Factor	Maximum	Max. g/sec				Emission
Pollutant	lb/MMSCF[3]	lb/MMBtu	lb/hr	1-12 hr avg.	24-hr avg.	annual avg.	Potential TPY	Factor Source
TSP	1.9	0.0019	0.05	0.006	0.004	0.002	0.04	AP-42 T 1.4-2
PM-10	1.9	0.0019	0.05	0.006	0.00	0.002	0.04	AP-42 T 1.4-2
SO_X	0.6	0.0006	0.02	0.002	0.001	0.001	0.01	AP-42 T 1.4-2
NO_X	280	0.28	7.60	0.96	0.53	0.301	5.23	AP-42 T 1.4-1
VOC	5.5	0.0055	0.15	0.02	0.01	0.006	0.10	AP-42 T 1.4-2
CO	84	0.084	2.28	0.29	0.16	0.090	1.57	AP-42 T 1.4-1
NH3	3.2	0.0032	0.09	0.01	0.01	0.003	0.06	4
CO2	120,000	120	3255.06	410	226	129	2,243	AP-42 T 1.4-2
POM/PAH	8.82E-05	8.82E-08	2.39E-06	3.01E-07	1.66E-07	9.48E-08	1.65E-06	AP-42 T1.4-3
Benzene	2.10E-03	2.10E-06	5.70E-05	7.18E-06	3.96E-06	2.26E-06	3.92E-05	AP-42 T1.4-3
Dichlorobenzene	1.20E-03	1.20E-06	3.26E-05	4.10E-06	2.26E-06	1.29E-06	2.24E-05	AP-42 T1.4-3
Formaldehyde	7.50E-02	7.50E-05	2.03E-03	2.56E-04	1.42E-04	8.06E-05	1.40E-03	AP-42 T1.4-3
Hexane	1.8	1.80E-03	4.88E-02	6.15E-03	3.40E-03	1.94E-03	3.36E-02	AP-42 T1.4-3
Naphthalene	6.10E-04	6.10E-07	1.65E-05	2.08E-06	1.15E-06	6.56E-07	1.14E-05	AP-42 T1.4-3
Toluene	3.40E-03	3.40E-06	9.22E-05	1.16E-05	6.42E-06	3.66E-06	6.35E-05	AP-42 T1.4-3
Arsenic	2.00E-04	2.00E-07	5.43E-06	6.84E-07	3.77E-07	2.15E-07	3.74E-06	AP-42 T1.4-4
Beryllium	1.20E-05	1.20E-08	3.26E-07	4.10E-08	2.26E-08	1.29E-08	2.24E-07	AP-42 T1.4-4
Cadmium	1.10E-03	1.10E-06	2.98E-05	3.76E-06	2.08E-06	1.18E-06	2.06E-05	AP-42 T1.4-4
Chromium	1.40E-03	1.40E-06	3.80E-05	4.78E-06	2.64E-06	1.51E-06	2.62E-05	AP-42 T1.4-4

Cobalt	8.40E-05	8.40E-08	2.28E-06	2.87E-07	1.59E-07	9.03E-08	1.57E-06	AP-42 T1.4-4
Lead	5.00E-04	5.00E-07	1.36E-05	1.71E-06	9.43E-07	5.38E-07	9.34E-06	AP-42 T1.4-2
Manganese	3.80E-04	3.80E-07	1.03E-05	1.30E-06	7.17E-07	4.09E-07	7.10E-06	AP-42 T1.4-4
Mercury	2.60E-04	2.60E-07	7.05E-06	8.89E-07	4.91E-07	2.80E-07	4.86E-06	AP-42 T1.4-4
Nickel	2.10E-03	2.10E-06	5.70E-05	7.18E-06	3.96E-06	2.26E-06	3.92E-05	AP-42 T1.4-4
Selenium	2.40E-05	2.40E-08	6.51E-07	8.20E-08	4.53E-08	2.58E-08	4.49E-07	AP-42 T1.4-4

	Potential Emissions Summary - Total TPY for		
Pollutant	Marine Heavy Fuel Oil	Low Sulfur Heavy Fuel	Natural Gas
TSP	9.69	4.12	0.07
PM-10	9.69	4.12	0.07
SO_X	152.21	57.08	0.02
NO_X	11.39	11.39	10.47
VOC	0.18	0.18	0.21
CO	1.21	1.21	3.14
NH3	0.10	0.10	0.06
CO2	5,914	6,059	4,485
Pb	3.7E-04	3.7E-04	3.3E-06
POM/PAH	3.15E-04	3.15E-04	3.30E-06
1,1,1-Trichloroethane	5.72E-05	5.72E-05	0.00E+00
Benzene	5.19E-05	5.19E-05	7.85E-05
Dichlorobenzene	0.00E+00	0.00E+00	4.49E-05
Ethylbenzene	1.54E-05	1.54E-05	0.00E+00
Formaldehyde	1.48E-02	1.48E-02	2.80E-03
Hexane	0.00E+00	0.00E+00	6.73E-02
Naphthalene	2.74E-04	2.74E-04	2.28E-05
Toluene	1.50E-03	1.50E-03	1.27E-04
Xylene	2.64E-05	2.64E-05	0.00E+00
Antimony	1.27E-03	1.27E-03	0.00E+00
Arsenic	3.20E-04	3.20E-04	7.48E-06
Beryllium	6.74E-06	6.74E-06	4.49E-07
Cadmium	9.65E-05	9.65E-05	4.11E-05
Chromium	2.05E-04	2.05E-04	5.23E-05
Cobalt	1.46E-03	1.46E-03	3.14E-06
Lead	3.66E-04	3.66E-04	1.87E-05
Manganese	7.27E-04	7.27E-04	1.42E-05
Mercury	2.74E-05	2.74E-05	9.72E-06
Nickel	2.05E-02	2.05E-02	7.85E-05
Selenium	1.66E-04	1.66E-04	8.97E-07

1. Based on ship information provided by AES, 5720 kW needed for pump power / (0.36 efficiency factor for thermal heat input to electrical power output) x 3414.4 Btu/kW-hr = 54.2 MMBtu/hr total fuel heat input.
2. Based on 208 ship loads/yr @ 13.25 hr/offload operation.
3. Emission factors based on EPA AP-42, Section 1.3 (No. 6 residual fuel oil) and Section 1.4 (nat. gas combustion). TSP and PM-10 emissions are total filterable particulate matter and assumed to all be less than 10 microns.
4. EPA Emission Inventory Improvement Program, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources - Draft Final Report", April 2004.

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TABLE 9A-7B: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS

Sparrows Point LNG Terminal

LNG Tanker Ship Unloading Operations Emissions (Case 2 - Diesel Engines Powering Pumps)

Fuel used	Diesel	
Fuel Heat Content, Btu/gal	140,000	
% Sulfur in Fuel	0.5%	
Max. Rating, kW	5720	
Max. Rating, Bhp	7671	Estimated (1.341 x kW)
Max Fuel, MMBtu/hr	53.69	Estimated (7,000 Btu/hp-hr)
Max Fuel, Gal/hr	383.5	
Max. Annual Operating Hours	2,756	(208 ship offloading events @ 13.25 hrs/offload)
Annual Fuel Use, Gal/yr	1,056,998	
Exhaust Gas Volume, acfm	60,000	Estimated
Exhaust Gas Temp., F	900	Estimated

Estimated Potential and Actual Emission Calculations @ 2756 hours per year maximum operation

Pollutant	Emission Factor (lb/1000 gal)	Emission Factor (lb/bhp-hr)	Potential Emissions (lb/hr)	lb/MMBtu	Potential Emissions (8760 hrs) (tons/yr)	Allowable[1] Emissions (tons/yr)	Emission Factor Source
PM-10		0.00070	5.37	0.10	23.52	7.40	AP-42, Table 3.4-1
SO_X	70.50		27.04	0.504	118.43	37.26	CTDEP Default (141*S)
NO_X		0.0240	184.09	3.43	806.33	253.68	AP-42, Table 3.4-1
VOC		0.00064	4.92	0.09	21.55	6.78	AP-42, Table 3.4-1
CO		0.0055	42.19	0.79	184.78	58.13	AP-42, Table 3.4-1
NH3	6.62		2.54	0.05	11.12	3.50	
CO_2		1.16	8898	165.71	38972	12261.2	AP-42, Table 3.4-1
		lb/MMBtu	Potential Emissions (lb/hr)		Potential Emissions (8760 hrs) (tons/yr)	Allowable[1] Emissions (tons/yr)	Emission Factor Source
Benzene		7.76E-04	4.17E-02		1.82E-01	5.74E-02	AP-42 T 3.4-3 (10/96)
Toluene		2.81E-04	1.51E-02		6.61E-02	2.08E-02	AP-42 T 3.4-3 (10/96)
Xylene		1.93E-04	1.04E-02		4.54E-02	1.43E-02	AP-42 T 3.4-3 (10/96)
Formaldehyde		7.89E-05	4.24E-03		1.86E-02	5.84E-03	AP-42 T 3.4-3 (10/96)
Acetaldehyde		2.52E-05	1.35E-03		5.93E-03	1.86E-03	AP-42 T 3.4-3 (10/96)
Acrolein		7.88E-06	4.23E-04		1.85E-03	5.83E-04	AP-42 T 3.4-3 (10/96)
Naphthalene		1.30E-04	6.98E-03		3.06E-02	9.62E-03	AP-42 T 3.4-4 (10/96)
POM/PAH		2.57E-07	1.38E-05		6.04E-05	1.90E-05	AP-42 T 3.4-4 (10/96)

1. Allowable emissions with maximum 2756 hours per consecutive 12-month period based on 208 ship offloads/year @ 13.25 hours per offload.

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TABLE 9A-7C: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
LNG Tanker Ship Unloading Operations Emissions (Composite Annual Emissions)[1]

Pollutant	LNG Ship Boiler Plant Natural Gas Scenario Potential Emissions, TPY	LNG Ship Diesel Engines 0.5% S Scenario Potential Emissions, TPY	LNG Ship Diesel Engines 2.5% S Scenario Potential Emissions, TPY	Total Composite[1] Annual Emissions (Tons/yr)
TSP	0.07	7.40	7.40	3.74
PM-10	0.07	7.40	7.40	3.74
SO_X	0.02	37.26	186.30	33.54
NO_X	10.47	253.68	253.68	132.07
VOC	0.21	6.78	6.78	3.49
CO	3.14	58.13	58.13	30.64
NH3	0.06	3.50	3.50	1.78
CO2	4,485	12,261	12,261	8,373
Pb	3.30E-06	0.00E+00	0.00E+00	1.65E-06
POM/PAH	3.30E-06	1.90E-05	1.90E-05	1.12E-05
1,1,1-Trichloroethane	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	0.00E+00	1.86E-03	1.86E-03	9.32E-04
Acrolein	0.00E+00	5.83E-04	5.83E-04	2.92E-04
Benzene	7.85E-05	5.74E-02	5.74E-02	2.87E-02
Dichlorobenzene	4.49E-05	0.00E+00	0.00E+00	2.24E-05
Ethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	2.80E-03	5.84E-03	5.84E-03	4.32E-03
Hexane	6.73E-02	0.00E+00	0.00E+00	3.36E-02
Naphthalene	2.28E-05	9.62E-03	9.62E-03	4.82E-03
Toluene	1.27E-04	2.08E-02	2.08E-02	1.05E-02
Xylene	0.00E+00	1.43E-02	1.43E-02	7.14E-03
Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	7.48E-06	0.00E+00	0.00E+00	3.74E-06
Beryllium	4.49E-07	0.00E+00	0.00E+00	2.24E-07
Cadmium	4.11E-05	0.00E+00	0.00E+00	2.06E-05
Chromium	5.23E-05	0.00E+00	0.00E+00	2.62E-05
Cobalt	3.14E-06	0.00E+00	0.00E+00	1.57E-06
Lead	1.87E-05	0.00E+00	0.00E+00	9.34E-06
Manganese	1.42E-05	0.00E+00	0.00E+00	7.10E-06
Mercury	9.72E-06	0.00E+00	0.00E+00	4.86E-06
Nickel	7.85E-05	0.00E+00	0.00E+00	3.92E-05
Selenium	8.97E-07	0.00E+00	0.00E+00	4.49E-07

1. Composite emission factors for LNG ships represent steam boiler power plants firing natural gas for 50% of ships, diesel CI engines firing 0.5% S diesel fuel for 40% of ships and diesel CI engines firing 2.5% S No. 6 fuel oil for 10% of ships on an annual basis.

TABLE 9A-8: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
LNG Tanker Ship Unloading Operations - Ship Boiler Exhaust Volume Calculation

TYPICAL GAS VOLUME CALCULATION - Heavy Oil Fired Boiler

Fuel Data :	No. 6 Fuel Oil				
HHV Consumption =	27.1	MMBtu/hr			
Fuel Consumption =	27.1	MMBtu/hr / 0.023	0.019567	MMBtu/lb=	1386.288706 lb/hr
Excess Air =	15	%			
Relative Humidity =	60	%			
Stack Exhaust Temp. =	350	deg. F			

Fuel Composition	Wt. %	lb/hr	O2 (lb/hr) Consumed	H2O(lb/hr) Produced	CO2 (lb/hr) Produced
C	85.7	1188.0	-3168.1	0.00	4356.181211
H2	10.5	145.6	-1164.5	1310.042827	0.00
	96.20	1333.6	-4332.6	1310.0	4356.2

Exhaust Composition

Component	From Fuel Combustion	From Air lb/hr	Total lb/hr	Wt. %	Moles/hr	Vol. %
O2	-4332.614303	4982.506448	649.9	2.85	20.31	2.60
H2O	1310.042827		1310.0	5.74	72.74	9.31
CO2	4356.181211		4356.2	19.09	98.98	12.67
N2		16500.08266	16500.1	72.32	589.08	75.42
Ar			0.0	0.00	0.00	0.00
	1333.609735	21482.58911	22816.19884	100.00	781.11	100.00

Total Exhaust Vol. Rate = 781.1087795 moles/hr x 385.3 cu.ft./mole / 60min/hr =

5016 scfm
4549 dscfm
7695 acfm

TABLE 9A-9: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
LNG Tanker Ship Unloading Operations - Ship Boiler Exhaust Volume Calculations

TYPICAL GAS VOLUME CALCULATION - Natural Gas Fired Boiler

Fuel Data :	Natural Gas				
HHV Consumption =	27.126	MMBtu/hr			
Fuel Consumption =	27.126	MMBtu/hr / 0.02	0.02331	MMBtu/lb=	1163.68559 lb/hr
Excess Air =	15	%			
Relative Humidity =	60	%			
Exhaust Temperatue =	350	deg. F			

Fuel Composition	Wt. %	lb/hr	O2 (lb/hr) Consumed	H2O(lb/hr) Produced	CO2 (lb/hr) Produced
C	75.32	876.5	-2337.3	0.00	3213.789284
H2	24.68	287.2	-2297.6	2584.778433	0.00
	100.00	1163.7	-4634.9	2584.8	3213.8

Exhaust Composition

Component	From Fuel Combustion	From Air lb/hr	Total lb/hr	Wt. %	Moles/hr	Vol. %
O2	-4634.882127	5330.114446	695.2	2.88	21.73	2.50
H2O	2584.778433		2584.8	10.71	143.52	16.53
CO2	3213.789284		3213.8	13.31	73.02	8.41
N2		17651.2223	17651.2	73.11	630.18	72.56
Ar			0.0	0.00	0.00	0.00
	1163.68559	22981.33675	24145.02234	100.00	868.44	100.00

Total Exhaust Vol. Rate = 868.4448819 moles/hr x 385.3cu.ft./mole / 60min/hr = 5577 scfm
4655 dscfm
8555 acfm

TABLE 9A-10: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Marine Vessel Emissions from LNG Tanker Ship Manuevering, Berthing and Hotelling

	Case 1	Case 2
LNG Ship Capacity, m^3	217,000	137,000
Frequency, ships/week	2.5	4
LNG Ships / year	130	208

Operting Scenarios - per LNG Ship Delivery

	LNG Ship Scenario		Tug Escort Scenario			Security & USCG Escort Scenario		
	Period (hours)	Power Level	Tugs Operating	Period (hours)	Power Level	Boats Operating	Period (hours)	Power Level
Transit Time from Entry of Md State Waters to SP Channel	10	0.8	2	1.5	0.6	2	10	0.8
USCG Inspection	2	0.1	0	0	0	2	2	0.2
Time to berth	1	0.2	3	1	0.6	2	1	0.6
			1	12	0.2	1	12	0.2
			2	12	0.1	0	0	0
Time at berth - Idle, while not offloading	12	0.2	0	0	0	0	0	0
Time to get underway	1	0.2	3	1	0.6	1	1	0.4
Time to MD/VA State Line	10	0.8	0	0	0	0	0	0
Time from MD/VA State Line to Territorial Water Limits (VA)	10	0.8	0	0	0	0	0	0

	LNG Ship	Tug Boats	Security & USCG Escort
Power @ MCR ea. vessel, kW	16,405	5,000	261
Total kW-hrs per LNG Ship Delivery	442,946	51,000	5,429
kW-hrs per Year - Case 1	57,582,954	6,630,000	705,730
kW-hrs per Year - Case 2	92,132,726	10,608,000	1,129,169
kW-hrs per LNG Ship in MD	311,703	51,000	5,429
kW-hrs per Year - Case 1	40,521,338	6,630,000	705,730
kW-hrs per Year - Case 2	64,834,141	10,608,000	1,129,169
kW-hrs per LNG Ship in VA	131,243	0	0
kW-hrs per Year - Case 1	17,061,616	0	0
kW-hrs per Year - Case 2	27,298,586	0	0

Total Emissions

Pollutant	LNG Ship Composite Emission Factor[2], g/kW hr	Marine CI Engine Emission Factor[3], g/kW-hr	(Case 1) Total Tons Per Year	(Case 2) Total Tons Per Year	Composite[4] Tons Per Year
NOX	2.88	10.58	267.77	428.43	348.10
CO	0.67	0.84	49.53	79.25	64.39
VOC (as CH4)	0.08	0.01	4.83	7.73	6.28
SOX	0.70	0.22	46.33	74.13	60.23
PM-10/PM-2.5	0.08	0.26	7.12	11.39	9.25
NH3	0.04	5.84E-03	2.53	4.05	3.29

Total Emissions in MD

Pollutant	LNG Ship Composite Emission Factor[2], g/kW hr	Marine CI Engine Emission Factor[3], g/kW-hr	(Case 1) Total Tons Per Year	(Case 2) Total Tons Per Year	Composite[4] Tons Per Year
NOX	2.88	10.58	213.75	341.99	277.87
CO	0.67	0.84	36.86	58.97	47.92
VOC (as CH4)	0.08	0.01	3.42	5.46	4.44
SOX	0.70	0.22	33.12	52.99	43.05

PM-10/PM-2.5	0.08	0.26	5.63	9.01	7.32
NH3	0.04	5.84E-03	1.79	2.87	2.33

Total Emissions In VA

Pollutant	LNG Ship Composite Emission Factor[2], g/kW hr	Marine CI Engine Emission Factor[3], g/kW-hr	(Case 1) Total Tons Per Year	(Case 2) Total Tons Per Year	Composite[4] Tons Per Year
NOX	2.88	10.58	54.03	86.44	70.23
CO	0.67	0.84	12.67	20.27	16.47
VOC (as CH4)	0.08	0.01	1.42	2.26	1.84
SOX	0.70	0.22	13.21	21.14	17.18
PM-10/PM-2.5	0.08	0.26	1.48	2.38	1.93
NH3	0.04	5.84E-03	0.74	1.18	0.96

Notes:

1. Emissions from LNG Ship unloading operations @ berth estimated separately (see Table 9A-7).
2. Composite emission factors for LNG ships represent steam boiler power plants firing natural gas for 50% of ships, diesel CI engines firing 0.5% S diesel fuel for 40% of ships and diesel CI engines firing 2.5% S No. 6 fuel oil for 10% of ships on an annual basis.
3. Emission factors from Table 5-1 in EPA-420-R-00-002 (Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data) for diesel compression ignition (CI) engines. SO_2 emissions based on fuel sulfur content of 0.05 wt. %. (0.16 g/Bhp-hr / (0.7457 kW/Bhp) = 0.215 g/kW-hr). Ammonia emissions based on 1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.
4. Composite annual emissions assume 50% LNG ships with 217,000 m^3 capacity and 50% LNG ships with 137,000 m^3 capacity.

TABLE 9A-11: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
LNG Terminal Maintenance Dredging Activities
Onshore Processing and Stockpiling Activities

Description	Onshore Processing Equip.
No. of Units	2 water trucks, 2 backhoes, 2 dozers, 6 excavators, 4 loaders, 6 trucks, 1 broom sweeper and 2 skid steers
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	12

	2 Water Trucks				2 Backhoes				2 Dozers				6 Excavator			
	300 Bhp, each unit				85 Bhp, each unit				185 Bhp, each unit				300 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	2.07	0.057	0.114	0.33	2.07	0.016	0.032	0.33	1.29	0.022	0.044	0.33	1.29	0.035	0.213
NO_X	8.38	1.05	0.733	1.467	8.38	1.05	0.208	0.416	8.38	0.98	0.422	0.844	8.38	0.98	0.684	4.106
SO_2	0.16	1.16	0.016	0.031	0.16	1.16	0.004	0.009	0.16	0.99	0.008	0.016	0.16	0.99	0.013	0.080
CO	2.7	2.66	0.599	1.197	2.7	2.66	0.170	0.339	2.7	1.5	0.208	0.416	2.7	1.5	0.338	2.025
HC	0.68	2.23	0.126	0.253	0.68	2.23	0.036	0.072	0.68	0.88	0.031	0.062	0.68	0.88	0.050	0.299

	4 Loaders				6 Trucks				1 Sweeper				2 Skid Steers			
	300 Bhp, each unit				355 Bhp, each unit				200 Bhp, each unit				80 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	2.07	0.057	0.114	0.33	2.07	0.016	0.032	0.33	2.07	0.035	0.070	0.33	1.74	0.048	0.287
NO_X	8.38	1.05	0.733	1.467	8.38	1.05	0.208	0.416	8.38	1.05	0.452	0.904	8.38	0.95	0.663	3.981
SO_2	0.16	1.16	0.016	0.031	0.16	1.16	0.004	0.009	0.16	1.16	0.010	0.019	0.16	1.09	0.015	0.088
CO	2.7	2.66	0.599	1.197	2.7	2.66	0.170	0.339	2.7	2.66	0.369	0.738	2.7	1.83	0.412	2.471
HC	0.68	2.23	0.126	0.253	0.68	2.23	0.036	0.072	0.68	2.23	0.078	0.156	0.68	1.49	0.084	0.507

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 12 hr/day	Total TPY @ max. 30 days/yr[5]
PM	0.906	0.5	0.02	0.6
NO_X	13.599	0.5	0.32	9.7
SO_2	0.285	0.5	0.01	0.2
CO	8.722	0.5	0.21	6.2
HC	1.672	0.5	0.04	1.2

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by Clean Earth Technologies, Inc.
4 Period of Construction Activites Used for Calculation: Dredging Process Activities occur March 2008-May 2010 (27 months)
5. Expected to occur approximately one month every 3 years.

TABLE 9A-12: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
LNG Terminal Maintenance Dredging Activities
Offshore - Dredging and Marine Vessel Emissions

Description	Off-shore Start-Up Const. Equip.
No. of Units	1 Dredge, 1 Tug, 1 Work/Survey boat, 1 Crew boat, 1
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
# Operating Days	1
Operating hrs/day	12

	1 Dredge					1 Tug					1 Survey/Work Boat				
	1800 Bhp, each unit					2400 Bhp, each unit					250 Bhp, each unit				
Pollutant	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day
PM	1	0.261	16113.6	4206	4206	0.5	0.272	21485	5839	5839	0.5	0.272	2238	608	608
NO_X	1	10.575	16113.6	170403	170403	0.5	10.805	21485	232134	232134	0.5	10.805	2238	24181	24181
SO_2	1	0.16	16113.6	2578	2578	0.50	0.16	21485	3438	3438	0.16	0.642	2238	1437	1437
CO	1	0.0059	16113.6	95	95	0.5	0.017	21485	359	359	0.5	0.017	2238	37	37
HC	1	0.0067	16113.6	108	108	0.5	0.019	21485	407	407	0.5	0.019	2238	42	42

	1 Crew Boat					1 Inspecting/Contracting Vessel				
	200 Bhp, each unit					684 Bhp, each unit				
Pollutant	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day
PM	0.5	0.272	1790	487	487	0.5	0.272	6123	1664	1664
NO_X	0.5	10.805	1790	19344	19344	0.5	10.805	6123	66158	66158
SO_2	0.50	0.160	1790	286	286	0.50	0.160	6123	980	980
CO	0.5	0.017	1790	30	30	0.5	0.017	6123	102	102
HC	0.5	0.019	1790	34	34	0.5	0.019	6123	116	116

Pollutant	Total g/day	Total Tons per day @ 12 hr/day	Total TPY @ max. 30 days per year[3]
PM	12804	0.01	0.42
NO_X	512220	0.56	16.94
SO_2	8719	0.01	0.29
CO	623	0.001	0.02
HC	707	0.001	0.02

Notes:
1. Emission factors from "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data" EPA guidance report, February 2000, Office of Air and radiation.
2. Equipment list provided by Han Padron, Inc. and Clean Earth Technologies, Inc.
3. Expected to occur approximately one month every 3 years.

TABLE 9A-13: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
LNG Terminal Maintenance Dredging Activities
Indirect Emissions from Haul Trucks and Workers Commuting

				PM			NH3			NO_X			VOC			CO		
Vehicle Type	Vehicle Trips per Day	Days per Year	Round Trip Miles	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year
Spoils Haul Trucks (HDDV)	218	30	20	0.3	1.44E-03	0.04	0.02704	1.30E-04	3.90E-03	12.69	6.10E-02	1.83	1.56	7.50E-03	0.22	6.87	3.30E-02	0.99
Additive Supply Trucks (HDDV	27	30	20	0.3	1.79E-04	0.005	0.02704	1.61E-05	4.83E-04	12.69	7.55E-03	0.23	1.56	9.29E-04	0.03	6.87	4.09E-03	0.12
Workers Commuting (LDGV)	15	30	30	0.02	9.92E-06	0.0003	0.01513	7.50E-06	2.25E-04	1.86	9.23E-04	0.03	1.22	6.05E-04	0.02	14.72	7.30E-03	0.22
Workers Commuting (LDGT)	15	30	30	0.02	9.92E-06	0.0003	0.01513	7.50E-06	2.25E-04	2.31	1.15E-03	0.03	1.82	9.03E-04	0.03	22.24	1.10E-02	0.33
Total					1.64E-03	0.0492		1.61E-04	4.83E-03		7.06E-02	2.1183		9.93E-03	0.2980		5.54E-02	1.6632

Notes:

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude, 100°F ambient temperature.

Total days of operation = approximately 12 months x 23 days/month = 276 days @ 2years = 552 Days

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-14: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS

LNG Terminal Maintenance Dredging Activities

Summary of Total Emissions from Dredging Activities

Total Tons/Year - Maintenance Dredging Activities				
Pollutant	Onshore Processing - Total Tons/Yr	Offshore Marine Vessels and Dredging - Total Tons/Yr	Indirect Emissions from Commuting Workers and Haul Trucks, Tons/Yr	Total Maintenance Dredging Tons/Yr
PM_{10}	0.65	0.42	0.00	1.07
NO_X	9.71	16.94	2.12	28.77
SO_2	0.20	0.29		0.49
CO	6.23	0.02	1.66	7.91
VOC	1.19	0.02	0.30	1.52
NH3**	0.009	0.006	0.005	0.019

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-15: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Power Plant Scenario 1 - CTG + Fired HRSG Emissions

Parameter	Value
Fuel	Nat. Gas
MMBtu/hr (HHV), MCR, CTG	1963.1
MMBtu/hr (HHV), MCR, HRSG duct Burner (DB)	299.7
Btu/CF	1,000
CF/hr Nat. Gas, CTG	1,963,139
CF/hr Nat. Gas, HRSG	299,714
Max. hrs/yr	8,760
Stack Temp., deg. F	120
Total exhaust gas rate, ACFM	1,005,996
Stack Height, ft.	TBD
Stack diameter, ft.	28.0
Stack exit velocity, ft/s	27.2

Pollutant	Emission Factor, CTG + DB	Emission Factor Units	Emssion Factor Source	CTG + DB @ 100% Load, lb/hr	CTG + DB, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total CTG + DB, TPY
NOX	2	ppmvd @ 15% O_2	Mfg. guarantee	18.55	81.25	8.90	0.042	90.19
CO	5	ppmvd @ 15% O_2	Mfg. guarantee	28.23	123.65	6.78	0.032	130.45
VOC (as CH4)	0.005	lb/MMBtu	Mfg. guarantee	10.70	46.87			46.87
PM-10/PM-2.5	16.20	lb/hr	Mfg. guarantee	16.20	70.96			70.96
SOX	0.26	lb/hr	Mfg. guarantee	0.26	1.14			1.14
NH3	10	ppmvd @ 15% O_2	Mfg. guarantee	34.28	150.15			150.15

HAPs from CTG

Pollutant	Emission Factor, CTG	Emission Factor Units	Emssion Factor Source	CTG @ 100% Load, lb/hr	CTG, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total CTG, TPY
PAH	2.2E-06	lb/MMBtu	AP-42, T3.1-3 (4/00)	4.3E-03	1.9E-02			1.9E-02
Acetaldehyde	4.0E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	7.9E-02	3.4E-01			3.4E-01
Benzene	1.2E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	2.4E-02	1.0E-01			1.0E-01
1,3-Butadiene	4.3E-07	lb/MMBtu	AP-42, T3.1-3 (4/00)	8.4E-04	3.7E-03			3.7E-03
Ethylbenzene	3.2E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	6.3E-02	2.8E-01			2.8E-01
Formaldehyde	7.1E-04	lb/MMBtu	AP-42, T3.1-3 (4/00)	1.4E+00	6.1E+00			6.1E+00
Naphthalene	1.3E-06	lb/MMBtu	AP-42, T3.1-3 (4/00)	2.6E-03	1.1E-02			1.1E-02
Toluene	1.3E-04	lb/MMBtu	AP-42, T3.1-3 (4/00)	2.6E-01	1.1E+00			1.1E+00
Xylenes	6.4E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	1.3E-01	5.5E-01			5.5E-01

HAPs from DB

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	DB @ 100% Load, lb/hr	DB, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total DB, TPY
PAH	8.8E-05	lb/MMSCF	AP-42, T1.4-3 (7/98)	2.6E-08	1.2E-07			1.2E-07
Benzene	2.1E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	6.3E-07	2.8E-06			2.8E-06
Dichlorobenzene	1.2E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	3.6E-07	1.6E-06			1.6E-06
Formaldehyde	7.5E-02	lb/MMSCF	AP-42, T1.4-3 (7/98)	2.2E-05	9.8E-05			9.8E-05
Hexane	1.8	lb/MMSCF	AP-42, T1.4-3 (7/98)	5.4E-04	2.4E-03			2.4E-03
Naphthalene	6.1E-04	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.8E-07	8.0E-07			8.0E-07
Toluene	3.4E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.0E-06	4.5E-06			4.5E-06
Arsenic	2.00E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	6.0E-08	2.6E-07			2.6E-07
Beryllium	1.20E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	3.6E-09	1.6E-08			1.6E-08
Cadmium	1.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	3.3E-07	1.4E-06			1.4E-06
Chromium	1.40E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	4.2E-07	1.8E-06			1.8E-06
Cobalt	8.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	2.5E-08	1.1E-07			1.1E-07
Lead	5.00E-04	lb/MMSCF	AP-42, T1.4-2 (7/98)	1.5E-07	6.6E-07			6.6E-07
Manganese	3.80E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.1E-07	5.0E-07			5.0E-07
Mercury	2.60E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	7.8E-08	3.4E-07			3.4E-07
Nickel	2.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	6.3E-07	2.8E-06			2.8E-06
Selenium	2.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	7.2E-09	3.2E-08			3.2E-08

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Pollutant	Emission Factor, CTG + DB	Emission Factor Units	Emssion Factor Source	CTG + DB @ 100% Load, lb/hr	CTG + DB, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total CTG + DB, TPY
Total HAPs from CTG + DB								
Pollutant	**CTG, TPY**	**DB, TPY**	**Total TPY**					
PAH	1.9E-02	1.2E-07	1.9E-02					
Acetaldehyde	3.4E-01		3.4E-01					
Acrolein								
Benzene	1.0E-01	2.8E-06	1.0E-01					
1,3-Butadiene	3.7E-03		3.7E-03					
Dichlorobenzene		1.6E-06	1.6E-06					
Ethylbenzene	2.8E-01		2.8E-01					
Formaldehyde	6.1E+00	9.8E-05	6.1E+00					
Hexane		2.4E-03	2.4E-03					
Naphthalene	1.1E-02	8.0E-07	1.1E-02					
Propylene								
Toluene	1.1E+00	4.5E-06	1.1E+00					
Xylenes	5.5E-01		5.5E-01					
Arsenic		2.6E-07	2.6E-07					
Beryllium		1.6E-08	1.6E-08					
Cadmium		1.4E-06	1.4E-06					
Chromium		1.8E-06	1.8E-06					
Cobalt		1.1E-07	1.1E-07					
Lead		6.6E-07	6.6E-07					
Manganese		5.0E-07	5.0E-07					
Mercury		3.4E-07	3.4E-07					
Nickel		2.8E-06	2.8E-06					
Selenium		3.2E-08	3.2E-08					
Total HAPs	8.5E+00	2.5E-03	8.5E+00					

Notes:
1. Two SCR and/or oxidation catalyst malfunctions per year, 48 hours duration each malfunction. Only NOX and CO emissions are controlled and, therefore, would be increased as a result of control system malfunction.
2. Three cold iron startups per year at average 15% load, uncontrolled for duration of 1 hour per startup.

TABLE 9A-16: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Power Plant Scenario 1 - Auxiliary Boilers Emissions

Parameter	Value
Fuel	Nat. Gas
MMBtu/hr, MCR, ea. Boiler	350
Btu/CF	1,000
CF/hr Nat. Gas	350,000
CF/yr Nat. Gas	3.1E+9
Max. hrs/yr	8,760
MMBtu/yr ea. Boiler @ MCR	3,066,000
Stack Temp., deg. F	300
Flue gas rate ea. boiler, ACFM	103,179
Flue gas rate ea. boiler, DSCFM	58,910
Stack Height, ft.	TBD
Stack diameter (ea. flue[1]), ft.	4.7
Stack exit velocity, ft/s	99.1

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	1 Boiler @ 25% Load, lb/hr	1 Boiler @ 25%, TPY	Catalyst Malfunctions[2], TPY	Startup Emissions[3], TPY	Total Boilers, TPY
NOX	3	ppmvd @ 3% O_2	Mfg. guarantee	0.34	1.48	0.16	0.001	1.64
CO	10	ppmvd @ 3% O_3	Mfg. guarantee	0.65	2.85	0.31	0.001	3.16
VOC	10.33	ppmvd @ 3% O_4	Mfg. guarantee	0.43	1.86			1.86
PM-10/PM-2.5	3.50	lb/hr	Mfg. guarantee	0.88	3.83			3.83
SOX	0.07	ppmvd @ 3% O_3	Mfg. guarantee	0.01	0.04			0.04
NH3	5	ppmvd @ 3% O_3	Mfg. guarantee	0.20	0.88			0.88
PAH	8.8E-05	lb/MMSCF	AP-42, T1.4-3 (7/98)	7.7E-06	3.4E-05			3.4E-05
Benzene	2.1E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.8E-04	8.0E-04			8.0E-04
Dichlorobenzene	1.2E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.1E-04	4.6E-04			4.6E-04
Formaldehyde	7.5E-02	lb/MMSCF	AP-42, T1.4-3 (7/98)	6.6E-03	2.9E-02			2.9E-02
Hexane	1.8	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.6E-01	6.9E-01			6.9E-01
Naphthalene	6.1E-04	lb/MMSCF	AP-42, T1.4-3 (7/98)	5.3E-05	2.3E-04			2.3E-04
Toluene	3.4E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	3.0E-04	1.3E-03			1.3E-03
Arsenic	2.00E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.8E-05	7.7E-05			7.7E-05
Beryllium	1.20E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.1E-06	4.6E-06			4.6E-06
Cadmium	1.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	9.6E-05	4.2E-04			4.2E-04
Chromium	1.40E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.2E-04	5.4E-04			5.4E-04
Cobalt	8.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	7.4E-06	3.2E-05			3.2E-05
Lead	5.00E-04	lb/MMSCF	AP-42, T1.4-2 (7/98)	4.4E-05	1.9E-04			1.9E-04
Manganese	3.80E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	3.3E-05	1.5E-04			1.5E-04
Mercury	2.60E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	2.3E-05	1.0E-04			1.0E-04
Nickel	2.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.8E-04	8.0E-04			8.0E-04
Selenium	2.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	2.1E-06	9.2E-06			9.2E-06

Total HAPs 7.2E-01

Notes:
1. Two stacks serving 4 boilers, independent (per boiler basis) flues within shared stack
2. Two SCR and/or oxidation catalyst malfunctions per year, per boiler, 48 hours duration each malfunction. Only NOX and CO emissions are controlled and, therefore, would be increased as a result of control system malfunction.
3. Three cold iron startups per year per boiler at average 15% load, uncontrolled for duration of 1 hour per startup.

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TABLE 9A-17: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Power Plant Scenario 2 - CTG + Unfired HRSG (No Duct Burner Firing) Emissions

Parameter	Value
Fuel	Nat. Gas
MMBtu/hr (HHV), MCR, CTG	1963.1
MMBtu/hr (HHV), MCR, HRSG duct Burner (DB)	
Btu/CF	1,000
CF/hr Nat. Gas, CTG	1,963,139
CF/hr Nat. Gas, HRSG	
Max. hrs/yr	8,760
Stack Temp., deg. F	120
Total exhaust gas rate, ACFM	1,000,985
Stack Height, ft.	TBD
Stack diameter, ft.	28.0
Stack exit velocity, ft/s	27.1

Pollutant	Emission Factor, CTG + DB	Emission Factor Units	Emssion Factor Source	CTG + DB @ 100% Load, lb/hr	CTG + DB, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total CTG + DB, TPY
NOX	2	ppmvd @ 15% O_2	Mfg. guarantee	16.50	72.26	7.92	0.037	80.22
CO	5	ppmvd @ 15% O_2	Mfg. guarantee	25.11	109.96	6.03	0.028	116.02
VOC (as CH4)	0.002	lb/MMBtu	Mfg. guarantee	3.19	13.98			13.98
PM-10/PM-2.5	13.20	lb/hr	Mfg. guarantee	13.20	57.82			57.82
SOX	0.23	lb/hr	Mfg. guarantee	0.23	1.00			1.00
NH3	10	ppmvd @ 15% O_2	Mfg. guarantee	30.49	133.53			133.53

HAPs from CTG

Pollutant	Emission Factor, CTG	Emission Factor Units	Emssion Factor Source	CTG @ 100% Load, lb/hr	CTG, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total CTG, TPY
PAH	2.2E-06	lb/MMBtu	AP-42, T3.1-3 (4/00)	4.3E-03	1.9E-02			1.9E-02
Acetaldehyde	4.0E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	7.9E-02	3.4E-01			3.4E-01
Benzene	1.2E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	2.4E-02	1.0E-01			1.0E-01
1,3-Butadiene	4.3E-07	lb/MMBtu	AP-42, T3.1-3 (4/00)	8.4E-04	3.7E-03			3.7E-03
Ethylbenzene	3.2E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	6.3E-02	2.8E-01			2.8E-01
Formaldehyde	7.1E-04	lb/MMBtu	AP-42, T3.1-3 (4/00)	1.4E+00	6.1E+00			6.1E+00
Naphthalene	1.3E-06	lb/MMBtu	AP-42, T3.1-3 (4/00)	2.6E-03	1.1E-02			1.1E-02
Toluene	1.3E-04	lb/MMBtu	AP-42, T3.1-3 (4/00)	2.6E-01	1.1E+00			1.1E+00
Xylenes	6.4E-05	lb/MMBtu	AP-42, T3.1-3 (4/00)	1.3E-01	5.5E-01			5.5E-01

HAPs from DB

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	DB @ 100% Load, lb/hr	DB, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total DB, TPY
PAH	8.8E-05	lb/MMSCF	AP-42, T1.4-3 (7/98)					
Benzene	2.1E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)					
Dichlorobenzene	1.2E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)					
Formaldehyde	7.5E-02	lb/MMSCF	AP-42, T1.4-3 (7/98)					
Hexane	1.8	lb/MMSCF	AP-42, T1.4-3 (7/98)					
Naphthalene	6.1E-04	lb/MMSCF	AP-42, T1.4-3 (7/98)					
Toluene	3.4E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)					
Arsenic	2.00E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Beryllium	1.20E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Cadmium	1.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Chromium	1.40E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Cobalt	8.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Lead	5.00E-04	lb/MMSCF	AP-42, T1.4-2 (7/98)					
Manganese	3.80E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Mercury	2.60E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Nickel	2.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)					
Selenium	2.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)					

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Pollutant	Emission Factor, CTG + DB	Emission Factor Units	Emssion Factor Source	CTG + DB @ 100% Load, lb/hr	CTG + DB, TPY	Catalyst Malfunctions[1], TPY	Startup Emissions[2], TPY	Total CTG + DB, TPY
Total HAPs from CTG + DB								
Pollutant	**CTG, TPY**	**DB, TPY**	**Total TPY**					
PAH	1.9E-02		1.9E-02					
Acetaldehyde	3.4E-01		3.4E-01					
Acrolein								
Benzene	1.0E-01		1.0E-01					
1,3-Butadiene	3.7E-03		3.7E-03					
Dichlorobenzene								
Ethylbenzene	2.8E-01		2.8E-01					
Formaldehyde	6.1E+00		6.1E+00					
Hexane								
Naphthalene	1.1E-02		1.1E-02					
Propylene								
Toluene	1.1E+00		1.1E+00					
Xylenes	5.5E-01		5.5E-01					
Arsenic								
Beryllium								
Cadmium								
Chromium								
Cobalt								
Lead								
Manganese								
Mercury								
Nickel								
Selenium								
Total HAPs	8.5E+00		8.5E+00					

Notes:
1. Two SCR and/or oxidation catalyst malfunctions per year, 48 hours duration each malfunction. Only NOX and CO emissions are controlled and, therefore, would be increased as a result of control system malfunction.
2. Three cold iron startups per year at average 15% load, uncontrolled for duration of 1 hour per startup.

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TABLE 9A-18: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Power Plant Scenario 2 - Auxiliary Boilers Emissions

Parameter	Value
Fuel	Nat. Gas
MMBtu/hr, MCR, ea. Boiler	350
Btu/CF	1,000
CF/hr Nat. Gas	350,000
CF/yr Nat. Gas	3.1E+9
Max. hrs/yr	8,760
MMBtu/yr ea. Boiler @ MCR	3,066,000
Stack Temp., deg. F	300
Flue gas rate ea. boiler, ACFM	103,179
Flue gas rate ea. boiler, DSCFM	58,910
Stack Height, ft.	TBD
Stack diameter (ea. flue[1]), ft.	4.7
Stack exit velocity, ft/s	99.1

Pollutant	Emission Factor	Emission Factor Units	Emssion Factor Source	1 Boiler @ 100% Load, lb/hr	1 Boiler @ 25% Load, lb/hr	1 Boiler @ 100% + 1 Boiler @ 25%, TPY	Catalyst Malfunctions[2], TPY	Startup Emissions[3], TPY	Total Boilers, TPY
NOX	3	ppmvd @ 3% O_2	Mfg. guarantee	1.35	0.34	7.39	1.30	0.006	8.69
CO	10	ppmvd @ 3% O_3	Mfg. guarantee	2.60	0.65	14.24	1.25	0.006	15.49
VOC	10.33	ppmvd @ 3% O_4	Mfg. guarantee	1.70	0.43	9.31			9.31
PM-10/PM-2.5	3.50	lb/hr	Mfg. guarantee	3.50	0.88	19.16			19.16
SOX	0.07	ppmvd @ 3% O_3	Mfg. guarantee	0.04	0.01	0.22			0.22
NH3	5	ppmvd @ 3% O_3	Mfg. guarantee	0.80	0.20	4.39			4.39
PAH	8.8E-05	lb/MMSCF	AP-42, T1.4-3 (7/98)	3.1E-05	7.7E-06	1.7E-04			1.7E-04
Benzene	2.1E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	7.4E-04	1.8E-04	4.0E-03			4.0E-03
Dichlorobenzene	1.2E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	4.2E-04	1.1E-04	2.3E-03			2.3E-03
Formaldehyde	7.5E-02	lb/MMSCF	AP-42, T1.4-3 (7/98)	2.6E-02	6.6E-03	1.4E-01			1.4E-01
Hexane	1.8	lb/MMSCF	AP-42, T1.4-3 (7/98)	6.3E-01	1.6E-01	3.4E+00			3.4E+00
Naphthalene	6.1E-04	lb/MMSCF	AP-42, T1.4-3 (7/98)	2.1E-04	5.3E-05	1.2E-03			1.2E-03
Toluene	3.4E-03	lb/MMSCF	AP-42, T1.4-3 (7/98)	1.2E-03	3.0E-04	6.5E-03			6.5E-03
Arsenic	2.00E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	7.0E-05	1.8E-05	3.8E-04			3.8E-04
Beryllium	1.20E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	4.2E-06	1.1E-06	2.3E-05			2.3E-05
Cadmium	1.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	3.9E-04	9.6E-05	2.1E-03			2.1E-03
Chromium	1.40E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	4.9E-04	1.2E-04	2.7E-03			2.7E-03
Cobalt	8.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	2.9E-05	7.4E-06	1.6E-04			1.6E-04
Lead	5.00E-04	lb/MMSCF	AP-42, T1.4-2 (7/98)	1.8E-04	4.4E-05	9.6E-04			9.6E-04
Manganese	3.80E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	1.3E-04	3.3E-05	7.3E-04			7.3E-04
Mercury	2.60E-04	lb/MMSCF	AP-42, T1.4-4 (7/98)	9.1E-05	2.3E-05	5.0E-04			5.0E-04
Nickel	2.10E-03	lb/MMSCF	AP-42, T1.4-4 (7/98)	7.4E-04	1.8E-04	4.0E-03			4.0E-03
Selenium	2.40E-05	lb/MMSCF	AP-42, T1.4-4 (7/98)	8.4E-06	2.1E-06	4.6E-05			4.6E-05

Total HAPs 3.6E+00

Notes:
1. Two stacks serving 4 boilers, independent (per boiler basis) flues within shared stack
2. Two SCR and/or oxidation catalyst malfunctions per year, per boiler times 2 boilers, 48 hours duration each malfunction. Only NOX and CO emissions are controlled and, therefore, would be increased as a result of control system malfunction.
3. Three cold iron startups per year per boiler at average 15% load, uncontrolled for duration of 1 hour per startup.

TABLE 9A-19: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Power Plant Scenario 1 or 2 - Cooling Tower Emissions

Input Data

Total circulating water (gpm)	53,176
Drift loss (%)	0.001
Cycles of concentration	10
TDS/TSS of Blowdown (ppm)	2131
Number of cells in tower	4
Configuration of cells	1 X 4
Tower height (ft)	49
Tower length (ft)	192
Tower width (ft)	54
Cell diameter (ft)	33
Total tower heat duty (MMBtu/hr)	566
Total tower air flow (lb/hr)	24,269,222

Estimated PM10/PM2.5 emission rate = 53,176 gpm total circulating water flow x 8.34 lb/gal x 0.001 % drift loss

x 2131 ppm TDS/TSS x 60 min/hr =0.567 lb/hr

Annual Potential Emissions = 0.567 lb/hr x 8,760 hr/yr / 2000 lb/ton = 2.48 TPY

Emissions estimated based on vendor specifications and drift loss provided to AES and mass-balance emission calculation procedure in EPA AP-42, Section 13.4 (1/95).

TDS was estimated from maximum conductivity of 320μS reported in Municipal water data in 2005.

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TABLE 9A-20: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Power Plant Stationary Source Emissions Summary

Scenario 1: CTG + Fired HRSG + 1 Boiler @ 25% Standby Idle					
Potential Emissions (tons/year)					
Pollutant	CTG + HRSG	Auxiliary Boiler	Cooling Tower	Total Power Plant	Major Source Threshold
NO_X	90.2	1.6		91.8	25
CO	130.5	3.2		133.6	100
VOC	46.9	1.86		48.73	25
PM-10/PM-2.5	71.0	3.83	2.48	77.27	100
SOX	1.1	0.04		1.18	100
NH3	150.1	0.88		151.02	
PAH	1.9E-02	3.4E-05		1.9E-02	10
Acetaldehyde	3.4E-01			3.4E-01	10
Acrolein					10
Benzene	1.0E-01	8.0E-04		1.0E-01	10
1,3-Butadiene	3.7E-03			3.7E-03	10
Dichlorobenzene	1.6E-06	4.6E-04		4.6E-04	10
Formaldehyde	6.1E+00	2.9E-02		6.1E+00	10
Hexane	2.4E-03	6.9E-01		6.9E-01	10
Naphthalene	1.1E-02	2.3E-04		1.1E-02	10
Toluene	1.1E+00	1.3E-03		1.1E+00	10
Xylenes	5.5E-01			5.5E-01	10
Arsenic	2.6E-07	7.7E-05		7.7E-05	10
Beryllium	1.6E-08	4.6E-06		4.6E-06	10
Cadmium	1.4E-06	4.2E-04		4.2E-04	10
Chromium	1.8E-06	5.4E-04		5.4E-04	10
Cobalt	1.1E-07	3.2E-05		3.2E-05	10
Lead	6.6E-07	1.9E-04		1.9E-04	10
Manganese	5.0E-07	1.5E-04		1.5E-04	10
Mercury	3.4E-07	1.0E-04		1.0E-04	10
Nickel	2.8E-06	8.0E-04		8.1E-04	10
Selenium	3.2E-08	9.2E-06		9.2E-06	10
Total HAPs				8.98	25

Scenario 2: CTG + Unfired HRSG + 1 Boiler @ 100% + 1 Boiler @ 25% Standby					
Potential Emissions (tons/year)					
Pollutant	CTG + HRSG	Auxiliary Boilers	Cooling Tower	Total Power Plant	Major Source Threshold
NO_X	80.2	8.7		88.9	25
CO	116.0	15.5		131.5	100
VOC	14.0	9.31		23.28	25
PM-10/PM-2.5	57.8	19.16	2.48	79.46	100
SOX	1.0	0.22		1.22	100
NH3	133.5	4.39		137.92	
PAH	1.9E-02	1.7E-04		1.9E-02	10
Acetaldehyde	3.4E-01			3.4E-01	10
Acrolein					10
Benzene	1.0E-01	4.0E-03		1.1E-01	10
1,3-Butadiene	3.7E-03			3.7E-03	10
Dichlorobenzene		2.3E-03		2.3E-03	10
Formaldehyde	6.1E+00	1.4E-01		6.2E+00	10
Hexane		3.4E+00		3.4E+00	10
Naphthalene	1.1E-02	1.2E-03		1.2E-02	10
Propylene					10
Toluene	1.1E+00	6.5E-03		1.1E+00	10
Xylenes	5.5E-01			5.5E-01	10
Arsenic		3.8E-04		3.8E-04	10
Beryllium		2.3E-05		2.3E-05	10
Cadmium		2.1E-03		2.1E-03	10
Chromium		2.7E-03		2.7E-03	10
Cobalt		1.6E-04		1.6E-04	10
Lead		9.6E-04		9.6E-04	10
Manganese		7.3E-04		7.3E-04	10
Mercury		5.0E-04		5.0E-04	10
Nickel		4.0E-03		4.0E-03	10
Selenium		4.6E-05		4.6E-05	10
Total HAPs				11.87	25

TABLE 9A-21: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Indirect Emissions from Workers Commuting

Sparrows Point

				PM			NH3			NO_X			VOC			CO		
Vehicle Type	Vehicle Trips per Day	Days per Month	Round Trip Miles	Emissions Factor (g/mile)	Lbs/day	TPY	Emissions Factor (g/mile)	Lbs/day	TPY	Emissions Factor (g/mile)	Lbs/day	TPY	Emissions Factor (g/mile)	Lbs/day	TPY	Emissions Factor (g/mile)	Lbs/day	TPY
Workers Commuting (LDGV)	20	30	25	0.02	0.02	0.004	0.01513	0.017	0.003	1.86	2.1	0.4	1.22	1.3	0.2	14.72	16.2	2.9
Workers Commuting (LDGT)	20	30	25	0.02	0.02	0.004	0.01513	0.017	0.003	2.31	2.5	0.5	1.82	2.0	0.4	22.24	24.5	4.4
Total					0.04	0.01		0.033	0.006		4.6	0.8		3.4	0.6		40.7	7.3

Notes:

Emissions represent total construction worker commuting for both pipeline constrution spreads and the compressor station.

Total of 200 workers assumed to commute to the project sites each day, 20 days/month, for length of construction period (32 months).

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude.

Workers commuting are divided into half Light Duty Gasoline Vehicles (LDGV) and half Light Duty Gasoline Trucks (LDGT).

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-22: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Operating Emissions Summary (Annual Emissions in Tons/Year)

	NOX	CO	VOC	PM-10/2.5	SOX	NH3
LNG Terminal						
Auxiliary Boilers w/out Power Plant	18.7	34.2	21.2	43.7	0.5	10.0
1 Fire Pump (Fresh Water)	0.1	0.05	0.003	0.01	0.01	0.002
6 Fire Pumps (Salt Water)	1.0	0.4	0.02	0.03	0.6	0.003
1 Standby Generator	0.8	0.06	0.02	0.004	0.4	0.01
1 Vent Stack Heater	0.001	0.003	0.003	0.001	0.001	0.0004
Total LNG Terminal w/out LNG Ship Offloading (w/out Power Plant)	**20.5**	**34.8**	**21.3**	**43.7**	**1.6**	**10.0**
LNG Ship Offloading Operations	132.1	30.6	3.5	3.7	33.5	1.78
Total LNG Terminal + LNG Ship Offloading (w/out Power Plant)	**152.6**	**65.4**	**24.8**	**47.5**	**35.1**	**11.8**
Power Plant						
CTG + HRSG (Scenario 1)	90.2	130.5	46.9	71.0	1.1	150.1
CTG + HRSG (Scenario 2)	80.2	116.0	14.0	57.8	1.0	133.5
Auxiliary Boilers (Scenario 1)	1.6	3.2	1.9	3.8	0.04	0.9
Auxiliary Boilers (Scenario 2)	8.7	15.5	9.3	19.2	0.2	4.4
Cooling Tower				2.5		
Total Power Plant (Worst-Case Scenario)	**91.8**	**133.6**	**48.7**	**79.5**	**1.2**	**151.0**
Total Stationary Sources + LNG Ship Offloading (w/ Power Plant)	**225.7**	**164.8**	**52.3**	**83.2**	**35.8**	**152.8**
PSD Thresholds	100	100	100	100	100	NA
NNSR Thresholds	25	NA	25	100	NA	*
Marine Emissions						
LNG Ship Maneuvering/Berthing, hoteling, incl. tugs, security and escort vessels (total)	348.1	64.4	6.3	9.3	60.2	3.29
In State of MD Waters	277.9	47.9	4.4	7.3	43.1	2.33
In State of VA Waters	70.2	16.5	1.8	1.9	17.2	0.96

TABLE 9A-23: EMISSIONS CALCULATIONS - LNG TERMINAL OPERATING EMISSIONS
Sparrows Point LNG Terminal
Operating Emissions Summary - HAPs (Annual Emissions in Tons/Year)

	Total Stationary Sources + LNG Offloading w/out Power Plant	Total Stationary Sources + LNG Offloading w/ Power Plant	Major Source Threshold
PAH	4.0E-04	1.9E-02	10
Acetaldehyde	9.9E-04	3.4E-01	10
Acrolein	3.0E-04	3.0E-04	10
Benzene	3.9E-02	1.4E-01	10
1,3-Butadiene	1.8E-06	3.7E-03	10
Dichlorobenzene	5.3E-03	2.3E-03	10
Formaldehyde	3.3E-01	6.3E+00	10
Hexane	7.9E+00	3.5E+00	10
Naphthalene	7.6E-03	1.7E-02	10
Toluene	2.6E-02	1.1E+00	10
Xylenes	7.3E-03	5.6E-01	10
Arsenic	8.8E-04	3.9E-04	10
Beryllium	5.3E-05	2.3E-05	10
Cadmium	4.8E-03	2.1E-03	10
Chromium	6.1E-03	2.7E-03	10
Cobalt	3.7E-04	1.6E-04	10
Lead	2.2E-03	9.7E-04	10
Manganese	1.7E-03	7.4E-04	10
Mercury	1.1E-03	5.0E-04	10
Nickel	9.2E-03	4.1E-03	10
Selenium	1.1E-04	4.6E-05	10
Total HAPs	8.3	12.0	25

TABLE 9A-24: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Pipeline Construction Schedule

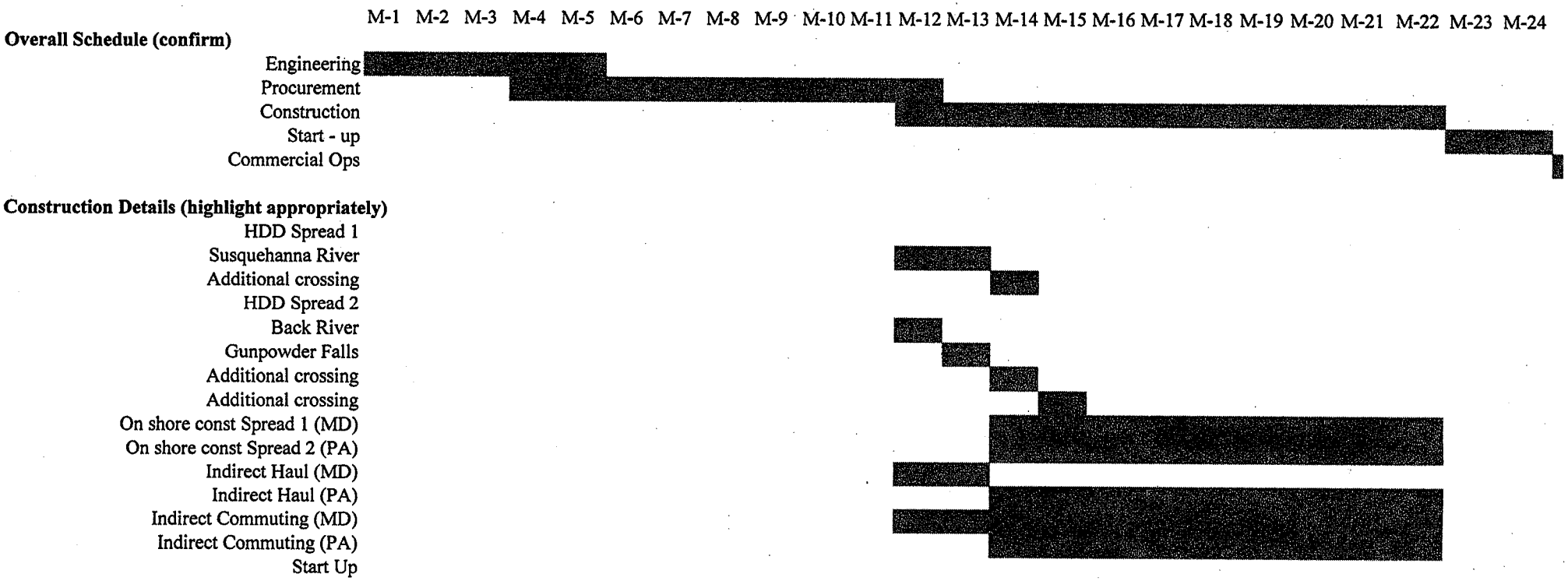

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TABLE 9A-25: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE— 2009 year, AQCR 115 and 114
Mid-Atlantic Express Pipeline
Horizontal Directional Drilling (HDD) Activities - Spread 1 (MD)

Split in half between AQCR 115 and 114, Construction Year 2009

Description	HDD Spread 1 (MD)
No. of Units	1 drill engine; 1 aux. generator; 1 cranes; 2 pumps;
	1 Cranes, 3 welding rigs, 5-pickups, 3 dozers
Generator kW / Bhp	300 kW 503 BHp
HDD Engine Bhp	450
BSFC, lb/hp-hr	0.367
% Sulfur Fuel	0.05
Crane Bhp, ea.	200
Pump Bhp, ea	200
Welding Rig	10
Crawler Sidebooms, Bhp	500
3/4 ton pickups	250
Engine Type	Diesel compression ignition
Load Factor	0.8 gen. 0.5 HDD + crane
Operating hrs/day	24

HDD Spread 1 Equipment

5 – ¾ ton pickup truck w/tools
3 - Crawler / Dozers (Diesel)
3 – Welding Rigs (Gasoline)
1 - Dragline Cranes (Diesel)

1 – Drilling rig (500 hp)
1 – Auxiliary Generators (Diesel)
1 – Water Pumps
1 – Slurry pumps

	HDD Engine			Aux. Generator			Crane, each			Pump, each			Welding Rig, each			Crawlers, each			3/4 ton pickups, each		
Pollutant	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec
PM	0.33	2.07	0.043	0.33	2.07	0.076	0.33	1	0.009	0.33	2.07	0.019	0.33	2.07	0.002	0.33	2.07	0.047	0.33	2.04	0.023
NO_X	8.38	1.05	0.550	8.38	1.05	0.983	8.38	1	0.233	8.38	1.05	0.244	8.38	1.05	0.020	8.38	1.05	0.611	8.38	1.03	0.300
SO_2	0.16	1.16	0.012	0.16	1.16	0.021	0.16	1	0.005	0.16	1.16	0.005	0.16	1.16	0.000	0.16	1.16	0.013	0.16	1.18	0.007
CO	2.7	2.66	0.449	2.7	2.66	0.803	2.7	1	0.075	2.7	2.66	0.200	2.7	2.66	0.016	2.7	2.66	0.499	2.7	2.31	0.217
HC	0.68	2.23	0.095	0.68	2.23	0.169	0.68	1	0.019	0.68	2.23	0.042	0.68	2.23	0.003	0.68	2.23	0.105	0.68	2.19	0.052

	HDD Engine	Aux. Generator #12	HDD Spread Cranes	HDD Pumps	HDD Welding Rigs	HDD Crawler	HDD Pickup Trucks	Total HDD Spread
No. of Units	1	1	1	2	3	3	5	
PM, g/sec	0.043	0.076	0.009	0.038	0.005	0.142	0.117	0.430
NO_X, g/sec	0.550	0.983	0.233	0.489	0.059	1.833	1.499	5.645
SO_2, g/sec	0.012	0.021	0.005	0.010	0.001	0.039	0.033	0.121
CO, g/sec	0.449	0.803	0.075	0.399	0.048	1.496	1.083	4.352
HC, g/sec	0.095	0.169	0.019	0.084	0.010	0.316	0.259	0.952

	Total tons/day @ 20 hr/day	TPY @ 180 day constr sched	TPY @180 day for AQCR 115	TPY @180 day for AQCR 114
PM	0.03	6.1	3.07	3.07
NO_X	0.45	80.6	40.32	40.32
SO_2	0.01	1.7	0.87	0.87
CO	0.35	62.2	31.09	31.09
HC	0.08	13.6	6.80	6.80

Notes:
[1] Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Period of Construction Activites Used for Calculation: HDD Activities occur within the calendar 2009 year.

TABLE 9A-26: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE--- 2009 year, AQCR 115
Mid-Atlantic Express Pipeline
Horizontal Directional Drilling (HDD) Activities - Spread 2 (MD)

Description	HDD Spread 2 (MD)
No. of Units	1 drill engine; 1 aux. generator; 1 cranes; 2 pumps;
	1 Cranes, 3 welding rigs, 5-pickups, 3 dozers
Generator kW / Bhp	300 kW 503 BHp
HDD Engine Bhp	450
BSFC, lb/hp-hr	0.367
% Sulfur Fuel	0.05
Crane Bhp, ea.	200
Pump Bhp, ea	200
Welding Rig	10
Crawler Sidebooms, Bhp	500
3/4 ton pickups	250
Engine Type	Diesel compression ignition
Load Factor	0.8 gen. 0.5 HDD + crane
Operating hrs/day	24

HDD Spread 2 Equipment

5 – ¾ ton pickup truck w/tools
3 - Crawler / Dozers (Diesel)
3 – Welding Rigs (Gasoline)
1 - Dragline Cranes (Diesel)

1 – Drilling rig (500 hp)
1 – Auxiliary Generators (Diesel)
1 – Water Pumps
1 – Slurry pumps

	HDD Engine			Aux. Generator			Crane, each			Pump, each			Welding Rig, each			Crawlers, each			3/4 ton pickups, each		
Pollutant	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec	Emission Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	g/sec
PM	0.33	2.07	0.043	0.33	2.07	0.076	0.33	1	0.009	0.33	2.07	0.019	0.33	2.07	0.002	0.33	2.07	0.047	0.33	2.04	0.023
NO_X	8.38	1.05	0.550	8.38	1.05	0.983	8.38	1	0.233	8.38	1.05	0.244	8.38	1.05	0.020	8.38	1.05	0.611	8.38	1.03	0.300
SO_2	0.16	1.16	0.012	0.16	1.16	0.021	0.16	1	0.005	0.16	1.16	0.005	0.16	1.16	0.000	0.16	1.16	0.013	0.16	1.18	0.007
CO	2.7	2.66	0.449	2.7	2.66	0.803	2.7	1	0.075	2.7	2.66	0.200	2.7	2.66	0.016	2.7	2.66	0.499	2.7	2.31	0.217
HC	0.68	2.23	0.095	0.68	2.23	0.169	0.68	1	0.019	0.68	2.23	0.042	0.68	2.23	0.003	0.68	2.23	0.105	0.68	2.19	0.052

	HDD Engine	Aux. Generator #12	HDD Spread Cranes	HDD Pumps	HDD Welding Rigs	HDD Crawler	HDD Pickup Trucks	Total HDD Spread
No. of Units	1	1	1	2	3	3	5	
PM, g/sec	0.043	0.076	0.009	0.038	0.005	0.142	0.117	0.430
NO_X, g/sec	0.550	0.983	0.233	0.489	0.059	1.833	1.499	5.645
SO_2, g/sec	0.012	0.021	0.005	0.010	0.001	0.039	0.033	0.121
CO, g/sec	0.449	0.803	0.075	0.399	0.048	1.496	1.083	4.352
HC, g/sec	0.095	0.169	0.019	0.084	0.010	0.316	0.259	0.952

	Total tons/day @ 20 hr/day	TPY @ 180 day constr sched
PM	0.03	6.1
NO_X	0.45	80.6
SO_2	0.01	1.7
CO	0.35	62.2
HC	0.08	13.6

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Period of Construction Activites Used for Calculation: HDD Activities occur within the calendar 2009 year.

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TABLE 9A-27: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE— Calculated for the construction period, years 2009-2010, AQCR 115 and 114

Mid-Atlantic Express Pipeline

Pipeline Construction Activities - Spread 1 (MD)

Description	Pipeline Construction Equipment (MD)
No. of Units	2 cranes, 13 trackhoes, 19 dozers, 2 trencher, 19 crawlers/dozers, 53 trucks, 4 graders, 2 pump units
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	10

Const Spread 1 Equipment (MD)

53 – ¾ ton pickup truck w/tools

13 – Track hoes

31 – Welding Rigs
2 - Dragline Cranes
4 - Motor Graders
2 – Generators
2 – Water Fill Pumps

4 – Fuel Trucks
4 – Road Bore Machines
2 – Wheel type Trenching Machines
16 – Tractor trailer transports (Diesel)

	2 Cranes				13 Trackhoes				2 Fuel Trucks			
	200 Bhp, each unit				140 Bhp, each unit				400 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	1	0.018	0.037	0.33	2.07	0.027	0.345	0.33	2.07	0.076	0.152
NO_X	8.38	1	0.466	0.931	8.38	1.05	0.342	4.448	8.38	1.05	0.978	1.955
SO_2	0.16	1	0.009	0.018	0.16	1.16	0.007	0.095	0.16	1.16	0.021	0.042
CO	2.7	1	0.150	0.300	2.7	2.66	0.279	3.631	2.7	2.66	0.798	1.596
HC	0.68	1	0.038	0.076	0.68	2.23	0.059	0.767	0.68	2.23	0.168	0.337

	2 Trenching Machines				53 3/4 ton Pickup trucks				31 Welding Rigs			
	200 Bhp, each unit				250 Bhp, each unit				10 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	2.07	0.038	0.076	0.33	2.07	0.047	2.514	0.33	2.07	0.002	0.059
NO_X	8.38	1.05	0.489	0.978	8.38	1.05	0.611	32.385	8.38	1.05	0.024	0.758
SO_2	16.21	1.16	1.045	2.090	0.16	1.16	0.013	0.692	0.18	1.16	0.001	0.018
CO	2.7	2.66	0.399	0.798	2.7	2.66	0.499	26.434	2.7	2.66	0.020	0.618
HC	0.68	2.23	0.084	0.168	0.68	2.23	0.105	5.581	0.68	2.23	0.004	0.131

	19 Crawlers / Dozers				2 Dump Trucks				4 Motor Graders			
	500 Bhp, each unit				400 Bhp, each unit				200 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	1.29	0.059	1.123	0.33	2.04	0.075	0.150	0.33	2.07	0.038	0.152
NO_X	8.38	0.98	1.141	21.672	8.38	1.03	0.959	1.918	8.38	1.05	0.489	1.955
SO_2	0.16	1	0.023	0.428	0.16	1.18	0.021	0.043	0.16	1.16	0.010	0.042
CO	2.7	1.5	0.563	10.688	2.7	2.31	0.693	1.386	2.7	2.66	0.399	1.596
HC	0.68	0.88	0.083	1.579	0.68	2.19	0.165	0.331	0.68	2.23	0.084	0.337

	2 Pumps				4 Road Bore Machine				16 Pipe Haul Trucks			
	150 Bhp, each unit				125 Bhp, each unit				500 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	2.07	0.028	0.057	0.33	2.07	0.024	0.095	0.33	2.07	0.095	1.518
NO_X	8.38	1.05	0.367	0.733	8.38	1.05	0.306	1.222	8.38	1.05	1.222	19.553
SO_2	0.16	1.16	0.008	0.016	0.16	1.16	0.007	0.026	0.16	1.16	0.026	0.418
CO	2.7	2.66	0.299	0.599	2.7	2.66	0.249	0.998	2.7	2.66	0.998	15.960
HC	0.68	2.23	0.063	0.126	0.68	2.23	0.053	0.211	0.68	2.23	0.211	3.370

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	Total TPY @ 190 day constr sched
PM	6.277	0.5	0.12	23.7
NO_X	88.509	0.5	1.76	333.7
SO_2	3.927	0.5	0.08	14.8
CO	64.603	0.5	1.28	243.5
HC	13.013	0.5	0.26	49.1

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) in nonroad diesel fuel.
2 In-use adjustment factor obtained from Table F-3 in above-referenced report.
3 Sizes of construction equipment diesel engines provided by Englobal.
4 Period of Construction Activites Used for Calculation: Pipeline Activities occur May 2009- Jan 2010 (9 months total).

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TABLE 9A-28: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE---- Calculated for the construction period, years 2009-2010, AQCR 196 and 045

Mid-Atlantic Express Pipeline

Pipeline Construction Activities - Spread 2 (PA)

Description	Pipeline Construction Equipment (PA)
No. of Units	4 cranes, 26 trackhoes, 38 dozers, 4 trencher, 38 crawlers/dozers, 106 trucks, 8 graders, 4 pump units
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	10

Const Spread 2 Equipment (PA)

53 – ¾ ton pickup truck w/tools

13 – Track hoes

31 – Welding Rigs
2 - Dragline Cranes
4 - Motor Graders
2 – Generators
2 – Water Fill Pumps

4 – Fuel Trucks
4 – Road Bore Machines
2 – Wheel type Trenching Machines
16 – Tractor trailer transports (Diesel)

	2 Cranes				13 Trackhoes				2 Fuel Trucks				2 Trenching Machines				53 3/4 ton Pickup trucks				31 Welding Rigs			
	200 Bhp, each unit				140 Bhp, each unit				400 Bhp, each unit				200 Bhp, each unit				250 Bhp, each unit				10 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	1	0.018	0.037	0.33	2.07	0.027	0.345	0.33	2.07	0.076	0.152	0.33	2.07	0.038	0.076	0.33	2.07	0.047	2.514	0.33	2.07	0.002	0.059
NO_X	8.38	1	0.466	0.931	8.38	1.05	0.342	4.448	8.38	1.05	0.978	1.955	8.38	1.05	0.489	0.978	8.38	1.05	0.611	32.385	8.38	1.05	0.024	0.758
SO_2	0.16	1	0.009	0.018	0.16	1.16	0.007	0.095	0.16	1.16	0.021	0.042	16.21	1.16	1.045	2.090	0.16	1.16	0.013	0.692	0.18	1.16	0.001	0.018
CO	2.7	1	0.150	0.300	2.7	2.66	0.279	3.631	2.7	2.66	0.798	1.596	2.7	2.66	0.399	0.798	2.7	2.66	0.499	26.434	2.7	2.66	0.020	0.618
HC	0.68	1	0.038	0.076	0.68	2.23	0.059	0.767	0.68	2.23	0.168	0.337	0.68	2.23	0.084	0.168	0.68	2.23	0.105	5.581	0.68	2.23	0.004	0.131

	19 Crawlers / Dozers				2 Dump Trucks				4 Motor Graders				2 Pumps				4 Road Bore Machine				16 Pipe Haul Trucks			
	500 Bhp, each unit				400 Bhp, each unit				200 Bhp, each unit				150 Bhp, each unit				125 Bhp, each unit				500 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	1.29	0.059	1.123	0.33	2.04	0.075	0.150	0.33	2.07	0.038	0.152	0.33	2.07	0.028	0.057	0.33	2.07	0.024	0.095	0.33	2.07	0.095	1.518
NO_X	8.38	0.98	1.141	21.672	8.38	1.03	0.959	1.918	8.38	1.05	0.489	1.955	8.38	1.05	0.367	0.733	8.38	1.05	0.306	1.222	8.38	1.05	1.222	19.553
SO_2	0.16	1	0.023	0.428	0.16	1.18	0.021	0.043	0.16	1.16	0.010	0.042	0.16	1.16	0.008	0.016	0.16	1.16	0.007	0.026	0.16	1.16	0.026	0.418
CO	2.7	1.5	0.563	10.688	2.7	2.31	0.693	1.386	2.7	2.66	0.399	1.596	2.7	2.66	0.299	0.599	2.7	2.66	0.249	0.998	2.7	2.66	0.998	15.960
HC	0.68	0.88	0.083	1.579	0.68	2.19	0.165	0.331	0.68	2.23	0.084	0.337	0.68	2.23	0.063	0.126	0.68	2.23	0.053	0.211	0.68	2.23	0.211	3.370

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	Total TPY @ 190 day constr sched
PM	6.277	0.5	0.12	23.7
NO_X	88.509	0.5	1.76	333.7
SO_2	3.927	0.5	0.08	14.8
CO	64.603	0.5	1.28	243.5
HC	13.013	0.5	0.26	49.1

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) in nonroad diesel fuel.
2 In-use adjustment factor obtained from Table F-3 in above-referenced report.
3 Sizes of construction equipment diesel engines provided by Englobal.
4 Period of Construction Activites Used for Calculation: Pipeline Activities occur May 2009- Jan 2010 (9 months total).

TABLE 9A-29: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
---- Divided by years 2009 and 2010, divided by AQCR
Mid-Atlantic Express Pipeline

SPREAD 1 (MD)

Pollutant	Total TPCP @ 190day constr sched	Total TPCP @ 190 day AQCR 115	Total TPY 2009 (170 days) AQCR 115	Total TPY 2010 (20 days) AQCR 115	Total TPCP @ 190 day AQCR 114	Total TPY 2009 (170 days) AQCR 114	Total TPY 2010 (20 days) AQCR 114
PM	23.664	21.672	19.390	2.281	1.993	1.783	0.210
NO_X	333.665	305.566	273.401	32.165	28.100	25.142	2.958
SO_2	14.803	13.556	12.129	1.427	1.247	1.115	0.131
CO	243.542	223.032	199.555	23.477	20.510	18.351	2.159
HC	49.058	44.926	40.197	4.729	4.131	3.697	0.435

SPREAD 2 (PA)

Pollutant	Total TPCP @ 190day constr sched	Total TPCP @ 190 day AQCR 196	Total TPY 2009 (170 days) AQCR 196	Total TPY 2010 (20 days) AQCR 196	Total TPCP @ 190 day AQCR 045	Total TPY 2009 (170 days) AQCR 045	Total TPY 2010 (20 days) AQCR 045
PM	23.664	4.806	4.300	0.506	18.859	16.873	1.985
NO_X	333.665	67.761	60.629	7.133	265.904	237.914	27.990
SO_2	14.803	3.006	2.690	0.316	11.797	10.555	1.242
CO	243.542	49.459	44.253	5.206	194.083	173.653	20.430
HC	49.058	9.963	8.914	1.049	39.095	34.980	4.115

Notes:
1 Period of Construction Activites Used for Calculation: Pipeline Activities occur May 2009- Jan 2010 (9 months total); 21 days/month.
2 Pipeline Mileage of Spread 1 and 2 was proportioned between AQCRs according to following lengths: Pipeline Spread 1 (AQCR 115 and 114): 48.21 total miles; AQCR 115: 44.15 miles; AQCR 114: 4.06 miles. Pipeline Spread 2 (AQCR 196 and 045): 39.59 total miles; AQCR 196: 8.04 miles; AQCR 045: 31.55 miles.

TABLE 9A-30: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Indirect Emissions from Haul Trucks and Workers Commuting

Vehicle Type	Vehicle Trips per Day	Days per Year	Round Trip Miles	PM			NH3			NO_X			VOC (HC)			CO		
				Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year
Spoils Haul Trucks (HDDV)	16	40	20	0.3	0.0001	0.004	0.02704	0.0000	0.000	12.69	0.0045	0.18	1.56	0.0006	0.02	6.87	0.0024	0.10
Supplies Trucks (HDDV)	6	40	40	0.3	0.0001	0.003	0.02704	0.0000	0.000	12.69	0.0034	0.13	1.56	0.0004	0.02	6.87	0.0018	0.07
Workers Commuting (LDGV)	80	190	30	0.02	0.0001	0.010	0.01513	0.0000	0.008	1.86	0.0049	0.93	1.22	0.0032	0.39	14.72	0.0389	4.67
Workers Commuting (LDGT)	80	190	30	0.02	0.0001	0.010	0.01513	0.0000	0.008	2.31	0.0061	1.16	1.82	0.0048	0.58	22.24	0.0588	7.06
Total					0.0003	0.0275		0.0001	0.0159		0.0189	2.4094		0.0090	1.0036		0.1020	11.9030
Total- MD AQCR 115					0.0001	0.0140		0.0000	0.0081		0.0096	1.2227		0.0046	0.5093		0.0518	6.0404
Total- MD AQCR 114					0.0000	0.0013		0.0000	0.0007		0.0009	0.1124		0.0004	0.0468		0.0048	0.5555
Total-PA AQCR 196					0.0000	0.0025		0.0000	0.0015		0.0017	0.2227		0.0008	0.0927		0.0094	1.1000
Total-PA AQCR 045					0.0001	0.0100		0.0000	0.0058		0.0068	0.8737		0.0033	0.3639		0.0370	4.3165

Notes:
1. Period of Construction Activites Used for Calculation: Pipeline Activities occur Feb 2009- Jan 2010 (12 months total); 21 days/month.
2. Pipeline Mileage of Spread 1 and 2 was proportioned between AQCRs according to following lengths: Pipeline Spread 1 (AQCR 115 and 114): 48.21 total miles; AQCR 115: 44.15 miles; AQCR 114: 4.06 miles. Pipeline Spread 2 (AQCR 196 and 045): 39.59 total miles; AQCR 196: 8.04 miles; AQCR 045: 31.55 miles.
3. Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude, 100°F ambient temperature.
4. Emission factors for PM obtained from USEPA report, "Mobile 6. 1 Particulate Emmision Factor Model Technical Description", January 2003.
5. Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-31a: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 115

AQCR 115 MARYLAND

Total Tons/Year During Construction Period					
Pollutant	HDD - Total Tons/Yr. During Construction Period (2009)	Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)	Indirect Emissions from Commuting Construction Workers and Haul Trucks	Tons Emitted-2009	Tons Emitted-2010
PM_{10}	9.2	21.7	0.0	28.48	2.41
NO_X	121.0	305.6	1.2	393.80	35.17
SO_2	2.6	13.6		14.65	1.51
CO	93.3	223.0	6.0	297.56	30.82
HC	20.4	44.9	0.5	60.84	5.50
NH3**	0.12	0.29	0.01	0.39	0.04

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-31b: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 114

AQCR 114 MARYLAND

Total Tons/Year During Construction Period					
Pollutant	HDD - Total Tons/Yr. During Construction Period (2009)	Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)	Indirect Emissions from Commuting Construction Workers and Haul Trucks	Tons Emitted-2009	Tons Emitted-2010
PM_{10}	3.1	2.0	0.0	4.84	0.22
NO_X	40.3	28.1	0.1	65.41	3.23
SO_2	0.9	1.2		1.98	0.14
CO	31.1	20.5	0.6	49.88	2.83
HC	6.8	4.1	0.0	10.52	0.51
NH3**	0.04	0.03	0.00	0.07	0.00

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-31c: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 196

AQCR 196 Pennsylvania

Total Tons/Year During Construction Period				
Pollutant	Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)	Indirect Emissions from Commuting Construction Workers and Haul Trucks	Tons Emitted-2009	Tons Emitted-2010
PM_{10}	4.8	0.0	4.27	0.54
NO_X	67.8	0.2	60.45	7.75
SO_2	3.0		2.67	0.33
CO	49.5	1.1	45.06	6.60
HC	10.0	0.1	8.95	1.20
NH3**	0.06	0.00	0.06	0.01

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-31d: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 045

AQCR 045 Pennsylvania

Total Tons/Year During Construction Period				
Pollutant	Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)	Indirect Emissions from Commuting Construction Workers and Haul Trucks	Tons Emitted-2009	Tons Emitted-2010
PM_{10}	18.9	0.0	16.77	2.11
NO_X	265.9	0.9	237.23	30.42
SO_2	11.8		10.49	1.31
CO	194.1	4.3	176.83	25.88
HC	39.1	0.4	35.12	4.71
NH3**	0.25	0.01	0.23	0.03

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

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TABLE 9A-32a: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE— 2008 year; AQCR- 115
LNG Terminal
Onshore Construction Activities

Description	Onshore Construction Equipment
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period, construction during 2008 year
AQCR- 115

	1	Crane-M.888 Crawler		4	months (CP)	2	15 Ton Picker		10	months (CP)	1	60 Ton Crane		1	months (CP)
	350	Bhp, each unit				150	Bhp, each unit				290	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	1.29	0.041	0.041	0.066	0.33	2.07	0.028	0.057	0.226	0.33	1	0.027	0.027	0.011
NO_X	8.38	0.98	0.798	0.798	1.267	8.38	1.05	0.367	0.733	2.910	8.38	1	0.675	0.675	0.268
SO_2	0.16	0.99	0.016	0.016	0.025	0.16	1.16	0.008	0.016	0.062	0.16	1	0.013	0.013	0.005
CO	2.7	1.5	0.394	0.394	0.625	2.7	2.66	0.299	0.599	2.375	2.7	1	0.218	0.218	0.086
HC	0.68	0.88	0.058	0.058	0.092	0.68	2.23	0.063	0.126	0.501	0.68	1	0.055	0.055	0.022

	3	Backhoe		9	months (CP)	1	450 Dozer		7	months (CP)	1	D6 Dozer		12	months (CP)
	150	Bhp, each unit				150	Bhp, each unit				350	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	2.07	0.028	0.085	0.305	0.33	1.29	0.018	0.018	0.049	0.33	1.29	0.041	0.041	0.197
NO_X	8.38	1.05	0.855	2.566	9.166	8.38	0.98	0.342	0.342	0.951	8.38	0.98	0.798	0.798	3.802
SO_2	0.16	1.16	0.018	0.055	0.196	0.16	1	0.007	0.007	0.019	0.16	0.99	0.016	0.016	0.074
CO	2.7	2.66	0.698	2.095	7.481	2.7	1.5	0.169	0.169	0.469	2.7	1.5	0.394	0.394	1.875
HC	0.68	2.23	0.147	0.442	1.580	0.68	0.88	0.025	0.025	0.069	0.68	0.88	0.058	0.058	0.277

	1	Front End Loader		8	months (CP)	1	Bobcat		12	months (CP)	1	Cat 225 TrackHoe		9	months (CP)
	150	Bhp, each unit				150	Bhp, each unit				520	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	2.07	0.028	0.028	0.090	0.33	1.29	0.018	0.018	0.084	0.33	2.07	0.099	0.099	0.352
NO_X	8.38	1.05	0.367	0.367	1.164	8.38	0.98	0.342	0.342	1.629	8.38	1.05	1.271	1.271	4.539
SO_2	0.16	1.16	0.008	0.008	0.025	0.16	0.99	0.007	0.007	0.032	0.16	1.16	0.027	0.027	0.097
CO	2.7	2.66	0.299	0.299	0.950	2.7	1.5	0.169	0.169	0.804	2.7	2.66	1.037	1.037	3.705
HC	0.68	2.23	0.063	0.063	0.201	0.68	0.88	0.025	0.025	0.119	0.68	2.23	0.219	0.219	0.782

	2	Compactor		12	months (CP)	1	Pulvimxer Cat		3	months (CP)	1	Roller		12	months (CP)
	300	Bhp, each unit				300	Bhp, each unit				300	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	2.07	0.057	0.114	0.542	0.33	2.07	0.057	0.057	0.068	0.33	1.29	0.035	0.035	0.169
NO_X	8.38	1.05	0.733	1.467	6.983	8.38	1.05	0.733	0.733	0.873	8.38	0.98	0.684	0.684	3.259
SO_2	0.16	1.16	0.016	0.031	0.149	0.16	1.16	0.016	0.016	0.019	0.16	0.99	0.013	0.013	0.064
CO	2.7	2.66	0.599	1.197	5.700	2.7	2.66	0.599	0.599	0.713	2.7	1.5	0.338	0.338	1.607
HC	0.68	2.23	0.126	0.253	1.204	0.68	2.23	0.126	0.126	0.150	0.68	0.88	0.050	0.050	0.237

	1	Scrappers		12	months (CP)	1	Asphalt Paver		2	months (CP)	1	Tandem Truck		12	months (CP)
	350	Bhp, each unit				65	Bhp, each unit				200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	1.29	0.041	0.041	0.197	0.722	1.29	0.017	0.017	0.013	0.33	1.29	0.024	0.024	0.113
NO_X	8.38	0.98	0.798	0.798	3.802	8.3	0.98	0.147	0.147	0.117	8.38	0.98	0.456	0.456	2.173
SO_2	0.16	0.99	0.016	0.016	0.074	0.16	1	0.003	0.003	0.002	0.16	0.99	0.009	0.009	0.042
CO	2.7	1.5	0.394	0.394	1.875	2.7	1.5	0.073	0.073	0.058	2.7	1.5	0.225	0.225	1.071
HC	0.68	0.88	0.058	0.058	0.277	0.99	0.88	0.016	0.016	0.012	0.68	0.88	0.033	0.033	0.158

DRAFT

	1	Stake Bed			12	months (CP)	1	Water Truck			12	months (CP)	5	Pickup F150			11	months (CP)
	200	Bhp, each unit					200	Bhp, each unit					200	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	
PM	0.33	2.07	0.038	0.038	0.181		0.33	2.07	0.038	0.038	0.181		0.33	2.07	0.038	0.190	0.828	
NO_x	8.38	1.05	0.489	0.489	2.328		8.38	1.05	0.489	0.489	2.328		8.38	1.05	0.489	2.444	10.669	
SO_2	0.16	1.16	0.010	0.010	0.050		0.16	1.16	0.010	0.010	0.050		0.16	1.16	0.010	0.052	0.228	
CO	2.7	2.66	0.399	0.399	1.900		2.7	2.66	0.399	0.399	1.900		2.7	2.66	0.399	1.995	8.708	
HC	0.68	2.23	0.084	0.084	0.401		0.68	2.23	0.084	0.084	0.401		0.68	2.23	0.084	0.421	1.839	

	4	Dump Truck 12/14			12	months (CP)	1	Fuel Truck			12	months (CP)	2	Forklift 8000 lbs			11	months (CP)
	340	Bhp, each unit					200	Bhp, each unit					75	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	
PM	0.33	2.07	0.065	0.258	1.229		0.4	2.07	0.046	0.046	0.219		0.722	2.02	0.030	0.061	0.265	
NO_x	8.38	1.05	0.831	3.324	15.829		8.38	1.05	0.489	0.489	2.328		8.3	0.96	0.166	0.332	1.449	
SO_2	0.16	1.16	0.018	0.071	0.338		0.16	1.16	0.010	0.010	0.050		0.16	1	0.003	0.007	0.029	
CO	2.7	2.66	0.678	2.713	12.920		2.7	2.66	0.399	0.399	1.900		2.7	3.68	0.207	0.414	1.807	
HC	0.68	2.23	0.143	0.573	2.728		0.68	2.23	0.084	0.084	0.401		0.99	1.07	0.022	0.044	0.193	

	2	Diesel Welder			11	months (CP)	2	Generator			8	months (CP)	0	Air Compressor			0	months (CP)
	55	Bhp, each unit					55	Bhp, each unit					55	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	
PM	0.722	2.07	0.023	0.046	0.199		0.722	2.07	0.023	0.046	0.145		0.722	2.07	0.023	0.046	0.000	
NO_x	8.3	1.05	0.133	0.266	1.162		8.3	1.05	0.133	0.266	0.845		8.3	1.05	0.133	0.266	0.000	
SO_2	0.16	1.16	0.003	0.006	0.025		0.16	1.16	0.003	0.006	0.018		0.16	1.16	0.003	0.006	0.000	
CO	2.7	2.66	0.110	0.219	0.958		2.7	2.66	0.110	0.219	0.697		2.7	2.66	0.110	0.219	0.000	
HC	0.99	2.23	0.034	0.067	0.294		0.99	2.23	0.034	0.067	0.214		0.99	2.23	0.034	0.067	0.000	

	2	Pump 4" & 6"			12	months (CP)	2	Man lifts			3	months (CP)	1	Light Tower			11	months (CP)
	55	Bhp, each unit					50	Bhp, each unit					50	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	Bhp, each unit			TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	
PM	0.722	2.07	0.023	0.046	0.217		0.722	2.07	0.021	0.042	0.049		0.722	2.07	0.021	0.021	0.091	
NO_x	8.3	1.05	0.133	0.266	1.268		8.3	1.05	0.121	0.242	0.288		8.3	1.05	0.121	0.121	0.528	
SO_2	0.16	1.16	0.003	0.006	0.027		0.16	1.16	0.003	0.005	0.006		0.16	1.16	0.003	0.003	0.011	
CO	2.7	2.66	0.110	0.219	1.045		2.7	2.66	0.100	0.200	0.238		2.7	2.66	0.100	0.100	0.435	
HC	0.99	2.23	0.034	0.067	0.321		0.99	2.23	0.031	0.061	0.073		0.99	2.23	0.031	0.031	0.134	

	2	Pile Drivers			7	months (CP)	1	Conc. Pump Truck			12	months (CP)
	350	Bhp, each unit					500	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	
PM	0.33	2.07	0.066	0.133	0.369		0.33	2.07	0.095	0.095	0.452	
NO_x	8.38	1.05	0.855	1.711	4.753		8.38	1.05	1.222	1.222	5.820	
SO_2	0.16	1.16	0.018	0.037	0.102		0.16	1.16	0.026	0.026	0.124	
CO	2.7	2.66	0.698	1.397	3.879		2.7	2.66	0.998	0.998	4.750	
HC	0.68	2.23	0.147	0.295	0.819		0.68	2.23	0.211	0.211	1.003	

SUMMARY OF EMISSIONS:

	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	TPY-2008	Tons emitted-2008
Pollutant					
PM	1.805	0.5	0.04	6.9	6.9
NO_x	24.107	0.5	0.48	92.5	92.5
SO_2	0.506	0.5	0.01	1.9	1.9
CO	18.088	0.5	0.36	70.5	70.5
HC	3.766	0.5	0.07	14.5	14.5

1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.

2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.

3 Sizes of construction equipment diesel engines estimated from data provided by CH-IV.

4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010

5 Period of Equipment Use referenced from construction activites schedule, provided by CH-IV.

TABLE 9A-32b: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE— 2009 year; AQCR- 115
LNG Terminal
Onshore Construction Activities

Description	Onshore Construction Equipment
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period, construction during 2009 year
AQCR- 115

	3	Crane-M.888 Crawler		11	months (CP)	3	15 Ton Picker		11	months (CP)	3	60 Ton Crane		10	months (CP)
	350	Bhp, each unit				150	Bhp, each unit				290	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	1.29	0.041	0.124	0.542	0.33	2.07	0.028	0.085	0.373	0.33	1	0.027	0.080	0.316
NO_X	8.38	0.98	0.798	2.395	10.456	8.38	1.05	0.367	1.100	4.801	8.38	1	0.675	2.025	8.037
SO_2	0.16	0.99	0.016	0.047	0.204	0.16	1.16	0.008	0.024	0.103	0.16	1	0.013	0.039	0.155
CO	2.7	1.5	0.394	1.181	5.156	2.7	2.66	0.299	0.898	3.919	2.7	1	0.218	0.653	2.589
HC	0.68	0.88	0.058	0.175	0.762	0.68	2.23	0.063	0.190	0.827	0.68	1	0.055	0.164	0.652

	2	Backhoe		12	months (CP)	0	450 Dozer		0	months (CP)	1	D6 Dozer		1	months (CP)
	150	Bhp, each unit				150	Bhp, each unit				350	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.028	0.057	0.271	0.33	1.29	0.018	0.000	0.000	0.33	1.29	0.041	0.041	0.016
NO_X	8.38	1.05	0.855	1.711	8.147	8.38	0.98	0.342	0.000	0.000	8.38	0.98	0.798	0.798	0.317
SO_2	0.16	1.16	0.018	0.037	0.174	0.16	1	0.007	0.000	0.000	0.16	0.99	0.016	0.016	0.006
CO	2.7	2.66	0.698	1.397	6.650	2.7	1.5	0.169	0.000	0.000	2.7	1.5	0.394	0.394	0.156
HC	0.68	2.23	0.147	0.295	1.404	0.68	0.88	0.025	0.000	0.000	0.68	0.88	0.058	0.058	0.023

	1	Front End Loader		1	months (CP)	1	Bobcat		3	months (CP)	0	Cat 225 TrackHoe		0	months (CP)
	150	Bhp, each unit				150	Bhp, each unit				520	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.028	0.028	0.011	0.33	1.29	0.018	0.018	0.021	0.33	2.07	0.099	0.000	0.000
NO_X	8.38	1.05	0.367	0.367	0.145	8.38	0.98	0.342	0.342	0.407	8.38	1.05	1.271	0.000	0.000
SO_2	0.16	1.16	0.008	0.008	0.003	0.16	0.99	0.007	0.007	0.008	0.16	1.16	0.027	0.000	0.000
CO	2.7	2.66	0.299	0.299	0.119	2.7	1.5	0.169	0.169	0.201	2.7	2.66	1.037	0.000	0.000
HC	0.68	2.23	0.063	0.063	0.025	0.68	0.88	0.025	0.025	0.030	0.68	2.23	0.219	0.000	0.000

	1	Compactor		10	months (CP)	0	Pulvimxer Cat		0	months (CP)	1	Roller		7	months (CP)
	300	Bhp, each unit				300	Bhp, each unit				300	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.057	0.057	0.226	0.33	2.07	0.057	0.000	0.000	0.33	1.29	0.035	0.035	0.099
NO_X	8.38	1.05	0.733	0.733	2.910	8.38	1.05	0.733	0.000	0.000	8.38	0.98	0.684	0.684	1.901
SO_2	0.16	1.16	0.016	0.016	0.062	0.16	1.16	0.016	0.000	0.000	0.16	0.99	0.013	0.013	0.037
CO	2.7	2.66	0.599	0.599	2.375	2.7	2.66	0.599	0.000	0.000	2.7	1.5	0.338	0.338	0.938
HC	0.68	2.23	0.126	0.126	0.501	0.68	2.23	0.126	0.000	0.000	0.68	0.88	0.050	0.050	0.139

	0	Scrappers		0	months (CP)	0	Asphalt Paver		0	months (CP)	1	Tandem Truck		12	months (CP)
	350	Bhp, each unit				65	Bhp, each unit				200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	1.29	0.041	0.000	0.000	0.722	1.29	0.017	0.000	0.000	0.33	1.29	0.024	0.024	0.113
NO_X	8.38	0.98	0.798	0.000	0.000	8.3	0.98	0.147	0.000	0.000	8.38	0.98	0.456	0.456	2.173
SO_2	0.16	0.99	0.016	0.000	0.000	0.16	1	0.003	0.000	0.000	0.16	0.99	0.009	0.009	0.042
CO	2.7	1.5	0.394	0.000	0.000	2.7	1.5	0.073	0.000	0.000	2.7	1.5	0.225	0.225	1.071
HC	0.68	0.88	0.058	0.000	0.000	0.99	0.88	0.016	0.000	0.000	0.68	0.88	0.033	0.033	0.158

DRAFT

	1	Stake Bed		12	months (CP)
	200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.038	0.038	0.181
NO_X	8.38	1.05	0.489	0.489	2.328
SO_2	0.16	1.16	0.010	0.010	0.050
CO	2.7	2.66	0.399	0.399	1.900
HC	0.68	2.23	0.084	0.084	0.401

	1	Water Truck		12	months (CP)
	200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.038	0.038	0.181
NO_X	8.38	1.05	0.489	0.489	2.328
SO_2	0.16	1.16	0.010	0.010	0.050
CO	2.7	2.66	0.399	0.399	1.900
HC	0.68	2.23	0.084	0.084	0.401

	5	Pickup F150			12	months (CP)
	200	Bhp, each unit				
Pollutant	Em. Factor[3] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	
PM	0.33	2.07	0.038	0.190	0.904	
NO_X	8.38	1.05	0.489	2.444	11.639	
SO_2	0.16	1.16	0.010	0.052	0.249	
CO	2.7	2.66	0.399	1.995	9.500	
HC	0.68	2.23	0.084	0.421	2.006	

	3	Dump Truck 12/14		12	months (CP)
	340	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.065	0.194	0.922
NO_X	8.38	1.05	0.831	2.493	11.872
SO_2	0.16	1.16	0.018	0.053	0.254
CO	2.7	2.66	0.678	2.035	9.690
HC	0.68	2.23	0.143	0.430	2.046

	1	Fuel Truck		10	months (CP)
	200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.038	0.038	0.151
NO_X	8.38	1.05	0.489	0.489	1.940
SO_2	0.16	1.16	0.010	0.010	0.041
CO	2.7	2.66	0.399	0.399	1.583
HC	0.68	2.23	0.084	0.084	0.334

	2	Forklift 8000 lbs			12	months (CP)
	75	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	
PM	0.722	2.02	0.030	0.061	0.289	
NO_X	8.3	0.96	0.166	0.332	1.581	
SO_2	0.16	1	0.003	0.007	0.032	
CO	2.7	3.68	0.207	0.414	1.971	
HC	0.99	1.07	0.022	0.044	0.210	

	3	Diesel Welder		12	months (CP)
	55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.722	2.07	0.023	0.068	0.326
NO_X	8.3	1.05	0.133	0.399	1.902
SO_2	0.16	1.16	0.003	0.009	0.041
CO	2.7	2.66	0.110	0.329	1.568
HC	0.99	2.23	0.034	0.101	0.482

	1	Generator		12	months (CP)
	55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.722	2.07	0.023	0.023	0.109
NO_X	8.3	1.05	0.133	0.133	0.634
SO_2	0.16	1.16	0.003	0.003	0.014
CO	2.7	2.66	0.110	0.110	0.523
HC	0.99	2.23	0.034	0.034	0.161

	1	Air Compressor			10	months (CP)
	55	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	
PM	0.722	2.07	0.023	0.068	0.272	
NO_X	8.3	1.05	0.133	0.399	1.585	
SO_2	0.16	1.16	0.003	0.009	0.034	
CO	2.7	2.66	0.110	0.329	1.306	
HC	0.99	2.23	0.034	0.101	0.402	

	1	Pump 4" & 6"		5	months (CP)
	55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.722	2.07	0.023	0.023	0.045
NO_X	8.3	1.05	0.133	0.133	0.264
SO_2	0.16	1.16	0.003	0.003	0.006
CO	2.7	2.66	0.110	0.110	0.218
HC	0.99	2.23	0.034	0.034	0.067

	4	Man lifts		10	months (CP)
	50	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.722	2.07	0.021	0.083	0.329
NO_X	8.3	1.05	0.121	0.484	1.921
SO_2	0.16	1.16	0.003	0.010	0.041
CO	2.7	2.66	0.100	0.399	1.583
HC	0.99	2.23	0.031	0.123	0.487

	1	Light Tower			11	months (CP)
	50	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	
PM	0.722	2.07	0.021	0.021	0.091	
NO_X	8.3	1.05	0.121	0.121	0.528	
SO_2	0.16	1.16	0.003	0.003	0.011	
CO	2.7	2.66	0.100	0.100	0.435	
HC	0.99	2.23	0.031	0.031	0.134	

	0	Pile Drivers		0	months (CP)
	350	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.066	0.000	0.000
NO_X	8.38	1.05	0.855	0.000	0.000
SO_2	0.16	1.16	0.018	0.000	0.000
CO	2.7	2.66	0.698	0.000	0.000
HC	0.68	2.23	0.147	0.000	0.000

	1	Conc. Pump Truck		12	months (CP)
	500	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.095	0.095	0.452
NO_X	8.38	1.05	1.222	1.222	5.820
SO_2	0.16	1.16	0.026	0.026	0.124
CO	2.7	2.66	0.998	0.998	4.750
HC	0.68	2.23	0.211	0.211	1.003

SUMMARY OF EMISSIONS:

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	TPY-2009	Tons emitted-2009
PM	1.489	0.5	0.03	1.5	1.5
NO_X	20.241	0.5	0.40	20.2	20.2
SO_2	0.420	0.5	0.01	0.4	0.4
CO	14.166	0.5	0.28	14.2	14.2
HC	2.961	0.5	0.06	3.0	3.0

1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.

2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.

3 Sizes of construction equipment diesel engines estimated from data provided by CH-IV.

4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010

5 Period of Equipment Use referenced from construction activites schedule, provided by CH-IV.

TABLE 9A-32c: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE— 2009 year; AQCR- 115
LNG Terminal
Onshore Construction Activities

Description	Onshore Construction Equipment
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period, construction during 2010 year
AQCR- 115

	1	Crane-M.888 Crawler		8	months (CP)	1	15 Ton Picker		11	months (CP)	1	60 Ton Crane		9	months (CP)
	350	Bhp, each unit				150	Bhp, each unit				290	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	1.29	0.041	0.041	0.131	0.33	2.07	0.028	0.028	0.124	0.33	1	0.027	0.027	0.095
NO_X	8.38	0.98	0.798	0.798	2.535	8.38	1.05	0.367	0.367	1.600	8.38	1	0.675	0.675	2.411
SO_2	0.16	0.99	0.016	0.016	0.050	0.16	0.16	0.001	0.001	0.005	0.16	1	0.013	0.013	0.047
CO	2.7	1.5	0.394	0.394	1.250	2.7	2.66	0.299	0.299	1.306	2.7	1	0.218	0.218	0.777
HC	0.68	0.88	0.058	0.058	0.185	0.68	2.23	0.063	0.063	0.276	0.68	1	0.055	0.055	0.196

	1	Backhoe		12	months (CP)	0	450 Dozer		0	months (CP)	0	D6 Dozer		0	months (CP)
	150	Bhp, each unit				150	Bhp, each unit				350	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.028	0.028	0.136	0.33	1.29	0.018	0.000	0.000	0.33	1.29	0.041	0.000	0.000
NO_X	8.38	1.05	0.855	0.855	4.074	8.38	0.98	0.342	0.000	0.000	8.38	0.98	0.798	0.000	0.000
SO_2	0.16	1.16	0.018	0.018	0.087	0.16	1	0.007	0.000	0.000	0.16	0.99	0.016	0.000	0.000
CO	2.7	2.66	0.698	0.698	3.325	2.7	1.5	0.169	0.000	0.000	2.7	1.5	0.394	0.000	0.000
HC	0.68	2.23	0.147	0.147	0.702	0.68	0.88	0.025	0.000	0.000	0.68	0.88	0.058	0.000	0.000

	0	Front End Loader		0	months (CP)	0	Bobcat		0	months (CP)	0	Cat 225 TrackHoe		0	months (CP)
	150	Bhp, each unit				150	Bhp, each unit				520	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.028	0.000	0.000	0.33	1.29	0.018	0.000	0.000	0.33	2.07	0.099	0.000	0.000
NO_X	8.38	1.05	0.367	0.000	0.000	0.33	0.98	0.013	0.000	0.000	8.38	1.05	1.271	0.000	0.000
SO_2	0.16	1.16	0.008	0.000	0.000	0.16	0.99	0.007	0.000	0.000	0.16	1.16	0.027	0.000	0.000
CO	2.7	2.66	0.299	0.000	0.000	2.7	1.5	0.169	0.000	0.000	2.7	2.66	1.037	0.000	0.000
HC	0.68	2.23	0.063	0.000	0.000	0.68	0.88	0.025	0.000	0.000	0.68	2.23	0.219	0.000	0.000

	0	Compactor		0	months (CP)	0	Pulvimxer Cat		0	months (CP)	0	Roller		0	months (CP)
	300	Bhp, each unit				300	Bhp, each unit				300	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.057	0.000	0.000	0.33	2.07	0.057	0.000	0.000	0.33	1.29	0.035	0.000	0.000
NO_X	8.38	1.05	0.733	0.000	0.000	8.38	1.05	0.733	0.000	0.000	8.38	0.98	0.684	0.000	0.000
SO_2	0.16	1.16	0.016	0.000	0.000	0.16	1.16	0.016	0.000	0.000	0.16	0.99	0.013	0.000	0.000
CO	2.7	2.66	0.599	0.000	0.000	2.7	2.66	0.599	0.000	0.000	2.7	1.5	0.338	0.000	0.000
HC	0.68	2.23	0.126	0.000	0.000	0.68	2.23	0.126	0.000	0.000	0.68	0.88	0.050	0.000	0.000

	0	Scrappers		0	months (CP)	1	Asphalt Paver		3	months (CP)	1	Tandem Truck		10	months (CP)
	350	Bhp, each unit				65	Bhp, each unit				200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	1.29	0.041	0.000	0.000	0.722	1.29	0.017	0.017	0.020	0.33	1.29	0.024	0.024	0.094
NO_X	8.38	0.98	0.798	0.000	0.000	8.3	0.98	0.147	0.147	0.175	8.38	0.98	0.456	0.456	1.811
SO_2	0.16	0.99	0.016	0.000	0.000	0.16	1	0.003	0.003	0.003	0.16	0.99	0.009	0.009	0.035
CO	2.7	1.5	0.394	0.000	0.000	2.7	1.5	0.073	0.073	0.087	2.7	1.5	0.225	0.225	0.893
HC	0.68	0.88	0.058	0.000	0.000	0.99	0.88	0.016	0.016	0.019	0.68	0.88	0.033	0.033	0.132

DRAFT

	1	Stake Bed		10	months (CP)
	200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.038	0.038	0.151
NO_X	8.38	1.05	0.489	0.489	1.940
SO_2	0.16	1.16	0.010	0.010	0.041
CO	2.7	2.66	0.399	0.399	1.583
HC	0.68	2.23	0.084	0.084	0.334

	1	Water Truck		10	months (CP)
	200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.038	0.038	0.151
NO_X	8.38	1.05	0.489	0.489	1.940
SO_2	0.16	1.16	0.010	0.010	0.041
CO	2.7	2.66	0.399	0.399	1.583
HC	0.68	2.23	0.084	0.084	0.334

	5	Pickup F150			10	months (CP)
	200	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	
PM	0.33	2.07	0.038	0.190	0.753	
NO_X	8.38	1.05	0.489	2.444	9.699	
SO_2	0.16	1.16	0.010	0.052	0.207	
CO	2.7	2.66	0.399	1.995	7.917	
HC	0.68	2.23	0.084	0.421	1.672	

	3	Dump Truck 12/14		10	months (CP)
	340	Bhp, each unit			
Pollutant	0.33	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.065	0.194	0.768
NO_X	8.38	1.05	0.831	2.493	9.893
SO_2	0.16	1.16	0.018	0.053	0.211
CO	2.7	2.66	0.678	2.035	8.075
HC	0.68	2.23	0.143	0.430	1.705

	1	Fuel Truck		10	months (CP)
	200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.038	0.038	0.151
NO_X	8.38	1.05	0.489	0.000	0.000
SO_2	0.16	1.16	0.010	0.000	0.000
CO	2.7	2.66	0.399	0.000	0.000
HC	0.68	2.23	0.084	0.000	0.000

	2	Forklift 8000 lbs			10	months (CP)
	75	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	
PM	0.722	2.02	0.030	0.061	0.241	
NO_X	8.3	0.96	0.166	0.332	1.317	
SO_2	0.16	1	0.003	0.007	0.027	
CO	2.7	3.68	0.207	0.414	1.643	
HC	0.99	1.07	0.022	0.044	0.175	

	2	Diesel Welder		9	months (CP)
	55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.722	2.07	0.023	0.046	0.163
NO_X	8.3	1.05	0.133	0.266	0.951
SO_2	0.16	1.16	0.003	0.006	0.020
CO	2.7	2.66	0.110	0.219	0.784
HC	0.99	2.23	0.034	0.067	0.241

	1	Generator		10	months (CP)
	55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.722	2.07	0.023	0.023	0.091
NO_X	8.3	1.05	0.133	0.133	0.528
SO_2	0.16	1.16	0.003	0.003	0.011
CO	2.7	2.66	0.110	0.110	0.435
HC	0.99	2.23	0.034	0.034	0.134

	1	Air Compressor			2	months (CP)
	55	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	
PM	0.722	2.07	0.023	0.046	0.036	
NO_X	8.3	1.05	0.133	0.266	0.211	
SO_2	0.16	1.16	0.003	0.006	0.005	
CO	2.7	2.66	0.110	0.219	0.174	
HC	0.99	2.23	0.034	0.067	0.054	

	0	Pump 4" & 6"		0	months (CP)
	55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.722	2.07	0.023	0.000	0.000
NO_X	8.3	1.05	0.133	0.000	0.000
SO_2	0.16	1.16	0.003	0.000	0.000
CO	2.7	2.66	0.110	0.000	0.000
HC	0.99	2.23	0.034	0.000	0.000

	2	Man lifts		9	months (CP)
	50	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.722	2.07	0.021	0.042	0.148
NO_X	8.3	1.05	0.121	0.242	0.865
SO_2	0.16	1.16	0.003	0.005	0.019
CO	2.7	2.66	0.100	0.200	0.713
HC	0.99	2.23	0.031	0.061	0.219

	1	Light Tower			4	months (CP)
	50	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	
PM	0.722	2.07	0.021	0.021	0.033	
NO_X	8.3	1.05	0.121	0.121	0.192	
SO_2	0.16	1.16	0.003	0.003	0.004	
CO	2.7	2.66	0.100	0.100	0.158	
HC	0.99	2.23	0.031	0.031	0.049	

	0	Pile Drivers		0	months (CP)
	350	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.066	0.000	0.000
NO_X	8.38	1.05	0.855	0.000	0.000
SO_2	0.16	1.16	0.018	0.000	0.000
CO	2.7	2.66	0.698	0.000	0.000
HC	0.68	2.23	0.147	0.000	0.000

	1	Conc. Pump Truck		5	months (CP)
	500	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.095	0.095	0.188
NO_X	8.38	1.05	1.222	1.222	2.425
SO_2	0.16	1.16	0.026	0.026	0.052
CO	2.7	2.66	0.998	0.998	1.979
HC	0.68	2.23	0.211	0.211	0.418

SUMMARY OF EMISSIONS:

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	TPY-2010	Tons emitted- 2010
PM	0.995	0.5	0.02	1.0	1.0
NO_X	11.796	0.5	0.23	11.8	11.8
SO_2	0.241	0.5	0.00	0.2	0.2
CO	8.994	0.5	0.18	9.0	9.0
HC	1.907	0.5	0.04	1.9	1.9

1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.

2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.

3 Sizes of construction equipment diesel engines estimated from data provided by CH-IV.

4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010

5 Period of Equipment Use referenced from construction activites schedule, provided by CH-IV.

TABLE 9A-33: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE— Construction Period 2009-2010, AQCR 115
LNG Terminal
Pier Rebabilitation

Description	Onshore Construction Equipment
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	8

TPCP= Tons per construction period, 18 months June 2009-December 2010
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	3	400 Amp Welder		360	days (CP)	2	Air Compressor		360	days (CP)	1	35 Ton Crane		360	days (CP)
	30	Bhp, each unit				275	Bhp, each unit				234	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.722	2.11	0.013	0.038	0.218	0.33	2.07	0.052	0.104	0.596	0.33	2.07	0.044	0.044	0.25
NO_X	8.3	1.31	0.091	0.272	1.553	8.38	1.05	0.672	1.344	7.682	8.38	1.05	0.572	0.572	3.27
SO_2	0.16	1.29	0.002	0.005	0.030	0.16	1.16	0.014	0.029	0.164	0.16	1.16	0.012	0.012	0.07
CO	2.7	3.22	0.072	0.217	1.242	2.7	2.66	0.549	1.097	6.270	2.7	2.66	0.467	0.467	2.67
HC	0.99	3.16	0.026	0.078	0.447	0.68	2.23	0.116	0.232	1.324	0.68	2.23	0.099	0.099	0.56

	1	GVW Truck		360	days (CP)	1	20 KW Generator		360	days (CP)	1	Backhoe		360	days (CP)
	340	Bhp, each unit				28	Bhp, each unit				77	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.065	0.065	0.369	0.722	2.07	0.012	0.012	0.066	0.722	2.07	0.032	0.032	0.183
NO_X	8.38	1.05	0.831	0.831	4.749	8.3	1.05	0.068	0.068	0.387	8.3	1.05	0.186	0.186	1.065
SO_2	0.16	1.16	0.018	0.018	0.101	0.16	1.16	0.001	0.001	0.008	0.16	1.16	0.004	0.004	0.023
CO	2.7	2.66	0.678	0.678	3.876	2.7	2.66	0.056	0.056	0.319	2.7	2.66	0.154	0.154	0.878
HC	0.68	2.23	0.143	0.143	0.818	0.99	2.23	0.017	0.017	0.098	0.99	2.23	0.047	0.047	0.270

	1	Dump Truck		360	days (CP)	1	Conc. Pump Truck		360	days (CP)	1	Excavator		360	days (CP)
	325	Bhp, each unit				350	Bhp, each unit				137	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.062	0.062	0.352	0.33	2.07	0.066	0.066	0.380	0.33	0.89	0.011	0.011	0.06
NO_X	8.38	1.05	0.073	0.073	0.419	8.38	1.05	0.855	0.855	4.888	8.38	0.87	0.277	0.277	1.59
SO_2	0.16	1.16	0.002	0.002	0.009	0.16	1.16	0.018	0.018	0.104	0.16	1.03	0.006	0.006	0.04
CO	2.7	2.66	0.060	0.060	0.342	2.7	2.66	0.698	0.698	3.990	2.7	0.44	0.045	0.045	0.26
HC	0.68	2.23	0.013	0.013	0.072	0.68	2.23	0.147	0.147	0.842	0.68	1.4	0.036	0.036	0.21

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	Tons Emissions 2009	Tons Emissions-2010
PM	0.434	0.5	0.01	1.0	1.5
NOX	4.479	0.5	0.09	10.0	15.6
SO2	0.096	0.5	0.00	0.2	0.3
CO	3.473	0.5	0.07	7.7	12.1
HC	0.812	0.5	0.02	1.8	2.8

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by CH IV.
4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010

TABLE 9A-34: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE— Construction Period years 2008-2010, AQCR 115
LNG Terminal
Indirect Emissions from Workers Commuting

Sparrows Point

					PM				NH3				NO_X				VOC				CO			
Vehicle Type	Vehicle Trips per Day	Days per Month	Length of CP (Months)	Round Trip Miles	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY
Workers Commuting (LDGV)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	1.86	10.3	3.3	1.2	1.22	6.7	2.2	0.8	14.72	81.1	26.0	9.7
Workers Commuting (LDGT)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	2.31	12.7	4.1	1.5	1.82	10.0	3.2	1.2	22.24	122.6	39.2	14.7
Site Transportation (Buses)	4	20	36	3	0.3	0.0	0.0	0.0	0.02704	0.0	0.0	0.0	2.31	0.1	0.0	0.0	1.82	0.0	0.0	0.0	22.24	0.6	0.2	0.1
Total						0.2	0.0	0.0		0.2	0.0	0.0		23.0	7.4	2.8		16.8	0.0	2.0		204.3	65.4	24.5

Notes:

Emissions represent total construction worker commuting for both pipeline constrution spreads and the compressor station.

Total of 200 workers assumed to commute to the project sites each day, 20 days/month, for length of construction period (32 months).

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude.

Workers commuting are divided into half Light Duty Gasoline Vehicles (LDGV) and half Light Duty Gasoline Trucks (LDGT).

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-35: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- Construction Period years 2008-2010, AQCR 115
LNG Terminal
Summary of Total Onshore Construction Activities

Total Tons/Year During Construction Period									
Pollutant	Term. Construction Tons Emitted - 2008	Term. Construction Tons Emitted - 2009	Term. Construction Tons Emitted - 2010	Pier Rehab Construction - Tons Emitted- 2009	Pier Rehab Construction - Tons Emitted- 2010	Indirect Emissions from Commuting Construction Workers (TPY)	Total Tons Emitted- 2008	Total Tons Emitted- 2009	Total Tons Emitted- 2010
PM_{10}	6.91	1.49	0.99	0.96	1.52	0.03	6.94	2.48	2.54
NO_X	92.50	20.24	11.80	9.95	15.64	2.77	95.26	32.96	30.20
SO_2	1.94	0.42	0.24	0.21	0.33		1.94	0.63	0.58
CO	70.53	14.17	8.99	7.72	12.13	24.52	95.05	46.40	45.64
VOC	14.50	2.96	1.91	1.81	2.84	2.02	16.52	6.78	6.76
NH3**	0.09	0.02	0.01	0.01	0.02	0.02	0.11	0.05	0.05

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

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TABLE 9A-36: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Onshore Start-up Construction Activities

Description	Onshore Start-Up Const. Equip.
No. of Units	1 cranes, 1 backhoes, 2 dozers, 2 excavators, 1 loader, 2 trucks, 1 graders and 1 skid steer
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	12

	1 Cranes				1 Backhoes				2 Dozers				2 Excavator			
	400 Bhp, each unit				85 Bhp, each unit				185 Bhp, each unit				225 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	1	0.037	0.037	0.33	2.07	0.016	0.016	0.33	1.29	0.022	0.044	0.33	0.89	0.018	0.037
NO_X	8.38	1	0.931	0.931	8.38	1.05	0.208	0.208	8.38	0.98	0.422	0.844	8.38	0.87	0.456	0.911
SO_2	0.16	1	0.018	0.018	0.16	1.16	0.004	0.004	0.16	0.99	0.008	0.016	0.16	1.03	0.010	0.021
CO	2.7	1	0.300	0.300	2.7	2.66	0.170	0.170	2.7	1.5	0.208	0.416	2.7	0.44	0.074	0.149
HC	0.68	1	0.076	0.076	0.68	2.23	0.036	0.036	0.68	0.88	0.031	0.062	0.68	1.4	0.060	0.119

	1 Loader				2 Trucks				1 Graders				1 Skid Steers			
	300 Bhp, each unit				355 Bhp, each unit				215 Bhp, each unit				80 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	2.07	0.076	0.076	0.33	2.07	0.016	0.016	0.33	1.29	0.022	0.044	0.33	1.74	0.036	0.072
NO_X	8.38	1.05	0.978	0.978	8.38	1.05	0.208	0.208	8.38	0.98	0.422	0.844	8.38	0.95	0.498	0.995
SO_2	0.16	1.16	0.021	0.021	0.16	1.16	0.004	0.004	0.16	0.99	0.008	0.016	0.16	1.09	0.011	0.022
CO	2.7	2.66	0.798	0.798	2.7	2.66	0.170	0.170	2.7	1.5	0.208	0.416	2.7	1.83	0.309	0.618
HC	0.68	2.23	0.168	0.168	0.68	2.23	0.036	0.036	0.68	0.88	0.031	0.062	0.68	1.49	0.063	0.127

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 12 hr/day	Total TPY @ 180 day constr sched
PM	0.341	0.5	0.01	1.5
NO_X	5.919	0.5	0.14	25.4
SO_2	0.124	0.5	0.00	0.5
CO	3.036	0.5	0.07	13.0
HC	0.684	0.5	0.02	2.9

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by Clean Earth Technologies, Inc.
4 Period of Construction Activites Used for Calculation: Dredging Start-up Activities occur during 2008 year.

TABLE 9A-37: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Onshore Processing and Stockpiling Activities

Description	Onshore Processing Equip.
No. of Units	2 water trucks, 2 backhoes, 2 dozers, 6 excavators, 4 loaders, 6 trucks, 1 broom sweeper and 2 skid steers
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	12

	2 Water Trucks				2 Backhoes				2 Dozers				6 Excavator			
	300 Bhp, each unit				85 Bhp, each unit				185 Bhp, each unit				300 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	2.07	0.057	0.114	0.33	2.07	0.016	0.032	0.33	1.29	0.022	0.044	0.33	1.29	0.035	0.213
NO_X	8.38	1.05	0.733	1.467	8.38	1.05	0.208	0.416	8.38	0.98	0.422	0.844	8.38	0.98	0.684	4.106
SO_2	0.16	1.16	0.016	0.031	0.16	1.16	0.004	0.009	0.16	0.99	0.008	0.016	0.16	0.99	0.013	0.080
CO	2.7	2.66	0.599	1.197	2.7	2.66	0.170	0.339	2.7	1.5	0.208	0.416	2.7	1.5	0.338	2.025
HC	0.68	2.23	0.126	0.253	0.68	2.23	0.036	0.072	0.68	0.88	0.031	0.062	0.68	0.88	0.050	0.299

	4 Loaders				6 Trucks				1 Sweeper				2 Skid Steers			
	300 Bhp, each unit				355 Bhp, each unit				200 Bhp, each unit				80 Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec
PM	0.33	2.07	0.057	0.114	0.33	2.07	0.016	0.032	0.33	2.07	0.035	0.070	0.33	1.74	0.048	0.287
NO_X	8.38	1.05	0.733	1.467	8.38	1.05	0.208	0.416	8.38	1.05	0.452	0.904	8.38	0.95	0.663	3.981
SO_2	0.16	1.16	0.016	0.031	0.16	1.16	0.004	0.009	0.16	1.16	0.010	0.019	0.16	1.09	0.015	0.088
CO	2.7	2.66	0.599	1.197	2.7	2.66	0.170	0.339	2.7	2.66	0.369	0.738	2.7	1.83	0.412	2.471
HC	0.68	2.23	0.126	0.253	0.68	2.23	0.036	0.072	0.68	2.23	0.078	0.156	0.68	1.49	0.084	0.507

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 12 hr/day	Total TPY @ 552 day (2-yr) constr sched
PM	0.906	0.5	0.02	6.0
NO_X	13.599	0.5	0.32	89.4
SO_2	0.285	0.5	0.01	1.9
CO	8.722	0.5	0.21	57.3
HC	1.672	0.5	0.04	11.0

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by Clean Earth Technologies, Inc.
4 Period of Construction Activites Used for Calculation: Dredging Process Activities occur March 2008-May 2010 (27 months)

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TABLE 9A-38: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Offshore - Dredging and Marine Vessel Emissions

Description	Off-shore Start-Up Const. Equip.
No. of Units	1 Dredge, 1 Tug, 1 Work/Survey boat, 1 Crew boat, 1 Inspecting/Contractor
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
# Operating Days	1
Operating hrs/day	12

	1 Dredge					1 Tug					1 Survey/Work Boat				
	1800 Bhp, each unit					2400 Bhp, each unit					250 Bhp, each unit				
Pollutant	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day
PM	1	0.261	16113.6	4206	4206	0.5	0.272	21485	5839	5839	0.5	0.272	2238	608	608
NO_X	1	10.575	16113.6	170403	170403	0.5	10.805	21485	232134	232134	0.5	10.805	2238	24181	24181
SO_2	1	0.16	16113.6	2578	2578	0.50	0.16	21485	3438	3438	0.16	0.642	2238	1437	1437
CO	1	0.0059	16113.6	95	95	0.5	0.017	21485	359	359	0.5	0.017	2238	37	37
HC	1	0.0067	16113.6	108	108	0.5	0.019	21485	407	407	0.5	0.019	2238	42	42

	1 Crew Boat					1 Inspecting/Contracting Vessel				
	200 Bhp, each unit					684 Bhp, each unit				
Pollutant	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day	Factor based on Fractional Load	Emissions Factor, g/kw-hr	kwhrs/day	Ea. Unit g/day	Total g/day
PM	0.5	0.272	1790	487	487	0.5	0.272	6123	1664	1664
NO_X	0.5	10.805	1790	19344	19344	0.5	10.805	6123	66158	66158
SO_2	0.50	0.160	1790	286	286	0.50	0.160	6123	980	980
CO	0.5	0.017	1790	30	30	0.5	0.017	6123	102	102
HC	0.5	0.019	1790	34	34	0.5	0.019	6123	116	116

Pollutant	Total g/day	Total Tons per day @ 12 hr/day	Total TPY @ 552 days (2-yr) constr sched
PM	12804	0.01	3.90
NO_X	512220	0.56	155.83
SO_2	8719	0.01	2.65
CO	623	0.001	0.19
HC	707	0.001	0.22

Notes:
1 Emission factors from "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data" EPA guidance report, February 2000, Office of Air and radiation.
2 Equipment list provided by Han Padron, Inc. and Clean Earth Technologies, Inc.

TABLE 9A-39: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Indirect Emissions from Haul Trucks and Workers Commuting

Vehicle Type	Vehicle Trips per Day	Days per Year	Round Trip Miles	PM			NH3			NO_X			VOC			CO		
				Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year
Spoils Haul Trucks (HDDV)	218	276	20	0.3	0.0014	0.40	0.02704	0.0001	0.04	12.69	0.0610	16.83	1.56	0.0075	2.07	6.87	0.0330	9.11
Additive Supply Trucks (HDDV	27	276	20	0.3	0.0002	0.05	0.02704	0.0000	0.00	12.69	0.0076	2.08	1.56	0.0009	0.26	6.87	0.0041	1.13
Workers Commuting (LDGV)	15	276	30	0.02	0.0000	0.00	0.01513	0.0000	0.00	1.86	0.0009	0.25	1.22	0.0006	0.17	14.72	0.0073	2.02
Workers Commuting (LDGT)	15	276	30	0.02	0.0000	0.00	0.01513	0.0000	0.00	2.31	0.0011	0.32	1.82	0.0009	0.25	22.24	0.0110	3.04
Total					0.0016	0.4527		0.0002	0.0445		0.0706	19.4884		0.0099	2.7417		0.0554	15.3014

Notes:

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude, 100°F ambient temperature.

Total days of operation = approximately 12 months x 23 days/month = 276 days @ 2years = 552 Days

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-40: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Summary of Total Emissions from Dredging Activities

Total Tons/Year During Construction Period								
Pollutant	Start-Up Construction - Total Tons/Yr During Construction Period	Onshore Construction - Total Tons/Yr During Construction Period	Offshore Construction - Total Tons/Yr During Construction Period	Indirect Emissions from Commuting Construction Workers and Haul Trucks	Total Tons/Yr During Construction Period	Tons Emitted 2008	Tons Emitted 2009	Tons Emitted 2010
PM_{10}	1.46	5.95	3.90	0.00	11.31	9.67	9.85	4.10
NO_X	25.37	89.37	155.83	19.49	290.05	245.94	264.69	102.17
SO_2	0.53	1.87	2.65		5.06	4.30	4.52	1.89
CO	13.01	57.32	0.19	15.30	85.82	73.68	72.81	23.96
VOC	2.93	10.99	0.22	2.74	16.88	14.55	13.94	4.67
NH3**	0.02	0.08	0.05	0.04	0.20	0.17	0.18	0.05

Maximum Tons/Day During Construction Period					
Pollutant	Start-Up Construction - Total Tons During Construction Period	Processing Construction - Total Tons During Construction Period	Offshore Construction - Total Tons During Construction Period	Indirect Emissions from Commuting Construction Workers and Haul Trucks	Total Tons/Day During Construction Period
PM_{10}	0.01	0.02	0.01		0.04
NO_X	0.14	0.32	0.56	0.07	1.10
SO_2	0.00	0.01	0.01		0.02
CO	0.07	0.21	0.00	0.06	0.34
VOC	0.02	0.04	0.00	0.01	0.07

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III 3 from above-noted USEPA reference.

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TABLE 9A-41: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- Construction years 2008-2010, AQCR 115
Power Plant
Onshore Construction Activities

Description	Onshore Construction Equipment
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period

	1 Crane-M.888 Crawler 350 Bhp, each unit				9 months (CP)	1 15 Ton Picker 150 Bhp, each unit				22 months (CP)	2 60 Ton Crane 290 Bhp, each unit				12 months (CP)
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	1.29	0.041	0.041	0.148	0.33	2.07	0.028	0.028	0.248	0.33	1	0.027	0.053	0.253
NO_X	8.38	0.98	0.798	0.798	2.852	8.38	1.05	0.367	0.367	3.201	8.38	1	0.675	1.350	6.429
SO_2	0.16	0.99	0.016	0.016	0.056	0.16	1.16	0.008	0.008	0.068	0.16	1	0.013	0.026	0.124
CO	2.7	1.5	0.394	0.394	1.406	2.7	2.66	0.299	0.299	2.613	2.7	1	0.218	0.435	2.071
HC	0.68	0.88	0.058	0.058	0.208	0.68	2.23	0.063	0.063	0.552	0.68	1	0.055	0.110	0.522

	1 Backhoe 150 Bhp, each unit				18 months (CP)	1 450 Dozer 150 Bhp, each unit				3 months (CP)	1 D6 Dozer 350 Bhp, each unit				3 months (CP)
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.028	0.028	0.203	0.33	1.29	0.018	0.018	0.021	0.33	1.29	0.041	0.041	0.049
NO_X	8.38	1.05	0.855	0.855	6.111	8.38	0.98	0.342	0.342	0.407	8.38	0.98	0.798	0.798	0.951
SO_2	0.16	1.16	0.018	0.018	0.131	0.16	1	0.007	0.007	0.008	0.16	0.99	0.016	0.016	0.019
CO	2.7	2.66	0.698	0.698	4.988	2.7	1.5	0.169	0.169	0.201	2.7	1.5	0.394	0.394	0.469
HC	0.68	2.23	0.147	0.147	1.053	0.68	0.88	0.025	0.025	0.030	0.68	0.88	0.058	0.058	0.069

	1 Front End Loader 150 Bhp, each unit				14 months (CP)	1 Bobcat 150 Bhp, each unit				22 months (CP)	1 Cat 225 Trac 520 Bhp, each unit				9 months (CP)
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.028	0.028	0.158	0.33	1.29	0.018	0.018	0.155	0.33	2.07	0.099	0.099	0.352
NO_X	8.38	1.05	0.367	0.367	2.037	8.38	0.98	0.342	0.342	2.987	8.38	1.05	1.271	1.271	4.539
SO_2	0.16	1.16	0.008	0.008	0.044	0.16	0.99	0.007	0.007	0.058	0.16	1.16	0.027	0.027	0.097
CO	2.7	2.66	0.299	0.299	1.663	2.7	1.5	0.169	0.169	1.473	2.7	2.66	1.037	1.037	3.705
HC	0.68	2.23	0.063	0.063	0.351	0.68	0.88	0.025	0.025	0.218	0.68	2.23	0.219	0.219	0.782

	1	Compactor			11	months (CP)	0	Pulvimxer Cat			0	months (CP)	1	Roller			13	months (CP)
	300	Bhp, each unit					300	Bhp, each unit					300	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	
PM	0.33	2.07	0.057	0.057	0.248		0.33	2.07	0.057	0.000	0.000		0.33	1.29	0.035	0.035	0.183	
NO_X	8.38	1.05	0.733	0.733	3.201		8.38	1.05	0.733	0.000	0.000		8.38	0.98	0.684	0.684	3.531	
SO_2	0.16	1.16	0.016	0.016	0.068		0.16	1.16	0.016	0.000	0.000		0.16	0.99	0.013	0.013	0.069	
CO	2.7	2.66	0.599	0.599	2.613		2.7	2.66	0.599	0.000	0.000		2.7	1.5	0.338	0.338	1.741	
HC	0.68	2.23	0.126	0.126	0.552		0.68	2.23	0.126	0.000	0.000		0.68	0.88	0.050	0.050	0.257	

	0	Scrappers			0	months (CP)	1	Asphalt Paver			3	months (CP)	1	Tandem Truc			23	months (CP)
	350	Bhp, each unit					65	Bhp, each unit					200	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	
PM	0.33	1.29	0.041	0.000	0.000		0.722	1.29	0.017	0.017	0.020		0.33	1.29	0.024	0.024	0.216	
NO_X	8.38	0.98	0.798	0.000	0.000		8.3	0.98	0.147	0.147	0.175		8.38	0.98	0.456	0.456	4.164	
SO_2	0.16	0.99	0.016	0.000	0.000		0.16	1	0.003	0.003	0.003		0.16	0.99	0.009	0.009	0.081	
CO	2.7	1.5	0.394	0.000	0.000		2.7	1.5	0.073	0.073	0.087		2.7	1.5	0.225	0.225	2.054	
HC	0.68	0.88	0.058	0.000	0.000		0.99	0.88	0.016	0.016	0.019		0.68	0.88	0.033	0.033	0.303	

	1	Stake Bed			28	months (CP)	1	Water Truck			18	months (CP)	4	Pickup F150			17	months (CP)
	200	Bhp, each unit					200	Bhp, each unit					200	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	
PM	0.33	2.07	0.038	0.038	0.422		0.33	2.07	0.038	0.038	0.271		0.33	2.07	0.038	0.152	1.024	
NO_X	8.38	1.05	0.489	0.489	5.432		8.38	1.05	0.489	0.489	3.492		8.38	1.05	0.489	1.955	13.191	
SO_2	0.16	1.16	0.010	0.010	0.116		0.16	1.16	0.010	0.010	0.075		0.16	1.16	0.010	0.042	0.282	
CO	2.7	2.66	0.399	0.399	4.433		2.7	2.66	0.399	0.399	2.850		2.7	2.66	0.399	1.596	10.767	
HC	0.68	2.23	0.084	0.084	0.936		0.68	2.23	0.084	0.084	0.602		0.68	2.23	0.084	0.337	2.273	

	2	Dump Truck 12/14			4	months (CP)	1	Fuel Truck			24	months (CP)	2	Forklift 8000			16	months (CP)
	340	Bhp, each unit					200	Bhp, each unit					75	Bhp, each unit				
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP		Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	
PM	0.33	2.07	0.065	0.129	0.205		0.33	2.07	0.038	0.038	0.361		0.722	2.02	0.030	0.061	0.386	
NO_X	8.38	1.05	0.831	1.662	2.638		8.38	1.05	0.489	0.489	4.656		8.3	0.96	0.166	0.332	2.108	
SO_2	0.16	1.16	0.018	0.036	0.056		0.16	1.16	0.010	0.010	0.100		0.16	1	0.003	0.007	0.043	
CO	2.7	2.66	0.678	1.357	2.153		2.7	2.66	0.399	0.399	3.800		2.7	3.68	0.207	0.414	2.629	
HC	0.68	2.23	0.143	0.286	0.455		0.68	2.23	0.084	0.084	0.802		0.99	1.07	0.022	0.044	0.280	

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	1	Diesel Welder		20	months (CP)	1	Generator		23	months (CP)	1	Air Compres:		8	months (CP)
	55	Bhp, each unit				55	Bhp, each unit				55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.722	2.07	0.023	0.023	0.181	0.722	2.07	0.023	0.023	0.208	0.722	2.07	0.023	0.023	0.072
NO_X	8.3	1.05	0.133	0.133	1.057	8.3	1.05	0.133	0.133	1.215	8.3	1.05	0.133	0.133	0.423
SO_2	0.16	1.16	0.003	0.003	0.023	0.16	1.16	0.003	0.003	0.026	0.16	1.16	0.003	0.003	0.009
CO	2.7	2.66	0.110	0.110	0.871	2.7	2.66	0.110	0.110	1.001	2.7	2.66	0.110	0.110	0.348
HC	0.99	2.23	0.034	0.034	0.268	0.99	2.23	0.034	0.034	0.308	0.99	2.23	0.034	0.034	0.107

	1	Pump 4" & 6"		10	months (CP)	2	Man lifts		19	months (CP)	1	Light Tower		7	months (CP)
	55	Bhp, each unit				50	Bhp, each unit				50	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.722	2.07	0.023	0.023	0.091	0.722	2.07	0.021	0.042	0.313	0.722	2.07	0.021	0.021	0.058
NO_X	8.3	1.05	0.133	0.133	0.528	8.3	1.05	0.121	0.242	1.825	8.3	1.05	0.121	0.121	0.336
SO_2	0.16	1.16	0.003	0.003	0.011	0.16	1.16	0.003	0.005	0.039	0.16	1.16	0.003	0.003	0.007
CO	2.7	2.66	0.110	0.110	0.435	2.7	2.66	0.100	0.200	1.504	2.7	2.66	0.100	0.100	0.277
HC	0.99	2.23	0.034	0.034	0.134	0.99	2.23	0.031	0.061	0.462	0.99	2.23	0.031	0.031	0.085

	1	Pile Drivers		3	months (CP)	1	Conc. Pump Truck		17	months (CP)
	350	Bhp, each unit				500	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.066	0.066	0.079	0.33	2.07	0.095	0.095	0.640
NO_X	8.38	1.05	0.855	0.855	1.018	8.38	1.05	1.222	1.222	8.244
SO_2	0.16	1.16	0.018	0.018	0.022	0.16	1.16	0.026	0.026	0.176
CO	2.7	2.66	0.698	0.698	0.831	2.7	2.66	0.998	0.998	6.729
HC	0.68	2.23	0.147	0.147	0.176	0.68	2.23	0.211	0.211	1.421

SUMMARY OF EMISSIONS:

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	Avg. Tons/Month	Average TPY
PM	1.259	0.5	0.02	0.5	5.99
NO_X	16.901	0.5	0.34	6.7	80.48
SO_2	0.352	0.5	0.01	0.1	1.68
CO	12.126	0.5	0.24	4.8	57.74
HC	2.499	0.5	0.05	1.0	11.90

Notes:

1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.

2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.

3 Sizes of construction equipment diesel engines provided by CH IV.

4 Period of Construction Activites Used for Calculation: Power Plant Construction Activities occur June 2008-April 2010

TABLE 9A-42: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
Power Plant
Indirect Emissions from Onshore Construction Activities

Sparrows Point

					PM				NH3				NO_X				VOC				CO			
Vehicle Type	Vehicle Trips per Day	Days per Month	Length of Construction Period (CP, Months)	Round Trip Miles	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY
Workers Commuting (LDGV)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	1.86	10.3	3.3	1.2	1.22	6.7	2.2	0.8	14.72	81.1	26.0	9.7
Workers Commuting (LDGT)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	2.31	12.7	4.1	1.5	1.82	10.0	3.2	1.2	22.24	122.6	39.2	14.7
Site Transportation (Buses)	4	20	36	3	0.3	0.0	0.0	0.0	0.02704	0.0	0.0	0.0	2.31	0.1	0.022	0.01	1.82	0.048	0.017	0.01	22.24	0.6	0.2	0.1
Total						0.2	0.0	0.0		0.2	0.0	0.0		23.0	7.4	2.8		16.8	0.0	2.0		204.3	65.4	24.5

Notes:

Emissions represent total construction worker commuting for both pipeline constrution spreads and the compressor station.

Total of 200 workers assumed to commute to the project sites each day, 20 days/month, for length of construction period (32 months).

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude.

Workers commuting are divided into half Light Duty Gasoline Vehicles (LDGV) and half Light Duty Gasoline Trucks (LDGT).

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-43: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2
Power Plant
Summary of Total Emissions from Power Plant Construction

Total Tons/Year During Construction Period						
Pollutant	Power Plant Construction - Total Tons/Yr During Construction Period	Indirect Emissions from Commuting Construction Workers	Total Tons/Yr During Construction Period	Tons Emitted 2008	Tons Emitted 2009	Tons Emitted 2010
PM_{10}	5.99	0.03	6.02	3.51	6.02	2.01
NO_X	80.48	2.77	83.25	48.56	83.25	27.75
SO_2	1.68		1.68	0.98	1.68	0.56
CO	57.74	24.52	82.26	47.98	82.26	27.42
VOC	11.90	2.02	13.92	8.12	13.92	4.64
NH3 **	0.08	0.02	0.10	0.06	0.10	0.03

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

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TABLE 9A-44: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE
Sparrows Point Project
AQCR 115 Construction Emissions Summary (Annual Emissions in Tons/Year)

2008- Tons Emitted

AQCR 115- Baltimore and Harford Counties	NOX	CO	VOC	PM-10/2.5	SOX	NH3	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde
Terminal	95.26	95.05	16.52	6.94	1.94	0.11	0.88	0.05	0.33	0.03	1.95
Dredging	245.94	73.68	14.55	9.67	4.30	0.17	0.77	0.04	0.29	0.03	1.72
TOTAL (w/o powerplant)	341.20	168.73	31.07	16.61	6.25	0.28	1.65	0.09	0.62	0.06	3.67
Powerplant	48.56	47.98	8.12	3.51	0.98	0.06	0.43	0.02	0.16	0.02	0.96
TOTAL (w/ powerplant)	389.76	216.71	39.19	20.12	7.22	0.34	2.08	0.12	0.78	0.08	4.62

2009- Tons Emitted

AQCR 115- Baltimore and Harford Counties	NOX	CO	VOC	PM-10/2.5	SOX	NH3	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde
Pipeline	393.80	297.56	60.84	28.48	14.65	0.39	3.22	0.18	1.22	0.12	7.18
Terminal	32.96	46.40	6.78	2.48	0.63	0.05	0.36	0.02	0.14	0.01	0.80
Dredging	264.69	72.81	13.94	9.85	4.52	0.18	0.74	0.04	0.28	0.03	1.65
TOTAL (w/o powerplant)	691.45	416.76	81.57	40.81	19.81	0.23	4.32	0.24	1.63	0.16	9.63
Powerplant	83.25	82.26	13.92	6.02	1.68	0.10	0.74	0.04	0.28	0.03	1.64
TOTAL (w/ powerplant)	774.70	499.02	95.48	46.83	21.48	0.33	5.06	0.29	1.91	0.19	11.27

2010- Tons Emitted

AQCR 115- Baltimore and Harford Counties	NOX	CO	VOC	PM-10/2.5	SOX	NH3	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde
Pipeline	35.17	30.82	5.50	2.41	1.51	0.04	0.29	0.02	0.11	0.01	0.65
Terminal	30.20	45.64	6.76	2.54	0.58	0.05	0.36	0.02	0.14	0.01	0.80
Dredging	102.17	23.96	4.67	4.10	4.52	0.05	0.25	0.01	0.09	0.01	0.55
TOTAL (w/o powerplant)	167.55	100.42	16.93	9.05	6.61	0.11	0.90	0.05	0.34	0.03	2.00
Powerplant	27.75	27.42	4.64	2.01	0.56	0.03	0.25	0.01	0.09	0.01	0.55
TOTAL (w/ powerplant)	195.29	127.84	21.57	11.06	7.16	0.14	1.14	0.06	0.43	0.04	2.54

Air Toxics Fractions of VOC[1]

Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.02
1,3-Butadiene	0.002
Formaldehyde	0.118

1. Identified hazardous air pollutants are EPA-targeted Mobile Source Air Toxics (MSAT). Air toxics VOC fractions were obtained from Table 3.1-3, "Final Regulatory Analylsis: Control of Emissions from Nonroad Diesel Engines", EPA420-R-04-007, May 2004).

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TABLE 9A-45: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE

Sparrows Point Project

AQCRs 115, 114, 196, and 045 Construction Emissions Summary (Annual Emissions in Tons)

All Emissions From LNG Terminal Construction Activities in AQCR 115

All Emissions From Pipeline Construction Activities in AQCR 114, 196 and 045

AQCR-115 (MD)	2008	2009	2010
$PM_{10}/PM_{2.5}$	20.12	46.83	11.06
NO_X	389.76	774.70	195.29
SO_2	7.22	21.48	7.16
CO	216.71	499.02	127.84
VOC	39.19	95.48	21.57
NH3	0.34	0.33	0.14
Acetaldehyde	2.08	5.06	1.14
Acrolein	0.12	0.29	0.06
Benzene	0.78	1.91	0.43
1,3-Butadiene	0.08	0.19	0.04
Formaldehyde	4.62	11.27	2.54

AQCR-196 (PA)	2008	2009	2010
$PM_{10}/PM_{2.5}$		4.27	0.54
NO_X		60.45	7.75
SO_2		2.67	0.33
CO		45.06	6.60
VOC		8.95	1.20
NH3		0.06	0.01
Acetaldehyde		0.47	0.06
Acrolein		0.03	0.00
Benzene		0.18	0.02
1,3-Butadiene		0.02	0.00
Formaldehyde		1.06	0.14

AQCR-114 (MD)	2008	2009	2010
$PM_{10}/PM_{2.5}$		4.84	0.22
NO_X		65.41	3.23
SO_2		1.98	0.14
CO		49.88	2.83
VOC		10.52	0.51
NH3		0.07	0.00
Acetaldehyde		0.56	0.03
Acrolein		0.03	0.00
Benzene		0.21	0.01
1,3-Butadiene		0.02	0.00
Formaldehyde		1.24	0.06

AQCR-045 (PA)	2008	2009	2010
$PM_{10}/PM_{2.5}$		16.77	2.11
NO_X		237.23	30.42
SO_2		10.49	1.31
CO		176.83	25.88
VOC		35.12	4.71
NH3		0.23	0.03
Acetaldehyde		1.86	0.25
Acrolein		0.11	0.01
Benzene		0.70	0.09
1,3-Butadiene		0.07	0.01
Formaldehyde		4.14	0.56

Total MD	2008	2009	2010
$PM_{10}/PM_{2.5}$	20.12	51.67	11.28
NO_X	389.76	840.11	198.53
SO_2	7.22	23.46	7.30
CO	216.71	548.89	130.67
VOC	39.19	106.00	22.07
NH3	0.34	0.39	0.15
Acetaldehyde	2.08	5.62	1.17
Acrolein	0.12	0.32	0.07
Benzene	0.78	2.12	0.44
1,3-Butadiene	0.08	0.21	0.04
Formaldehyde	4.62	12.51	2.60

Total PA	2008	2009	2010
$PM_{10}/PM_{2.5}$		21.05	2.64
NO_X		297.69	38.17
SO_2		13.16	1.64
CO		221.90	32.48
VOC		44.06	5.91
NH3		0.29	0.04
Acetaldehyde		2.34	0.31
Acrolein		0.13	0.02
Benzene		0.88	0.12
1,3-Butadiene		0.09	0.01
Formaldehyde		5.20	0.70