

CCNPP3COLA PEmails

From: Quinn, Laura
Sent: Wednesday, April 14, 2010 3:38 PM
To: Parkhurst, Mary Ann; Brown, David; Ramsdell, James V Jr (Van)
Cc: Imboden, Stacey; Cushing, Jack; Palmrose, Donald
Subject: New submittal from UniStar on Air conformity
Attachments: ML1010201740.pdf; ML1010201730.pdf

Here are the new numbers from UniStar on air conformity. Please review and let me know what you all think. Let me know if we need to have a call internally and/or with the applicant once you review the submittal. Please have an answer to me no later than next Thurs COB. That gives you a week to look it over. any questions let me know.

Thanks
Laura

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10 CFR 50.4
10 CFR 52.79

April 7, 2010

UN#10-099

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Calvert Cliffs Nuclear Power Plant (CCNPP), Unit 3, Calvert County, Maryland
Revised NO_x and Volatile Organic Compound (VOC) Emissions and Air Conformity
Report

Reference: UniStar Nuclear Energy Letter UN#09-516, from Greg Gibson (UNE) to
Document Control Desk, U.S. NRC, RAI No. 1014, NO_x and VOC (Ozone
Precursor) Air Emissions during Construction and Operation, dated
December 11, 2009.

This letter transmits Revision 1 of "NO_x and VOC Emissions from Construction Activities and Air
Conformity Applicability Calvert Cliffs Unit 3," as requested by Laura Quinn, NRC Environmental
Project Manager. Revision 0 of the report was transmitted in the referenced letter.

This letter contains no new regulatory commitments.

DO96
NRO

UN#10-099
April 7, 2010
Page 2

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Dimitri Lutchenkov at (410) 470-5524.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 7, 2010



for Greg Gibson

Enclosure: NO_x and VOC Emissions from Construction Activities and Air Conformity
Applicability Calvert Cliffs Unit 3 Rev.1, dated March 2010

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
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Loren Plisco, Deputy Regional Administrator, NRC Region II
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U.S. NRC Region I Office

Enclosure

**NO_x and VOC Emissions
from Construction Activities and Air Conformity Applicability
Calvert Cliffs Unit 3 Rev. 1
dated March 2010**



Environment

Submitted to:
Calvert Cliffs 3 Nuclear Project, LLC and
UniStar Nuclear Operating Services, LLC
Baltimore, MD

Submitted by:
AECOM
Westford, MA
Project No. 60136676
March, 2010

NO_x and VOC Emissions from Construction Activities and Air Conformity Applicability Calvert Cliffs Unit 3 Rev. 1



Environment

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March, 2010

NO_x and VOC Emissions from Construction Activities and Air Conformity Applicability Calvert Cliffs Unit 3 Rev. 1

A handwritten signature in black ink, appearing to read "Ian Miller U. Phaneendra".

Prepared By
Ian Miller and Phaneendra Uppalapati

A handwritten signature in black ink, appearing to read "Robert M. Wanchuk".

Reviewed By
Robert Wanchuk

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1.0 Introduction

Calvert Cliffs 3 Nuclear Project LLC ("CC3") and UniStar Nuclear Operating Services, LLC ("UNO") (Co-Applicants) are proposing to construct and operate a new nuclear power unit on the existing Calvert Cliffs Nuclear Power Plant (CCNPP) site. The new unit will be designated as CCNPP Unit 3 (CC3), and will have a gross electric generation capacity of about 1,710 megawatts.

Pursuant to the General Conformity Requirements under 40 CFR 93.150 et seq, the Nuclear Regulatory Commission (NRC) as the lead federal agency is required to make a conformity determination with regard to the proposed construction and operation of CC3. The General Conformity Rule applies only in locations designated in 40 CFR Part 81 as maintenance or nonattainment areas for any criteria air pollutant. As shown in Figure 1-1, the CC3 project site in Calvert County, Maryland is located within the Washington, DC-MD-VA moderate nonattainment area for the 8-hour ambient ozone standard. As such, construction-related emissions of ozone precursors, i.e., oxides of nitrogen (NO_x) and volatile organic compounds (VOC) from both direct and indirect project-related emissions have been evaluated to determine if annual emissions of these pollutants during the years of construction are above the applicable tonnage thresholds for applicability of General Conformity requirements. The applicable de minimis thresholds are 100 tons per year of NO_x and 50 tons per year of VOC emissions per 40 CFR 93.153.

Note that operation of CC3 will not result in significant generation of NO_x emissions, or significant releases of VOCs. Typical sources of NO_x during operation of CC3 will include vehicle operations (mobile sources) and periodic operation of diesel generators that are used to provide backup power (stationary sources). Potential emissions of NO_x and VOCs from CC3 stationary source operations will also be subject to restrictions imposed under the Certificate of Public Convenience and Necessity (CPCN) issued by Maryland Public Service Commission for CCNPP Unit 3 effective June 26, 2009. The CPCN constitutes the issuance of the Air Quality Minor New Source Review Permit to Construct, and a Major Prevention of Significant Deterioration (PSD) permit that was based on review by the Power Plant Research Program (PPRP) and the Maryland Department of the Environment (MDE). Potential NO_x and VOC emissions from operations will be below de minimis threshold values listed in 40 CFR 93.153(b). Mobile source emissions from operations were estimated by proportioning the worst case year of on-road emission during construction by the ratio of operational employees to the number of construction workers. Permitted emissions from the CC3 stationary sources are 24 tpy of NO_x and 4 tpy of VOC but these emissions are specifically excluded from the requirements for a conformity determination per the exclusion found in 40 CFR 93.153(d) for major new sources subject to PSD.

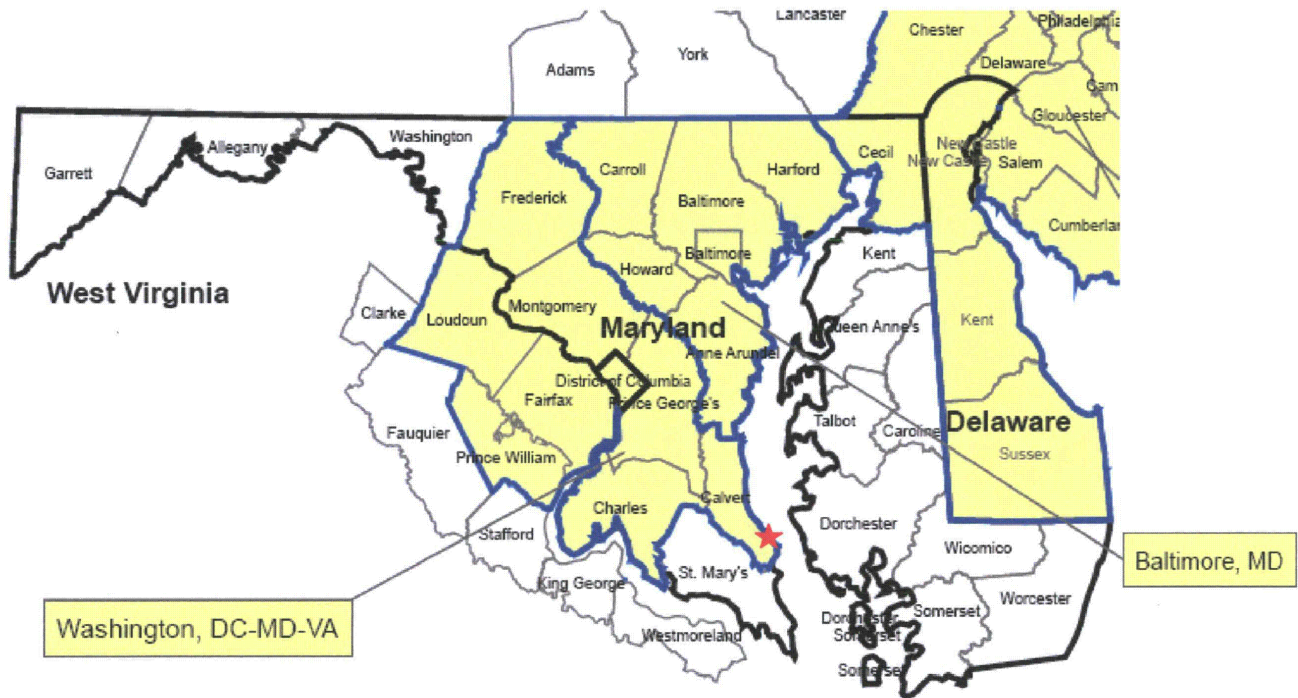
This report documents the NO_x and VOC emissions associated with the construction of CC3 for purposes of determining applicability to the federal Clean Air Act General Conformity Rule. An earlier version of this report was submitted to NRC to satisfy the commitment by CC3 and UNO pursuant to CC-09-0002 (dated October 2, 2009) to provide updated construction emissions by December 11, 2009. Prior to the December 2009 submittal, estimates of construction-related emissions were provided in the CPCN Technical Reports filed with the Maryland Public Service Commission (PSC) in November 2007 and later amended in August 2008. These CPCN reports only evaluated onsite NO_x and VOC emissions related to construction and did not address indirect emissions from activities outside the construction site that are required by EPA in a formal conformity applicability analysis. Indirect activities included in this analysis are employee commuting, commercial deliveries, and emissions from materials delivered by barge to the on-site dock. Moreover, the construction equipment schedule and timeline has been revised since the previous filings.

This document updates the version of this report filed with the NRC in December 2009 to specifically address NRC's request for a more detailed breakout of safety-related construction emissions as defined pursuant to 40 CFR Part 50.10. This request was verbally communicated in a conference call with UniStar and NRC on December 18, 2009.

1.1 Content of the Report

This report consists of four sections and two appendices. Section 2.1 presents the estimated direct and indirect VOC and NO_x emissions from construction of the project. Section 2.2 provides estimates of the indirect emissions associated with CC3 operations. Section 3 describes the methodology for the emission inventory. Technical references are provided in section 4. Appendix A contains the projected construction equipment details and hours of use for each year of construction. Appendix B contains detailed emissions calculations for the direct construction equipment and indirect emissions.

Figure 1-1 Washington, DC-MD-VA and Baltimore, MD 8-hr Ozone Nonattainment Regions



★ Location of CC3

2.0 Emissions Evaluation Approach

The evaluation of the construction and pre-construction emissions is the aggregate of Non-road and On-road emissions associated with the construction of CC3. Non-road emissions are estimated using NONROAD 2008 model and on-road emissions are estimated using MOBILE 6.2 model. AECOM incorporated these two models and applied them mathematically to determine the emissions.

Bechtel North American Power Corporation (Bechtel) is UniStar's current project/construction engineering firm. Bechtel has developed an overall equipment list for construction of CC3 (see Appendix A). This assumption was cross-checked with actual construction schedules from two comparably-sized projects.

In determining the construction emissions as defined in 40 CFR Part 50.2 and Part 50.10, UniStar has developed a "Resource Utilization" approach in consultation with Bechtel. In this approach, construction emission are measured only from the operations associated with Safety-related structures, systems, or components (SSCs) in addition to the onsite activities and are based on the labor distribution throughout the period of construction.

Labor utilization is characterized as being associated with the Nuclear Island, the Turbine Island or the Balance of plant. The assumption is that equipment utilization will be proportional to the predicted labor utilization and that SSC utilization can be defined as that portion of the total devoted to the Nuclear Island. Based upon the schedule, the period of safety-related construction is predicted to be 68 months beginning January 2012. The calculated distribution of resource utilization during that time is distributed as follows:

Table 2-1 Resource Utilization

	2012	2013	2014	2015	2016	2017
Nuclear Island	72.2%	60.5%	58.4%	80.9%	85.1%	100%
Turbine Island	0.10%	13.8%	13.7%	16.1%	14.9%	0%
Balance of Plant	27.7%	25.6%	27.9%	3.0%	0%	0%
	100%	100%	100%	100%	100%	100%

Emissions from equipment associated with safety-related activities are estimated separately from the overall emissions estimate. These are Tables B-1a and B-1b in Appendix B.

3.0 Emissions Estimates

3.1 Construction/Pre-Construction Emissions

Tables 3-1 and 3-2 present the total VOC and NO_x emissions estimates over the construction of the project. These are broken up into separate tables for the two ozone nonattainment regions which are affected. As seen in Figure 1-1, CC3 is located in the Washington DC-MD-VA nonattainment area, but is also close to the Baltimore nonattainment area. Indirect emissions from employee commuting, commercial deliveries and barge deliveries are expected to be generated in both nonattainment areas.

At the request of NRC, Table 3-3 presents a breakout of safety-related construction emissions as defined under 10 CFR Part 50 – Domestic Licensing for Production and Utilization Facilities. The definition of construction under 10 CFR 50.2 reads as follows:

Construction or constructing means, for the purposes of §50.55(e), the analysis, design, manufacture, fabrication, quality assurance, placement, erection, installation, modification, inspection, or testing of a facility or activity which is subject to the regulations in this part and consulting services related to the facility or activity that are safety related.

Additional delineation of construction versus “pre-construction” activities is found under 10 CFR 50.10(a)(1) and (2) under limited work authorization. These are paraphrased below.

- (1) Activities constituting construction are the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or in-place assembly, erection, fabrication, or testing, which are for: safety-related structures, systems, or components (SSCs)
- (2) Construction does not include: Site exploration, preparation of a site for construction of a facility, including clearing of the site, grading, installation of drainage, erosion and other environmental mitigation measures, and construction of temporary roads and borrow areas; excavation; erection of support buildings building of service facilities

The level of detail to precisely breakout preconstruction and construction activities as defined by NRC is unknown at this time. Emissions reported in Table 3-3 are based on estimated equipment types expected to perform safety-related construction activities as defined in 10 CFR 50. For example groups excluded are direct or indirect emissions from motor vehicles (except concrete trucks), site preparation equipment and dredging equipment. Equipment groups included are earthmoving, compacting, cranes, forklifts, concrete/aggregate equipment, air compressors, manlifts, welding equipment, generating equipment, small capitol equipment and concrete equipment.

The equipment groups included in construction-related activities are shown in Appendix B combined with the non-safety related equipment and also separately. Since the labor (and resource) utilization is not assigned to any specific equipment, a breakdown of emissions by equipment group is not possible. Therefore, the resource utilization of the nuclear island was applied to the total estimated emissions from the safety-related construction equipment for the estimates provided in Table 3-3..

Table 3-1 CC3 Total Construction Emissions within the Washington DC-MD-VA Ozone Nonattainment Area

Year	Off-Road Diesel VOC	Off-Road Gasoline VOC	On-Road Vehicles VOC	Marine VOC	Boiler VOC	VOC (Tons)	Exceeds Conformity Threshold (Yes/No)	Off-Road Diesel NOx	Off-Road Gasoline NOx	On-Road Vehicles NOx	Marine NOx	Boiler NOx	NOx (Tons)	Exceeds Conformity Threshold (Yes/No)
2010	2.6	1.6	3.9	0	0	8.2	No	36.4	0.12	4.0	0	0	40.5	No
2011	9.9	5.2	17.3	0.34	0	32.7	No	138.1	0.5	20.6	6.8	0	166.0	Yes
2012	3.3	1.1	19.9	0.11	0.02	24.4	No	48.1	0.4	24.3	2.1	1.5	76.5	No
2013	9.9	3.8	26.8	0.11	0.05	40.7	No	150.9	1.8	34.4	2.1	4.6	193.8	Yes
2014	12.4	4.8	29.5	0.11	0.05	46.8	No	188.8	2.4	43.1	2.1	4.6	241.0	Yes
2015	12.7	4.8	25.8	0.11	0.05	43.4	No	193.0	2.4	39.8	2.1	4.6	242.0	Yes
2016	11.3	4.6	21.2	0.11	0.03	37.3	No	170.9	2.3	29.3	2.1	3.1	207.8	Yes
2017	6.7	4.5	10.0	0	0	21.2	No	101.3	2.2	14.5	0	0	118.0	Yes
2018	1.3	1.3	3.5	0	0	6.2	No	19.4	0.9	4.1	0	0	24.4	No

Includes activities not defined as construction under 10 CFR 50.

Table 3-2 CC3 Total Construction Emissions within Baltimore Nonattainment Area

Year	Off-Road Diesel VOC	Off-Road Gasoline VOC	On-Road Vehicles VOC	Marine VOC	Boiler VOC	VOC (Tons)	Exceeds Conformity Threshold (Yes/No)	Off-Road Diesel NOx	Off-Road Gasoline NOx	On-Road Vehicles NOx	Marine NOx	Boiler NOx	NOx (Tons)	Exceeds Conformity Threshold (Yes/No)
2010	0	0	0.3	0	0	0.35	No	0	0	0.27	0	0	0.27	No
2011	0	0	1.5	0	0	1.48	No	0	0	1.1	0	0	1.1	No
2012	0	0	2.1	0.35	0	2.49	No	0	0	2.1	6.8	0	8.9	No
2013	0	0	2.7	0.35	0	3.06	No	0	0	2.5	6.8	0	9.3	No
2014	0	0	2.9	0.35	0	3.20	No	0	0	2.4	6.8	0	9.2	No
2015	0	0	2.4	0.35	0	2.71	No	0	0	1.8	6.8	0	8.6	No
2016	0	0	1.8	0.35	0	2.18	No	0	0	1.3	6.8	0	8.2	No
2017	0	0	0.8	0	0	0.82	No	0	0	0.6	0	0	0.6	No
2018	0	0	0.3	0	0	0.27	No	0	0	0.19	0	0	0.19	No

Includes activities not defined as construction under 10 CFR 50.

Table 3-3 CC3 10 CFR 50 Construction Emissions within the Washington DC-MD-VA Ozone Nonattainment Area

Year	Off-Road Diesel VOC	Off-Road Gasoline VOC	On-Road Vehicles VOC	Marine VOC	Boiler VOC	Total VOC (Tons)	10 CFR 50 Construction Resource Utilization	10 CFR 50 Construction Emissions VOC (Tons)	Exceeds Conformity Threshold (Yes/No)
2010	0	0	0	0	0	0	0.0%	0	No
2011	0	0	0	0	0	0	0.0%	0	No
2012	1.5	0.77	0.19	0	0	2.5	72.2%	1.8	No
2013	8.8	3.25	0.37	0	0	12.5	60.5%	7.5	No
2014	11.1	4.25	0.36	0	0	15.7	58.4%	9.2	No
2015	11.4	4.22	0.34	0	0	16.0	80.9%	12.9	No
2016	10.6	4.05	0.31	0	0	14.9	85.1%	12.7	No
2017	6.6	3.92	0	0	0	10.6	100.0%	10.6	No
2018	1.3	1.02	0	0	0	2.35	0.0%	0.00	No

Year	Off-Road Diesel NOx	Off-Road Gasoline NOx	On-Road Vehicles NOx	Marine NOx	Boiler NOx	Total NOx (Tons)	10 CFR 50 Construction Resource Utilization	10 CFR 50 Construction Emissions NOx (Tons)	Exceeds Conformity Threshold (Yes/No)
2010	0	0	0	0	0	0	0.0%	0	No
2011	0	0	0	0	0	0	0.0%	0	No
2012	22.3	0.41	3.1	0	0	25.8	72.2%	18.6	No
2013	132.2	1.83	5.5	0	0	139.5	60.5%	84.4	No
2014	167.1	2.41	4.7	0	0	174.2	58.4%	101.7	Yes
2015	171.3	2.40	4.1	0	0	177.8	80.9%	143.9	Yes
2016	157.7	2.34	3.4	0	0	163.4	85.1%	139.1	Yes
2017	100.1	2.23	0	0	0	102.4	100.0%	102.4	Yes
2018	19.3	0.85	0	0	0	20.2	0.0%	0.00	No

As stated previously, the emissions in Table 3-3 represent the best estimate of "construction" emissions as defined by 10 CFR Part 50 and an estimate of associated resource (labor) utilization. Construction of the reactor and cooling tower are not expected to start in great capacity until the middle of 2012. A detailed plan of construction has not yet been developed in order to specify the start of construction of individual equipment. For example, backfilling and soil compaction are considered construction so the entire group of operating earthmoving and compacting equipment is included in the emissions estimate. Other equipment groups included are compaction, cranes, forklifts, manlifts, welding equipment, concrete equipment, air compressors, pipelaying, cable laying, winches, generation equipment, and small capital equipment. This list is presented in Appendix B, Table B-1b.

Based on the NRC definition of construction and estimated resource utilization by UniStar, Table 3-3 shows that the exceedances of the conformity threshold for NO_x for the years 2014 through 2017. Only non-safety related construction activities are expected to take place in 2010, 2011, and 2018.

3.2 Operational Emissions

As noted in Section 1, the operational emissions from CC3 stationary sources required a permit under the PSD program. As such, these emissions are specifically excluded from the requirements for a conformity determination per the exclusion found in 40 CFR 93.153(d).

The only other emissions of NO_x and VOC from CC3 operations are indirect emissions associated with vehicular emissions from employee traffic. As stated in the Phase II traffic study prepared in June 2009 (Reference 10), 363 permanent employees are expected once CC3 begins operations resulting in at most 363 additional round trips. This is very similar to the 379 round trips estimated for the construction workforce in 2018 but well below the estimated number of peak daily round trips during construction of 3,000.

Using similar assumptions as with the construction workforce, emissions from indirect operational employee commuting are expected to be only 1.4 tons/yr of NO_x and 2.0 tons/yr of VOC in the Washington DC nonattainment area and 0.2 tons/yr of NO_x and 0.3 tons/yr of VOC in the Baltimore nonattainment area. These levels are well below the respective applicability thresholds of 100 tons/yr and 50 tons/yr.

4.0 Emission Estimation Methodology

Bechtel North American Power Corporation (Bechtel), UniStar's current project/construction engineering firm, was responsible for developing an estimate of fuel-burning equipment (non-road and on-road) needed to construct the proposed Unit 3. Bechtel provided an equipment schedule with equipment sizes and estimated annual hours of operation and as previously mentioned in Section 2, this list was then used to develop a safety-related construction list of equipment. Emissions calculations based on this equipment along with indirect NO_x and VOC emissions are presented in Appendix B.

4.1 Emissions from Non-Road Equipment

Emissions from non-road equipment (mobile, portable, and stationary fuel-burning equipment) were estimated using EPA's NONROAD2008 model and methodology. Bechtel provided a study of engines with horsepower and annual hours of operation for construction of CC3. Similar to the previously submitted construction emissions from 2008, AECOM developed a spreadsheet-based approach to estimate non-road engine emissions based on the NONROAD model guidance and NONROAD model data files. This allows the emissions estimates to be thoroughly checked and allows transparency to how emissions are developed.

Applicable engine tiers for this analysis are based on the estimated usage dates and the phase-in years for engine size ranges given in Table 1 of Reference 2 for diesel engines and Tables 1 through 7 of Reference 3 for gasoline engines. The applicable SCC codes for equipment were chosen (based on engine duty and fuel type) from the list in Appendix A of Reference 4. This cross reference allowed AECOM to match equipment from Bechtel's list to the NONROAD data files which contain the steady state pollutant emission factors and load factors. Note that this methodology is slightly different than that submitted in 2008, because the NONROAD 2008 data file used here has the transient adjustment factor (TAF) built into the steady state emission factor.

The Equation involved in determining the non-road construction emissions is as follows (from Page 1 of Reference 4):

$$EF_{adj} = EF_{ss} * DF \text{.....Equation 1}$$

EF_{adj} = Final emission factor used in model after adjustments to account for transient operation and deterioration (g/hp-hr)

EF_{ss} = NONROAD 2008 steady state emission factor (g/hp-hr)

DF = Deterioration factor

The deterioration factor (DF) is a function of the technology type and age of the engine.

The NONROAD methodology addresses the effects of deterioration in the engines by multiplying the steady state emission factor for each category of engine by deterioration factor (DF). The following equation (from p 19 of Reference 2 and p 3 of Reference 5) is used to calculate DF as a function of engine age

$$DF = 1 + A * (\text{Age factor})^b \text{ for Age Factor} \leq 1 \text{.....Equation 2}$$

$$DF = 1 + A \text{ for Age Factor} > 1 \text{.....Equation 3}$$

Where Age factor = fraction of median life expended = (cumulative hours * load factor) / median life at full load, in hours.

A = constants for a given pollutant / technology type

$b \leq 1$, for most engines or 0.5 for 2-stroke engines less than 25 Hp

Deterioration is capped at the end of an engine's median life (age factor = 1), under the assumption that an engine deteriorated to a point where any increased deterioration is offset by maintenance. For this analysis, all age factors were set to 1 ("fully deteriorated") in order to simplify the calculations.

Annual non-road emissions were estimated using the following equation from Page 1 of Reference 4

$$E_{Sta} = EF_{adj} * HP * Hours * Load Factor * \frac{Ton}{2000 lb} * \frac{lb}{453.6 g} \quad \text{Equation 4}$$

E_{Sta} = Annual stationary source emissions in tons

EF_{adj} = Final adjusted emission factor (g/hp-hr)

HP = Rated horsepower hp

Hours = Annual operating hours of the equipment

Load Factor = fraction of available rated power

The load factor is an adjustment included in the model to avoid grossly over counting emissions. It is the average fraction of the rated power of an engine that is expected to be actually used in annual operation. This factor takes into account idling, partial load operation, and transient operation. For instance, a 100 hp diesel powered crane has a load factor of 0.43 from the NONROAD data table based on the SCC code. This means that in normal operation, the crane is expected to use an average of 43 hp for every available 100 hp capacity. These factors are based on surveys of equipment users.

One final adjustment that is special to VOC is the conversion from total hydrocarbons (HC). The NONROAD model steady state emission factors are all in terms of HC. This is so the model has a common basis to output emissions in terms of VOC, total organic gasses (TOG), or non-methane hydrocarbons (NMHC). Reference 6 gives the conversion from HC to VOC as 1.053 for diesel engines, 1.034 for 2-stroke gasoline engines, and 0.933 for 4-stroke gasoline engines.

4.2 On-Road Vehicles

Estimation of on-road vehicular emissions was calculated with EPA's MOBILE6.2 Vehicle Emission Modeling Software. MOBILE6.2 is an emission factor model for predicting gram of emissions (VOC, and NO_x) per mile as well as other criteria and air toxic emissions from cars, trucks, and motorcycles. The MOVES model (as a replacement for Mobile 6.2) is currently under development by EPA but has not been finalized at the time of this report.

Mobile 6.2 gives emission rates in terms of grams per vehicle mile traveled. To obtain miles traveled for on-site vehicles, the estimated hours of vehicle use was multiplied by an estimated annual speed in mile/hr. Specific vehicle categories from Mobile6.2 for on-site vehicles are given in Appendix B. For employee commuting, the estimated annual number of construction employees was multiplied by a factor of 1.3 (for estimating carpooling) to get a number of vehicles. This assumption is consistent with the Phase II traffic study prepared in June 2009. Employees are assumed to have a typical daily commute which is constant for 312 working days per calendar year and have vehicles which fall into the LDGV category. The geographic breakdown was assumed to be 10% from St. Mary's County to the south and west (an attainment area for ozone), 25% from the Baltimore nonattainment area to the north, and the rest from the Washington DC-MD-VA ozone nonattainment area. The number of commercial deliveries was determined based on the expected goods to be delivered to the site during construction by truck. For this analysis, commercial deliveries are assumed to be in the HDDV8b category. Thirty percent of the commercial deliveries were assumed to come from the Baltimore nonattainment area with the balance from the Washington DC-MD-VA nonattainment area.

For indirect emissions from employee commuting and commercial deliveries, AECOM assumed a 15 year time span for the vehicle population as a reasonable estimation of typical vehicle ownership. That is, beginning in 2010, the emissions model used a vehicle population mix from model years 1995-2010. This progressively increased by one year until 2018.

Fuel consumption for these vehicles is gasoline and transportation diesel as noted in Appendix B. Emissions from on-road vehicles are estimated using Equation 1.

$$E_{Mob} = VMT * EF * \frac{Ton}{2000 lb} * \frac{lb}{453.6 g} \dots \dots \dots \text{Equation 5}$$

E_{Mob} = On-road vehicle emissions in tons per year

VMT = Vehicle miles travelled in a year

EF = Mobile 6.2 emission factor for on road vehicles in grams/mile.

4.3 Marine Equipment

The current Calvert Cliffs Nuclear Plant has an existing barge dock on-site which UniStar plans to use for receipt of some equipment by delivery. Additionally, UniStar will be dredging some off-shore areas during the CC3 construction period. Emissions from marine equipment used in these activities are included in this emissions inventory. Ancillary on-shore equipment (such as dump trucks or cranes) related to dredging and barge deliveries are accounted for in the non-road category.

US EPA has released a final report in April 2009 describing the methodologies used for the preparation of port-related emission inventory. This report is identified as reference number 8. Equations involved in determining the emissions from the marine sources are:

$$E_{Mar} = EF_{Pol} * HP * Hours * Load Factor * \frac{kWh}{1.341 HP-hr} * \frac{Ton}{2000 lb} * \frac{lb}{453.6 g} \dots \dots \dots \text{Equation 6}$$

Where

E_{Mar} = Annual marine emissions in tons

EF_{pol} = Emission factor in (g/kW-hr)

HP = Rated horse power (hp)

Hours = Annual operating hours

Load Factor = Fraction of available operating rated power

Emission factors, load factors, and guidance on typical engine sizes are taken from the referenced port inventory document. All of the marine dredging operations for this project occur during 2011 for barge dock preparation. Deliveries of materials by barge are assumed to begin in 2012 after dredging is completed. The dredging operations are expected to occur from October through December 2011, 10 hours per day, 6 days per week. Dredging is assumed to be performed by crane and dredged materials will be disposed of on-site. Deliveries of materials by barge are expected to originate at Harve de Grace, MD which is in the Baltimore nonattainment area. By ship, the distance is approximately 75 nautical miles (nm) with 18 nm assumed to occur within the state maritime zone boundaries of Calvert County and 57 nm occurring within the maritime zone boundaries of the Baltimore nonattainment area. Transportation emissions from barge deliveries were divided accordingly.

4.4 Boiler

The proposed concrete batch plant will require a small boiler (~ 20 MMBtu/hr) for the winter months to ensure the concrete does not freeze and to maintain consistency in batch preparation. The boiler is assumed to only use distillate oil for fuel. Emission factors for the boiler were taken from EPA's AP-42 document for fuel oil combustion. When operated, the boiler was assumed to operate at maximum capacity.

5.0 References

1. EPA's "MOBILE6.2 Vehicle Emission Modeling Software"
2. EPA's "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling—Compression-Ignition" NR-009c April 2004, EPA420-P-04-009.
3. EPA's "Exhaust Emission Factors for Nonroad Engine Modeling: Spark Ignition" NR-010e December 2005, EPA420-R-05-019.
4. EPA's "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling" NR-005c April 2004, EPA420-P-04-005
5. EPA's "Nonroad Spark-Ignition Engine Emission Deterioration Factors" NR-011c December 2005, EPA420-R-05-023.
6. EPA's "Conversion Factors for Hydrocarbon Emission Components" NR-002c December 2005, EPA420-R-05-015
7. EPA's "NONROAD08 Model (nonroad engines, equipment, and vehicles)"
8. US EPA / ICF International "Current Methodologies in Preparing Mobile Source Port-Related Emission inventories" Final Report April 2009.
9. EPA's AP-42 Compilation of Emission Factors, Section 3.1 Fuel Oil Combustion, 9/98
10. Traffic Impact Study at the Calvert Cliffs Nuclear Power Plant Draft Final Report, KLD Engineering, June 13, 2009 Rev. 1

Appendix A

Construction Schedule

Table A-1 Construction Equipment List / Hours of Operation

Classification	Equipment	Unit	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26	Apr-26	May-26	Jun-26	Jul-26	Aug-26	Sep-26	Oct-26	Nov-26	Dec-26	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28	Jan-29	Feb-29	Mar-29	Apr-29	May-29	Jun-29	Jul-29	Aug-29	Sep-29	Oct-29	Nov-29	Dec-29	Jan-30	Feb-30	Mar-30	Apr-30	May-30	Jun-30	Jul-30	Aug-30	Sep-30	Oct-30	Nov-30	Dec-30	Jan-31	Feb-31	Mar-31	Apr-31	May-31	Jun-31	Jul-31	Aug-31	Sep-31	Oct-31	Nov-31	Dec-31	Jan-32	Feb-32	Mar-32	Apr-32	May-32	Jun-32	Jul-32	Aug-32	Sep-32	Oct-32	Nov-32	Dec-32	Jan-33	Feb-33	Mar-33	Apr-33	May-33	Jun-33	Jul-33	Aug-33	Sep-33	Oct-33	Nov-33	Dec-33	Jan-34	Feb-34	Mar-34	Apr-34	May-34	Jun-34	Jul-34	Aug-34	Sep-34	Oct-34	Nov-34	Dec-34	Jan-35	Feb-35	Mar-35	Apr-35	May-35	Jun-35	Jul-35	Aug-35	Sep-35	Oct-35	Nov-35	Dec-35	Jan-36	Feb-36	Mar-36	Apr-36	May-36	Jun-36	Jul-36	Aug-36	Sep-36	Oct-36	Nov-36	Dec-36	Jan-37	Feb-37	Mar-37	Apr-37	May-37	Jun-37	Jul-37	Aug-37	Sep-37	Oct-37	Nov-37	Dec-37	Jan-38	Feb-38	Mar-38	Apr-38	May-38	Jun-38	Jul-38	Aug-38	Sep-38	Oct-38	Nov-38	Dec-38	Jan-39	Feb-39	Mar-39	Apr-39	May-39	Jun-39	Jul-39	Aug-39	Sep-39	Oct-39	Nov-39	Dec-39	Jan-40	Feb-40	Mar-40	Apr-40	May-40	Jun-40	Jul-40	Aug-40	Sep-40	Oct-40	Nov-40	Dec-40	Jan-41	Feb-41	Mar-41	Apr-41	May-41	Jun-41	Jul-41	Aug-41	Sep-41	Oct-41	Nov-41	Dec-41	Jan-42	Feb-42	Mar-42	Apr-42	May-42	Jun-42	Jul-42	Aug-42	Sep-42	Oct-42	Nov-42	Dec-42	Jan-43	Feb-43	Mar-43	Apr-43	May-43	Jun-43	Jul-43	Aug-43	Sep-43	Oct-43	Nov-43	Dec-43	Jan-44	Feb-44	Mar-44	Apr-44	May-44	Jun-44	Jul-44	Aug-44	Sep-44	Oct-44	Nov-44	Dec-44	Jan-45	Feb-45	Mar-45	Apr-45	May-45	Jun-45	Jul-45	Aug-45	Sep-45	Oct-45	Nov-45	Dec-45	Jan-46	Feb-46	Mar-46	Apr-46	May-46	Jun-46	Jul-46	Aug-46	Sep-46	Oct-46	Nov-46	Dec-46	Jan-47	Feb-47	Mar-47	Apr-47	May-47	Jun-47	Jul-47	Aug-47	Sep-47	Oct-47	Nov-47	Dec-47	Jan-48	Feb-48	Mar-48	Apr-48	May-48	Jun-48	Jul-48	Aug-48	Sep-48	Oct-48	Nov-48	Dec-48	Jan-49	Feb-49	Mar-49	Apr-49	May-49	Jun-49	Jul-49	Aug-49	Sep-49	Oct-49	Nov-49	Dec-49	Jan-50	Feb-50	Mar-50	Apr-50	May-50	Jun-50	Jul-50	Aug-50	Sep-50	Oct-50	Nov-50	Dec-50	Jan-51	Feb-51	Mar-51	Apr-51	May-51	Jun-51	Jul-51	Aug-51	Sep-51	Oct-51	Nov-51	Dec-51	Jan-52	Feb-52	Mar-52	Apr-52	May-52	Jun-52	Jul-52	Aug-52	Sep-52	Oct-52	Nov-52	Dec-52	Jan-53	Feb-53	Mar-53	Apr-53	May-53	Jun-53	Jul-53	Aug-53	Sep-53	Oct-53	Nov-53	Dec-53	Jan-54	Feb-54	Mar-54	Apr-54	May-54	Jun-54	Jul-54	Aug-54	Sep-54	Oct-54	Nov-54	Dec-54	Jan-55	Feb-55	Mar-55	Apr-55	May-55	Jun-55	Jul-55	Aug-55	Sep-55	Oct-55	Nov-55	Dec-55	Jan-56	Feb-56	Mar-56	Apr-56	May-56	Jun-56	Jul-56	Aug-56	Sep-56	Oct-56	Nov-56	Dec-56	Jan-57	Feb-57	Mar-57	Apr-57	May-57	Jun-57	Jul-57	Aug-57	Sep-57	Oct-57	Nov-57	Dec-57	Jan-58	Feb-58	Mar-58	Apr-58	May-58	Jun-58	Jul-58	Aug-58	Sep-58	Oct-58	Nov-58	Dec-58	Jan-59	Feb-59	Mar-59	Apr-59	May-59	Jun-59	Jul-59	Aug-59	Sep-59	Oct-59	Nov-59	Dec-59	Jan-60	Feb-60	Mar-60	Apr-60	May-60	Jun-60	Jul-60	Aug-60	Sep-60	Oct-60	Nov-60	Dec-60	Jan-61	Feb-61	Mar-61	Apr-61	May-61	Jun-61	Jul-61	Aug-61	Sep-61	Oct-61	Nov-61	Dec-61	Jan-62	Feb-62	Mar-62	Apr-62	May-62	Jun-62	Jul-62	Aug-62	Sep-62	Oct-62	Nov-62	Dec-62	Jan-63	Feb-63	Mar-63	Apr-63	May-63	Jun-63	Jul-63	Aug-63	Sep-63	Oct-63	Nov-63	Dec-63	Jan-64	Feb-64	Mar-64	Apr-64	May-64	Jun-64	Jul-64	Aug-64	Sep-64	Oct-64	Nov-64	Dec-64	Jan-65	Feb-65	Mar-65	Apr-65	May-65	Jun-65	Jul-65	Aug-65	Sep-65	Oct-65	Nov-65	Dec-65	Jan-66	Feb-66	Mar-66	Apr-66	May-66	Jun-66	Jul-66	Aug-66	Sep-66	Oct-66	Nov-66	Dec-66	Jan-67	Feb-67	Mar-67	Apr-67	May-67	Jun-67	Jul-67	Aug-67	Sep-67	Oct-67	Nov-67	Dec-67	Jan-68	Feb-68	Mar-68	Apr-68	May-68	Jun-68	Jul-68	Aug-68	Sep-68	Oct-68	Nov-68	Dec-68	Jan-69	Feb-69	Mar-69	Apr-69	May-69	Jun-69	Jul-69	Aug-69	Sep-69	Oct-69	Nov-69	Dec-69	Jan-70	Feb-70	Mar-70	Apr-70	May-70	Jun-70	Jul-70	Aug-70	Sep-70	Oct-70	Nov-70	Dec-70	Jan-71	Feb-71	Mar-71	Apr-71	May-71	Jun-71	Jul-71	Aug-71	Sep-71	Oct-71	Nov-71	Dec-71	Jan-72	Feb-72	Mar-72	Apr-72	May-72	Jun-72	Jul-72	Aug-72	Sep-72	Oct-72	Nov-72	Dec-72	Jan-73	Feb-73	Mar-73	Apr-73	May-73	Jun-73	Jul-73	Aug-73	Sep-73	Oct-73	Nov-73	Dec-73	Jan-74	Feb-74	Mar-74	Apr-74	May-74	Jun-74	Jul-74	Aug-74	Sep-74	Oct-74	Nov-74	Dec-74	Jan-75	Feb-75	Mar-75	Apr-75	May-75	Jun-75	Jul-75	Aug-75	Sep-75	Oct-75	Nov-75	Dec-75	Jan-76	Feb-76	Mar-76	Apr-76	May-76	Jun-76	Jul-76	Aug-76	Sep-76	Oct-76	Nov-76	Dec-76	Jan-77	Feb-77	Mar-77	Apr-77	May-77	Jun-77	Jul-77	Aug-77	Sep-77	Oct-77	Nov-77	Dec-77	Jan-78	Feb-78	Mar-78	Apr-78	May-78	Jun-78	Jul-78	Aug-78	Sep-78	Oct-78	Nov-78	Dec-78	Jan-79	Feb-79	Mar-79	Apr-79	May-79	Jun-79	Jul-79	Aug-79	Sep-79	Oct-79	Nov-79	Dec-79	Jan-80	Feb-80	Mar-80	Apr-80	May-80	Jun-80	Jul-80	Aug-80	Sep-80	Oct-80	Nov-80	Dec-80	Jan-81	Feb-81	Mar-81	Apr-81	May-81	Jun-81	Jul-81	Aug-81	Sep-81	Oct-81	Nov-81	Dec-81	Jan-82	Feb-82	Mar-82	Apr-82	May-82	Jun-82	Jul-82	Aug-82	Sep-82	Oct-82	Nov-82	Dec-82	Jan-83	Feb-83	Mar-83	Apr-83	May-83	Jun-83	Jul-83	Aug-83	Sep-83	Oct-83	Nov-83	Dec-83	Jan-84	Feb-84	Mar-84	Apr-84	May-84	Jun-84	Jul-84	Aug-84	Sep-84	Oct-84	Nov-84	Dec-84	Jan-85	Feb-85	Mar-85	Apr-85	May-85	Jun-85	Jul-85	Aug-85	Sep-85	Oct-85	Nov-85	Dec-85	Jan-86	Feb-86	Mar-86	Apr-86	May-86	Jun-86	Jul-86	Aug-86	Sep-86	Oct-86	Nov-86	Dec-86	Jan-87	Feb-87	Mar-87	Apr-87	May-87	Jun-87	Jul-87	Aug-87	Sep-87	Oct-87	Nov-87	Dec-87	Jan-88	Feb-88	Mar-88	Apr-88	May-88	Jun-88	Jul-88	Aug-88	Sep-88	Oct-88	Nov-88	Dec-88	Jan-89	Feb-89	Mar-89	Apr-89	May-89	Jun-89	Jul-89	Aug-89	Sep-89	Oct-89	Nov-89	Dec-89	Jan-90	Feb-90	Mar-90	Apr-90	May-90	Jun-90	Jul-90	Aug-90	Sep-90	Oct-90	Nov-90	Dec-90	Jan-91	Feb-91	Mar-91	Apr-91	May-91	Jun-91	Jul-91	Aug-91	Sep-91	Oct-91	Nov-91	Dec-91	Jan-92	Feb-92	Mar-92	Apr-92	May-92	Jun-92	Jul-92	Aug-92	Sep-92	Oct-92	Nov-92	Dec-92	Jan-93	Feb-93	Mar-93	Apr-93	May-93	Jun-93	Jul-93	Aug-93	Sep-93	Oct-93	Nov-93	Dec-93	Jan-94	Feb-94	Mar-94	Apr-94	May-94	Jun-94	Jul-94	Aug-94	Sep-94	Oct-94	Nov-94	Dec-94	Jan-95	Feb-95	Mar-95	Apr-95	May-95	Jun-95	Jul-95	Aug-95	Sep-95	Oct-95	Nov-95	Dec-95	Jan-96	Feb-96	Mar-96	Apr-96	May-96	Jun-96	Jul-96	Aug-96	Sep-96	Oct-96	Nov-96	Dec-96	Jan-97	Feb-97	Mar-97	Apr-97	May-97	Jun-97	Jul-97	Aug-97	Sep-97	Oct-97	Nov-97	Dec-97	Jan-98	Feb-98	Mar-98	Apr-98	May-98	Jun-98	Jul-98	Aug-98	Sep-98	Oct-98	Nov-98	Dec-98	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-2
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Table A-1 Construction Equipment List / Hours of Operation

CONSTRUCTION EQUIPMENT & VEHICLES		Description		Quantity		Unit Price		Total Price		Remarks	
GENERATION EQUIPMENT											
Generator	D	150	655	2,620	1,310	7,071	15,000	15,724	15,724	15,724	5,363
Generator	D	85				435	4,000	5,241	5,241	5,241	1,007
Generator	D	240					6,533	7,862	7,862	7,862	3,722
Generator	D	143					13,876	15,938	15,938	15,938	4,173
Generator	D	143					8,209	10,483	10,483	10,483	4,804
Generator	D	14					8,798	52,063	83,088	23,228	30,590
MANUFACTURING EQUIPMENT											
Aerial Lift	D	28						17,971	22,464	22,464	6,572
Aerial Lift	D	65						11,880	15,724	15,724	3,900
Aerial Lift	D	48						11,837	11,837	11,837	16,670
Aerial Lift	D	48						4,492	4,492	4,492	1,121
Aerial Lift	D	78						27,774	31,508	31,508	7,705
Aerial Lift	D	78						6,729	6,729	6,729	1,877
Aerial Lift	D	75						5,616	5,616	5,616	
Aerial Lift	D	75						6,729	6,729	6,729	1,487
Aerial Lift	D	32						2,246	2,246	2,246	2,895
Aerial Lift	D	75						6,729	6,729	6,729	2,895
SMALL CAPITAL EQUIPMENT											
Plate Compactor	D	8					9,594	33,696	33,696	33,696	1,636
Plate Compactor	D	15					3,460	10,836	10,836	10,836	2,954
Plate Compactor	D	19					2,808	16,380	22,464	22,464	12,870
Plate Compactor	D	7					4,212	21,762	20,884	20,884	26,720
Generator	D	11					5,850	34,866	30,544	30,544	19,656
Chopper/Slump Grinder	D	11						2,106	2,106	2,106	1,754
Lean Mixer	D	3					936	5,616	5,616	5,616	3,716
Concrete & Mortar Mixer	D	13					1,700	10,520	8,424	8,424	2,728
Pump	D	6					2,808	16,848	22,464	19,332	9,360
Pump	D	15						5,616	5,616	5,616	3,616
Pump	D	15						5,616	5,616	5,616	3,276
Concrete/Industrial Saw	D	11						5,616	5,616	5,616	3,276
Concrete Hammer	D	3						2,468	2,468	2,468	1,976
Chopper/Slump Grinder	D	3						2,468	2,468	2,468	1,976
Concrete & Mortar Mixer	D	6					1,804	10,464	16,368	17,700	9,360
Concrete & Mortar Mixer	D	13						1,804	16,146	17,700	9,360
Common Equipment	D	3						5,148	23,868	33,696	33,696
Pump	D	24						5,314	30,654	26,888	26,888
CONCRETE BATCH PLANT											
Generator	D	620					12,480	12,480	12,480	7,280	
Oil Field Boiler	D	1					1,000	12,480	1,000	2,080	2,080
Concrete Batch Plant	D	80					6,500	12,480	12,480	7,280	
Heavy-Duty Diesel Vehicle B3	D	350					37,440	74,880	74,880	43,680	
SITE PREPARATION											
AE Terrain Vehicle/MC	D	10	2,340	9,360							
Tractor/Loader/Backhoe	D	104	6,040	6,040							
Chain Saw	D	3	11,700	35,100							
Chopper/Slump Grinder	D	75	5,600	4,680							
Plate Compactor	D	304	4,680	18,720							
Air Compressor	D	55	2,340								
Grapple Tractor	D	86	7,560								
Grapple Tractor	D	145	2,340	9,360							
Grapple Tractor	D	308	4,860	18,720							
Excavator	D	250	4,860	18,720							
Excavator	D	380	4,260	24,960							
Excavator	D	513	4,860	18,720							
Excavator	D	524	7,560	6,540							
Generator	D	89	3,120	12,480							
Generator	D	400	4,160								
Heavy-Duty Diesel Vehicle 3	D	400	2,340	2,340							
Heavy-Duty Diesel Vehicle B4	D	400	9,360								
Heavy-Duty Diesel Vehicle 3	D	200	7,560	2,420							
Light-Duty Diesel Truck 1 and 2	D	305	11,700	48,800							
Roller	D	6	9,360								
Rubber Tire Loader	D	148	2,340	6,240							
Scraper	D	181	1,120	5,200							
Tractor/Loader/Backhoe	D	75	5,600	4,160							
Tractor/Loader/Backhoe	D	188	2,340	8,260							
Tractor	D	450	5,600								
Grapple	D	200	780	2,080							
Pump	D	4	3,120	12,480							
Oil-Hydraulic Truck	D	305	2,340	4,680							
Oil-Hydraulic Truck	D	489	17,160	68,640							
DREDGING AND RELATED EQUIPMENT											
Excavator	D	345									
Excavator	D	247									
Tractor/Loader/Backhoe	D	200									
Tractor/Loader/Backhoe	D	66									
Plate Compactor	D	99									
Crane	D	300									
Welder	D	33									
Other Construction Equipment	D	148									
AE Terrain Vehicle/MC	D	10									
Tug Boat	D	1,200									
Dredge	D	25									

Appendix B

Emissions Calculations

Table B-1a Diesel Non-Road Engine Emissions

Equipment/Category/Based on Non-Road Classification	Serial No.	Fuel Type	Engine Technology Type	Equipment Horsepower	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999	3000	3001	3002	3003	3004	3005	3006	3007	3008	3009	3010	3011	3012	3013	3014	3015	3016	3017	3018	3019	3020	3021	3022	3023	3024	3025	3026	3027	3028	3029	3030	3031	3032	3033	3034	3035	3036	3037	3038	3039	3040	3041	3042	3043	3044	3045	3046	3047	3048	3049	3050	3051	3052	3053	3054	3055	3056	3057	3058	3059	3060	3061	3062	3063	3064	3065	3066	3067	3068	3069	3070	3071	3072	3073	3074	3075	3076	3077	3078	3079	3080	3081	3082	3083	3084	3085	3086	3087	3088	3089	3090	3091	3092	3093	3094	3095	3096	3097	3098	3099	3100	3101	3102	3103	3104	3105	3106	3107	3108	3109	3110	3111	3112	3113	3114	3115	3116	3117	3118	3119	3120	3121	3122	3123	3124	3125	3126	3127	3128	3129	3130	3131	3132	3133	3134	3135	3136	3137	3138	3139	3140	3141	3142	3143	3144	3145	3146	3147	3148	3149	3150	3151	3152	3153	3154	3155	3156	3157	3158	3159	3160	3161	3162	3163	3164	3165	3166	3167	3168	3169	3170	3171	3172	3173	3174	3175	3176	3177	3178	3179	3180	3181	3182	3183	3184	3185	3186	3187	3188	3189	3190	3191	3192	3193	3194	3195	3196	3197	3198	3199	3200	3201	3202	3203	3204	3205	3206	3207	3208	3209	3210	3211	3212	3213	3214	3215	3216	3217	3218	3219	3220	3221	3222	3223	3224	3225	3226	3227	3228	3229	3230	3231	3232	3233	3234	3235	3236	3237	3238	3239	3240	3241	3242	3243	3244	3245	3246	3247	3248	3249	3250	3251	3252	3253	3254	3255	3256	3257	3258	3259	3260	3261	3262	3263	3264	3265	3266	3267	3268	3269	3270	3271	3272	3273	3274	3275	3276	3277	3278	3279	3280	3281	3282	3283	3284	3285	3286	3287	3288	3289	3290	3291	3292	3293	3294	3295	3296	3297	3298	3299	3300	3301	3302	3303	3304	3305	3306	3307	3308	3309	3310	3311	3312	3313	3314	3315	3316	3317	3318	3319	3320	3321	3322	3323	3324	3325	3326	3327	3328	3329	3330	3331	3332	3333	3334	3335	3336	3337	3338	3339	3340	3341	3342	3343	3344	3345	3346	3347	3348	3349	3350	3351	3352	3353	3354	3355	3356	3357	3
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Table B-1a Diesel Non-Road Engine Emissions

Equipment Category based on HOMERAD Classification	VOC 2010 tons	VOC 2011 tons	VOC 2012 tons	VOC 2013 tons	VOC 2014 tons	VOC 2015 tons	VOC 2016 tons	VOC 2017 tons	VOC 2018 tons	NOx 2010 tons	NOx 2011 tons	NOx 2012 tons	NOx 2013 tons	NOx 2014 tons	NOx 2015 tons	NOx 2016 tons	NOx 2017 tons	NOx 2018 tons
Earthmoving																		
Sweeper/Scrubber	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.11	0.11	0.11	0.11	0.11	0.10
Crawler Tractor	0.00	0.00	0.00	0.07	0.08	0.08	0.08	0.05	0.01	0.00	0.00	0.06	0.90	1.01	1.01	1.01	0.64	0.11
Crawler Tractor	0.00	0.00	0.04	0.21	0.22	0.21	0.15	0.10	0.01	0.00	0.00	0.50	2.83	2.80	2.69	1.91	1.29	0.11
Crawler Tractor	0.00	0.00	0.05	0.27	0.29	0.27	0.13	0.04	0.00	0.00	0.00	0.74	3.85	4.10	3.93	1.93	0.57	0.00
Excavator	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.24	0.24	0.24	0.15	0.03	0.00
Excavator	0.00	0.00	0.03	0.25	0.27	0.27	0.22	0.03	0.00	0.00	0.00	0.43	3.15	3.43	3.43	2.79	0.43	0.00
Excavator	0.00	0.00	0.01	0.12	0.12	0.11	0.07	0.00	0.00	0.00	0.00	0.16	2.13	2.13	1.97	1.23	0.08	0.00
Excavator	0.00	0.00	0.01	0.07	0.07	0.07	0.05	0.00	0.00	0.00	0.00	0.21	1.24	1.24	1.24	0.83	0.00	0.00
Crawler Tractor	0.00	0.00	0.05	0.09	0.09	0.09	0.09	0.07	0.00	0.00	0.00	0.91	1.57	1.57	1.57	1.57	1.31	0.00
Grader	0.00	0.00	0.02	0.11	0.11	0.09	0.05	0.05	0.02	0.00	0.00	0.29	1.35	1.38	1.15	0.89	0.69	0.29
Tractor/Loader/Backhoe	0.00	0.00	0.01	0.05	0.06	0.06	0.03	0.01	0.00	0.00	0.00	0.10	0.41	0.46	0.46	0.25	0.09	0.00
Tractor/Loader/Backhoe	0.00	0.00	0.03	0.15	0.15	0.12	0.12	0.03	0.00	0.00	0.00	0.21	0.99	0.99	0.83	0.83	0.23	0.00
Skid Steer Loader	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.21	0.21	0.20	0.20	0.03	0.00
Tractor/Loader/Backhoe	0.00	0.00	0.01	0.11	0.12	0.12	0.12	0.01	0.00	0.00	0.00	0.04	0.75	0.79	0.79	0.79	0.04	0.00
Tractor/Loader/Backhoe	0.00	0.00	0.00	0.05	0.05	0.04	0.04	0.00	0.00	0.00	0.00	0.06	0.83	0.83	0.76	0.76	0.06	0.00
Tractor/Loader/Backhoe	0.00	0.00	0.01	0.09	0.13	0.11	0.09	0.01	0.00	0.00	0.00	0.05	0.62	0.69	0.72	0.59	0.05	0.00
Off-Highway Truck	0.00	0.00	0.09	0.45	0.62	0.62	0.39	0.06	0.00	0.00	0.00	1.70	8.11	11.12	11.12	9.95	1.08	0.00
On-Highway Tractor	0.00	0.00	0.01	0.08	0.05	0.09	0.09	0.01	0.00	0.00	0.00	0.15	1.08	1.18	1.18	1.11	0.07	0.00
Compaction																		
Plate Compactor	0.00	0.00	0.02	0.04	0.07	0.07	0.07	0.06	0.00	0.00	0.00	0.30	0.63	1.21	1.21	1.21	1.01	0.00
Plate Compactor	0.00	0.00	0.04	0.13	0.13	0.13	0.11	0.05	0.00	0.00	0.00	0.50	1.65	1.65	1.65	1.41	0.61	0.00
Crane																		
Crane	0.00	0.00	0.05	0.20	0.20	0.20	0.20	0.00	0.00	0.00	0.00	0.91	3.65	3.65	3.65	3.65	0.00	0.00
Crane	0.00	0.00	0.04	0.22	0.22	0.22	0.22	0.09	0.00	0.00	0.00	0.66	3.95	3.95	3.95	3.95	1.65	0.00
Crane	0.00	0.00	0.00	0.40	0.57	0.49	0.16	0.00	0.00	0.00	0.00	7.08	10.23	8.85	2.95	0.00	0.00	0.00
Crane	0.00	0.00	0.00	0.17	0.22	0.22	0.15	0.00	0.00	0.00	0.00	0.53	2.96	3.95	3.95	2.44	0.00	0.00
Crane	0.00	0.00	0.00	0.39	0.55	0.55	0.33	0.00	0.00	0.00	0.00	6.92	9.88	9.88	9.88	5.93	0.00	0.00
Crane	0.00	0.00	0.03	0.16	0.39	0.39	0.26	0.00	0.00	0.00	0.00	0.58	2.91	6.98	6.98	6.98	4.65	0.00
Crane	0.00	0.00	0.07	0.39	0.39	0.39	0.16	0.00	0.00	0.00	0.00	1.19	6.98	6.98	6.98	6.98	2.51	0.00
Crane	0.00	0.00	0.12	0.69	0.75	0.75	0.56	0.00	0.00	0.00	0.00	2.24	12.30	13.42	13.42	13.42	10.06	0.00
Crane	0.00	0.00	0.02	0.18	0.22	0.22	0.21	0.02	0.00	0.00	0.00	0.32	2.38	2.85	2.85	2.85	2.70	0.32
Crane	0.00	0.00	0.06	0.15	0.17	0.17	0.16	0.04	0.00	0.00	0.00	0.73	2.00	2.18	2.18	2.18	2.09	0.45
Crane	0.00	0.00	0.07	0.26	0.62	0.94	0.96	0.42	0.04	0.00	0.00	0.90	3.37	8.06	12.11	12.45	5.50	0.56
Crane	0.00	0.00	0.08	0.22	0.24	0.24	0.24	0.22	0.00	0.00	0.00	1.04	2.87	3.13	3.13	3.13	2.87	0.00
Crane	0.00	0.00	0.02	0.10	0.24	0.24	0.24	0.21	0.03	0.00	0.00	0.26	1.30	3.13	3.13	3.13	2.74	0.39
Forklift																		
Forklift	0.00	0.00	0.01	0.18	0.26	0.26	0.26	0.25	0.10	0.00	0.00	0.18	2.37	3.27	3.27	3.27	3.18	1.27
Crane	0.00	0.00	0.02	0.15	0.20	0.20	0.10	0.06	0.00	0.00	0.00	0.22	1.95	2.59	2.59	2.59	1.30	0.76
Forklift	0.00	0.00	0.01	0.12	0.16	0.16	0.16	0.13	0.00	0.00	0.00	0.14	1.78	2.46	2.46	2.46	2.05	0.00
Forklift	0.00	0.00	0.13	0.51	0.51	0.51	0.51	0.24	0.01	0.00	0.00	1.63	6.51	6.51	6.51	6.51	3.08	0.09
Forklift	0.00	0.00	0.12	0.59	0.66	0.66	0.66	0.26	0.04	0.00	0.00	1.50	7.58	8.46	8.46	8.46	3.35	0.53
Mastlift / Scissorlifts																		
Aerial Lift	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.01	0.00	0.00	0.00	0.01	0.35	0.44	0.44	0.44	0.13	0.00
Aerial Lift	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.02	0.00	0.00	0.00	0.02	0.55	0.72	0.72	0.72	0.43	0.00
Aerial Lift	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.10	0.38	0.38	0.38	0.38	0.08	0.00
Aerial Lift	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.05	0.15	0.15	0.15	0.15	0.04	0.00
Aerial Lift	0.00	0.00	0.00	0.00	0.01	0.06	0.09	0.04	0.00	0.00	0.00	0.00	0.21	1.30	1.83	1.83	0.94	0.10
Aerial Lift	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.04	0.28	0.33	0.33	0.33	0.00	0.00
Aerial Lift	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.04	0.23	0.35	0.35	0.35	0.05	0.00
Aerial Lift	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.04	0.03
Aerial Lift	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.05	0.15	0.15	0.15	0.15	0.07
Welding Equipment																		
Welder	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.07	0.27	0.27	0.27	0.27	0.20	0.00
Welder	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.00	0.05	0.37	0.37	0.37	0.37	0.27	0.00
Welder	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.10	0.50	0.50	0.50	0.50	0.38	0.01
Concrete / Aggregate																		
Pump	0.00	0.00	0.00	0.02	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.33	0.85	0.66	0.24	0.00	0.00
Air Compressors																		
Air Compressor	0.00	0.00	0.08	0.12	0.14	0.14	0.14	0.06	0.00	0.00	0.00	0.90	1.43	1.68	1.68	1.68	1.65	0.73
Air Compressor	0.00	0.00	0.01	0.07	0.10	0.10	0.10	0.04	0.00	0.00	0.00	0.17	0.90	1.29	1.29	1.29	1.22	0.51
Air Compressor	0.00	0.00	0.02	0.21	0.29	0.29	0.29	0.26	0.11	0.00	0.00	0.20	2.66	3.69	3.69	3.69	3.59	1.43
Air Compressor	0.00	0.00	0.02	0.21	0.29	0.29	0.29	0.28	0.11	0.00	0.00	0.20	2.66	3.69	3.69	3.69	3.59	1.43
Air Compressor	0.00	0.00	0.01	0.12	0.16	0.16	0.16	0.16	0.07	0.00	0.00	0.23	2.08	2.77	2.77	2.77	2.77	1.16
Pipelining / Trenching Equipment																		
Trencher	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.04	0.02	0.00	0.00	0.05	0.00
Class 25 Cable Laying/Pulling Equ.																		
Other Construction Equipment	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.15	0.27	0.27	0.27	0.27	0.04
Other Construction Equipment	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.15	0.27	0.27	0.27	0.27	0.04
Other Construction Equipment	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.15	0.27	0.27	0.27	0.27	0.04

Table B-1a Diesel Non-Road Engine Emissions

[illegible]

NOTES-

NOTE: Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss: g/hp-hr), and load factor are from NMMA/NONROAD08 model factors dated April 5, 2009.

EEs from NMIM/NONBOARD08 have transient adjustment factors built in

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009

App Factor = $1/E^*$ cumulative hours / median life, (where App factor is capped at 1). For this calculation, app factor is assumed to be 1 for simplification purposes.

Deterioration Factor: $1 - (A \cdot \Delta \text{Age Factor})^b$, where $b = 1$ for diesel engines and A is taken from Table A.4 from course.

Note 4: Adjusted Emission Factors for HC and NO_x are calculated using Equation 1 from "Exhaust and Greenhouse Emission Factors for Internal Engine Modeling: Commission 3rd/Rev" April 2004, EPA 420 R-04-000.

Note 4: Adjusted Emission Factors for HC and NO_x are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", AP-42, Chapter 3.3.2.

Adjusted EF = Efs * TAF * DF (as stated in Note 2, Efs have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation (1.053 * Adj. HC emission factor (g/hp-hr) * horsepower * h

1.053 is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015.

Note 6: Annual NOx Emissions are calculated using the following calculation (Adj. NOx emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Table B-1b Diesel Non-Road Engine Emissions included in safety-related construction

Equipment Category (based on NONRAD classification)	SSC	Fuel Type	Engine Technology Type	Equipment Horsepower	2010-2019								2020-2029								2030-2039								2040-2049								2050-2059								2060-2069								2070-2079								2080-2089								2090-2099								2100-2109								2110-2119								2120-2129								2130-2139								2140-2149								2150-2159								2160-2169								2170-2179								2180-2189								2190-2199								2200-2209								2210-2219								2220-2229								2230-2239								2240-2249								2250-2259								2260-2269								2270-2279								2280-2289								2290-2299								2300-2309								2310-2319								2320-2329								2330-2339								2340-2349								2350-2359								2360-2369								2370-2379								2380-2389								2390-2399								2400-2409								2410-2419								2420-2429								2430-2439								2440-2449								2450-2459								2460-2469								2470-2479								2480-2489								2490-2499								2500-2509								2510-2519								2520-2529								2530-2539								2540-2549								2550-2559								2560-2569								2570-2579								2580-2589								2590-2599								2600-2609								2610-2619								2620-2629								2630-2639								2640-2649								2650-2659								2660-2669								2670-2679								2680-2689								2690-2699								2700-2709								2710-2719								2720-2729								2730-2739								2740-2749								2750-2759								2760-2769								2770-2779								2780-2789								2790-2799								2800-2809								2810-2819								2820-2829								2830-2839								2840-2849								2850-2859								2860-2869								2870-2879								2880-2889								2890-2899								2900-2909								2910-2919								2920-2929								2930-2939								2940-2949								2950-2959								2960-2969								2970-2979								2980-2989								2990-2999								3000-3009								3010-3019								3020-3029								3030-3039								3040-3049								3050-3059								3060-3069								3070-3079								3080-3089								3090-3099								3100-3109								3110-3119								3120-3129								3130-3139								3140-3149								3150-3159								3160-3169								3170-3179								3180-3189								3190-3199								3200-3209								3210-3219								3220-3229								3230-3239								3240-3249								3250-3259								3260-3269								3270-3279								3280-3289								3290-3299								3300-3309								3310-3319								3320-3329								3330-3339								3340-3349								3350-3359								3360-3369								3370-3379								3380-3389								3390-3399								3400-3409								3410-3419								3420-3429								3430-3439								3440-3449								3450-3459								3460-3469								3470-3479								3480-3489								3490-3499								3500-3509								3510-3519								3520-3529								3530-3539								3540-3549								3550-3559								3560-3569								3570-3579								3580-3589								3590-3599								3600-3609								3610-3619								3620-3629								3630-3639								3640-3649								3650-3659								3660-3669								3670-3679								3680-3689								3690-3699								3700-3709								3710-3719								3720-3729								3730-3739								3740-3749								3750-3759								3760-3769								3770-3779								3780-3789								3790-3799								3800-3809								3810-3819								3820-3829								3830-3839								3840-3849								3850-3859								3860-3869								3870-3879								3880-3889								3890-3899								3900-3909								3910-3919								3920-3929								3930-3939								3940-3949								3950-3959								3960-3969								3970-3979								3980-3989								3990-3999								4000-4009								4010-4019								4020-4029								4030-4039								4040-4049								4050-4059								4060-4069								4070-4079								4080-4089								4090-4099								4100-4109								4110-4119								4120-4129								4130-4139								4140-4149								4150-4159								4160-4169								4170-4179								4180-4189								4190-4199								4200-4209								4210-4219								4220-4229								4230-4239								4240-4249								4250-4259								4260-4269								4270-4279								4280-4289								4290-4299								4300-4309								4310-4319								4320-4329								4330-4339								4340-4349								4350-4359								4360-4369								4370-4379								4380-4389								4390-4399								4400-4409								4410-4419								4420-4429								4430-4439								4440-4449								4450-4459								4460-4469								4470-4479								4480-4489								4490-4499								4500-4509								4510-4519								4520-4529								4530-4539								4540-4549								4550-4559								4560-4569								4570-4579								4580-4589								4590-4599								4600-4609								4610-4619								4620-4629								4630-4639								4640-4649								4650-4659								4660-4669								4670-4679								4680-4689								4690-4699								4700-4709								4710-4719								4720-4729								4730-4739								4740-4749								4750-4759								4760-4769								4770-4779								4780-4789								4790-4799								4800-4809								4810-4819								4820-4829								4830-4839								4840-4849								4850-4859								4860-4869								4870-4879								4880-4889								4890-4899								4900-4909								4910-4919								4920-4929								4930-4939								4940-494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Table B-1b Diesel Non-Road Engine Emissions Inc

Equipment category based on HONROAD Classification	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2010	2011	2012	2013	2014	2015	2016	2017
Earthmoving																	
Crawler Tractor	0.00	0.00	0.00	0.07	0.08	0.08	0.08	0.05	0.01	0.00	0.00	0.06	0.90	1.01	1.01	1.01	0.84
Crawler Tractor	0.00	0.00	0.04	0.21	0.22	0.21	0.15	0.10	0.01	0.00	0.00	0.50	2.83	2.80	2.89	1.91	1.29
Crawler Tractor	0.00	0.00	0.05	0.27	0.29	0.27	0.13	0.04	0.00	0.00	0.00	0.74	3.85	4.10	3.93	1.93	0.57
Excavator	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.24	0.24	0.24	0.15	0.03
Excavator	0.00	0.00	0.03	0.25	0.27	0.27	0.22	0.03	0.00	0.00	0.00	0.43	3.15	3.43	3.43	2.79	0.43
Excavator	0.00	0.00	0.01	0.12	0.12	0.11	0.07	0.00	0.00	0.00	0.00	0.16	2.13	2.13	1.97	1.23	0.68
Excavator	0.00	0.00	0.01	0.07	0.07	0.07	0.05	0.00	0.00	0.00	0.00	0.21	1.24	1.24	1.24	0.83	0.00
Crawler Tractor	0.00	0.00	0.05	0.09	0.09	0.09	0.09	0.07	0.00	0.00	0.00	0.91	1.57	1.57	1.57	1.31	0.00
Grader	0.00	0.00	0.02	0.11	0.11	0.09	0.05	0.05	0.00	0.00	0.00	0.29	1.35	1.38	1.15	0.69	0.29
Tractor/Loader/Backhoe	0.00	0.00	0.01	0.05	0.06	0.06	0.03	0.01	0.00	0.00	0.00	0.10	0.41	0.46	0.46	0.25	0.09
Tractor/Loader/Backhoe	0.00	0.00	0.03	0.15	0.15	0.12	0.12	0.03	0.00	0.00	0.00	0.21	0.99	0.99	0.83	0.83	0.23
Skid Steer Loader	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.21	0.21	0.20	0.20	0.03
Tractor/Loader/Backhoe	0.00	0.00	0.01	0.11	0.12	0.12	0.12	0.01	0.00	0.00	0.00	0.04	0.75	0.79	0.79	0.79	0.04
Tractor/Loader/Backhoe	0.00	0.00	0.00	0.05	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.06	0.83	0.83	0.76	0.76	0.06
Tractor/Loader/Backhoe	0.00	0.00	0.01	0.09	0.13	0.11	0.09	0.01	0.00	0.00	0.00	0.05	0.62	0.89	0.72	0.59	0.05
Off-Highway Tractor	0.00	0.00	0.01	0.08	0.09	0.09	0.09	0.01	0.00	0.00	0.00	0.15	1.08	1.18	1.18	1.11	0.07
Compaction																	
Plate Compactor	0.00	0.00	0.02	0.04	0.07	0.07	0.07	0.06	0.00	0.00	0.00	0.30	0.83	1.21	1.21	1.21	1.01
Plate Compactor	0.00	0.00	0.04	0.13	0.13	0.13	0.11	0.05	0.00	0.00	0.00	0.50	1.65	1.65	1.65	1.41	0.61
Cranes																	
Crane	0.00	0.00	0.05	0.20	0.20	0.20	0.20	0.00	0.00	0.00	0.00	0.91	3.65	3.65	3.65	3.65	0.00
Crane	0.00	0.00	0.04	0.22	0.22	0.22	0.22	0.09	0.00	0.00	0.00	0.66	3.95	3.95	3.95	3.95	1.65
Crane	0.00	0.00	0.00	0.40	0.57	0.49	0.16	0.00	0.00	0.00	0.00	0.00	7.08	10.23	8.85	2.95	0.00
Crane	0.00	0.00	0.02	0.17	0.22	0.22	0.22	0.15	0.00	0.00	0.00	0.33	2.96	3.95	3.95	3.95	2.64
Crane	0.00	0.00	0.00	0.39	0.55	0.55	0.55	0.33	0.00	0.00	0.00	0.92	6.98	9.98	9.98	9.98	5.53
Crane	0.00	0.00	0.03	0.16	0.39	0.39	0.39	0.26	0.00	0.00	0.00	0.58	2.91	6.98	6.98	6.98	4.65
Crane	0.00	0.00	0.07	0.39	0.39	0.39	0.39	0.16	0.00	0.00	0.00	1.19	6.98	6.98	6.98	6.98	2.91
Crane	0.00	0.00	0.12	0.69	0.75	0.75	0.75	0.56	0.00	0.00	0.00	2.24	12.30	13.42	13.42	13.42	10.06
Crane	0.00	0.00	0.02	0.18	0.22	0.22	0.22	0.21	0.02	0.00	0.00	0.32	2.38	2.85	2.85	2.85	2.70
Crane	0.00	0.00	0.06	0.15	0.17	0.17	0.17	0.16	0.04	0.00	0.00	0.73	2.00	2.18	2.18	2.18	2.09
Crane	0.00	0.00	0.07	0.26	0.62	0.94	0.96	0.42	0.04	0.00	0.00	0.90	3.37	8.08	12.11	12.45	5.50
Crane	0.00	0.00	0.08	0.22	0.24	0.24	0.24	0.22	0.00	0.00	0.00	1.04	2.87	3.13	3.13	3.13	2.87
Crane	0.00	0.00	0.02	0.10	0.24	0.24	0.24	0.21	0.03	0.00	0.00	0.26	1.30	3.13	3.13	3.13	2.74
Forklift																	
Forklift	0.00	0.00	0.01	0.18	0.26	0.26	0.26	0.25	0.10	0.00	0.00	0.18	2.37	3.27	3.27	3.27	3.18
Crane	0.00	0.00	0.02	0.15	0.20	0.20	0.20	0.10	0.06	0.00	0.00	0.22	1.95	2.59	2.59	2.59	1.30
Forklift	0.00	0.00	0.01	0.12	0.16	0.16	0.16	0.13	0.00	0.00	0.00	0.14	1.78	2.46	2.46	2.46	2.05
Forklift	0.00	0.00	0.13	0.51	0.51	0.51	0.51	0.24	0.01	0.00	0.00	1.83	6.51	6.51	6.51	6.51	3.08
Forklift	0.00	0.00	0.12	0.59	0.66	0.66	0.66	0.26	0.04	0.00	0.00	1.50	7.58	8.46	8.46	8.46	3.35
Manlift / Scissorlifts																	
Aerial Lift	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.35	0.44	0.44	0.13
Aerial Lift	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.10	0.38	0.38	0.38	0.08
Aerial Lift	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.05	0.15	0.15	0.15	0.04
Aerial Lift	0.00	0.00	0.00	0.00	0.01	0.06	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.21	1.30	1.83	0.94
Aerial Lift	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.04	0.28	0.33	0.33	0.33	0.00
Aerial Lift	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.04	0.29	0.35	0.35	0.35	0.00
Aerial Lift	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.03
Aerial Lift	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.05	0.15	0.15	0.15	0.07
Welding Equipment																	
Welder	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.07	0.27	0.27	0.27	0.27	0.20
Welder	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.00	0.05	0.37	0.37	0.37	0.37	0.27
Welder	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.10	0.50	0.50	0.50	0.50	0.38
Concrete / Aggregate																	
Pump	0.00	0.00	0.00	0.02	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.33	0.85	0.66	0.24	0.00
Air Compressors																	
Air Compressor	0.00	0.00	0.08	0.12	0.14	0.14	0.14	0.14	0.06	0.00	0.00	0.90	1.43	1.68	1.68	1.68	0.73
Air Compressor	0.00	0.00	0.01	0.07	0.10	0.10	0.10	0.10	0.04	0.00	0.00	0.17	0.90	1.29	1.29	1.29	1.22
Air Compressor	0.00	0.00	0.02	0.21	0.29	0.29	0.29	0.28	0.11	0.00	0.00	0.20	2.66	3.69	3.69	3.69	3.59
Air Compressor	0.00	0.00	0.02	0.21	0.29	0.29	0.29	0.28	0.11	0.00	0.00	0.20	2.66	3.69	3.69	3.69	3.59
Air Compressor	0.00	0.00	0.01	0.12	0.16	0.16	0.16	0.16	0.07	0.00	0.00	0.23	2.08	2.77	2.77	2.77	1.16
Pipelining / Trenching Equipment																	
Trencher	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.04	0.02	0.00	0.00	0.05
Class 25 Cable Laying/Pulling Equ.																	
Other Construction Equipment	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.15	0.27	0.27	0.27	0.27
Other Construction Equipment	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.15	0.27	0.27	0.27	0.27
Other Construction Equipment	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.15	0.27	0.27	0.27	0.27

Table B-1b Diesel Non-Road Engine Emissions included in safety-related construction

Winches and Tuggers																											
Other Construction Equipment		2270002081	Diesel	T4	140	4	0	0	0	0	2246	6739	6177	2246	0	0.371	0.13	2.5	0.59	1	0.027	0.008	1.027	1.008	0.134	2.520	
Generation Equipment																											
Generator	2270006005	Diesel	T3	150	655	2620	4367	15069	15724	15724	15724	14414	5241	367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520			
Generator	2270006005	Diesel	T3	86	0	0	436	4804	5241	5241	5241	3057	367	0.08	0.18	3	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520			
Generator	2270006005	Diesel	T4	345	0	0	1804	5241	5241	5241	5241	3057	367	0.287	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520			
Generator	2270006005	Diesel	T4	200	0	0	6552	7862	7862	7862	7862	3712	406	0.13	2.5	0.43	1	0.027	0.008	1.027	1.008	0.134	2.520				
Generator	2270006005	Diesel	T3	143	0	0	2839	12876	13104	13104	13104	13104	6115	367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520			
Generator	2270006005	Diesel	T3	143	0	0	873	8299	10483	10483	10483	4804	367	0.18	2.5	0.43	1	0.027	0.008	1.027	1.008	0.185	2.520				
Generator	2270006005	Diesel	T4	14	0	0	8738	52603	81806	83089	23328	37440	25592	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334			
Small Capital Equipment																											
Plate Compactor	2270020029	Diesel	T4	8	0	0	10530	33696	33696	33693	33696	33696	11636	0.408	0.13	4.3	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334			
Plate Compactor	2270020029	Diesel	T4	19	0	0	2308	16398	16848	16848	16848	7254	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476				
Plate Compactor	2270020029	Diesel	T4	15	0	0	2846	16390	22464	22464	22464	17682	12870	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476			
Pump	2270006010	Diesel	T4	7	0	0	5892	54862	54862	54862	54862	3276	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.476				
Pump	2270006010	Diesel	T4	7	0	0	468	5148	5616	5616	5616	3276	0.408	0.5908	0.43	0.43	1	0.027	0.008	1.027	1.008	0.566	4.334				
Pump	2270006010	Diesel	T4	15	0	0	468	5148	5616	5616	5616	3276	0.408	0.438	4.3999	0.43	0.43	1	0.027	0.008	1.027	1.008	0.450	4.475			
Concrete Saw	2270020039	Diesel	T4	65	0	0	7020	8424	9424	9424	9424	3878	0.408	0.13	4.44	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334				
Tramper/Rammer	2270020006	Diesel	T4	3	2808	0	14508	22464	22464	22464	22464	9332	9360	0.408	0.13	4.3	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334			
Tramper/Rammer	2270020026	Diesel	T4	3	0	7802	14508	22464	22464	22464	19332	9360	0.408	0.13	4.3	0.43	1	0.027	0.008	1.027	1.008	0.134	4.334				
Pump	2270006010	Diesel	T4	15	0	0	4914	16614	30654	39688	30888	30450	12402	0.408	0.438	4.3999	0.43	1	0.027	0.008	1.027	1.008	0.450	4.475			
TOTAL (Tons)																											

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-002

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss: g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EF) from NMBANONROAD08 have transient adjustment factors built in.

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition" April 2004, EPA-420-P-04-009

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition".

Age Factor = LF * cumulative hours / median life (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor = $1 + (A * \text{Age Factor} * b)$, where $b = 1$ for diesel engines and

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", A

Adjusted EF = Efss * TAF * DF (as stated in Note 2, EFss have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation: $(1.052 \cdot \text{Adj. HC emission factor (lb/hr)} \cdot \text{horses/year} \cdot \text{hours operated} \cdot \text{load factor}) / (2000 \text{ lb/ton} \cdot 453$

Note 5: Annual VOC Emissions are calculated using the following calculation (1.053 * Adj. HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.

1.053 is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015.

Table B-1b Diesel Non-Road Engine Emissions Inc

Winches and Tuggers																		
Other Construction Equipment	0.00	0.00	0.00	0.00	0.03	0.09	0.08	0.03	0.00	0.00	0.00	0.00	0.00	0.52	1.55	1.42	0.52	0.00
Generator Equipment																		
Generator	0.01	0.04	0.06	0.21	0.22	0.22	0.22	0.20	0.07	0.12	0.47	0.78	2.70	2.82	2.82	2.82	2.58	0.94
Generator	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.04	0.00	0.00	0.00	0.00	0.59	0.65	0.65	0.65	0.38	
Generator	0.00	0.00	0.00	0.11	0.12	0.12	0.12	0.12	0.07	0.18	0.60	0.99	2.19	2.16	2.16	2.16	1.29	
Generator	0.00	0.00	0.00	0.09	0.10	0.10	0.10	0.10	0.05	0.00	0.00	0.00	1.57	1.88	1.88	1.88	0.89	
Generator	0.00	0.00	0.04	0.17	0.17	0.17	0.17	0.17	0.08	0.00	0.00	0.48	2.20	2.24	2.24	2.24	1.04	
Generator	0.00	0.00	0.01	0.11	0.14	0.14	0.14	0.14	0.06	0.00	0.00	0.15	1.42	1.79	1.79	1.79	0.82	
Generator	0.00	0.00	0.01	0.05	0.08	0.08	0.08	0.08	0.02	0.00	0.00	0.28	1.56	2.43	2.47	2.89	1.11	0.61
Small Capital Equipment																		
Plate Compactor	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.17	0.55	0.55	0.55	0.55	0.19	
Plate Compactor	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.07	0.40	0.54	0.54	0.54	0.23	
Generator	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.01	0.00	0.00	0.11	0.66	0.66	0.66	0.66	0.32	
Generator	0.00	0.00	0.00	0.03	0.04	0.04	0.04	0.04	0.03	0.01	0.00	0.00	0.14	0.81	1.18	1.18	1.11	0.46
Pump	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.07	0.08	0.08	0.08	0.08	0.05
Pump	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.01	0.16	0.18	0.18	0.18	0.18	0.10
Concrete Saw	0.00	0.00	0.00	0.04	0.05	0.05	0.05	0.05	0.02	0.00	0.00	0.09	0.90	1.08	1.08	1.08	0.98	0.51
Tamper/Rammer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.14	0.14	0.14	0.12	0.06
Tamper/Rammer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.14	0.14	0.14	0.12	0.06
Pump	0.00	0.00	0.03	0.09	0.17	0.21	0.17	0.16	0.07	0.00	0.00	0.25	0.85	1.56	1.72	1.57	1.55	0.63
TOTAL (Tons)	0.01	0.04	1.54	8.84	11.10	11.40	10.56	6.64	1.33	0.12	0.47	22.28	132.17	167.08	170.34	157.73	100.12	19.34
Total construction sum																		

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss: g/hr-hr), and load factor are from NMIMNONROAD08 model factors dated April 5, 2009.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EF_{ss}) from NMHC/NONROAD08 have transient adjustment factors built in.

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition".

Age Factor = LF * cumulative hours / median life (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor = $1 + (A * \text{Age Factor}^b)$, where $b = 1$ for diesel engines and

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", Ap...

Adjusted EF = Efss * TAF * DF (as stated in Note 2, Efss have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation: $(1.053 \times \text{Adjusted EF} \times \text{TAPE} \times \text{DF})$ (as stated in Note 2, EFs have TAPE built in)

Note 5: Annual VOC Emissions are calculated using the following calculation (1.053 * Adj. HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.59237 g/lb).

Table B-2a Gasoline Non-Road Engine Emissions

Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Engine Technology Type	Equipment Horsepower	Annual Emissions (g/hr)										BSFC ² (lb/hp-hr)	EF _{ss} (g/hp-hr)		Load Factor	Age Factor	TAF ³		Deterioration Factor ⁴		Adjusted EF ⁵ (g/hp-hr)	
					2010 hrs	2011 hrs	2012 hrs	2013 hrs	2014 hrs	2015 hrs	2016 hrs	2017 hrs	2018 hrs	HC		NOx	HC			NOx	HC	NOx	HC	NOx	
Forklift	2265003020	Gasoline	G4GT252	52	0	0	3369	17596	22464	22464	22464	22089	9734	0.484	0.27	0.69	0.3	1	0.64	0.15	1.640	1.150	0.443	0.79	
Aerial Lift	2265003010	Gasoline	G4GT252	75	0	0	0	1497	4492	4492	4492	4492	2995	0.484	0.27	0.69	0.46	1	0.64	0.15	1.640	1.150	0.443	0.79	
Plate Compactor	2260002009	Gasoline	G4N2O2	7	0	0	4212	21762	30654	29688	30888	39520	12402	0.74	4.16	2.77	0.55	1	1.095	0	2.095	1.000	9	2.770	
Chipper/Stump Grinder	2265004066	Gasoline	L4N1	11	0	0	468	2106	2106	2106	2106	1754	0	0.693	3.91	5.25	0.78	1	1.095	0	2.095	1.000	8	5.250	
Lawn Mower	2265004011	Gasoline	G4N1O2	3	0	0	936	5616	5616	5616	5616	5616	3276	0.781	6.51	2.446	0.78	1	1.753	0	2.753	1.000	18	2.446	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	13	0	0	936	7020	8424	8424	8424	8424	3978	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Pump	2265006010	Gasoline	G4GT25	6	0	0	2808	16390	22464	22464	22464	19332	9360	0.605	3.85	8.43	0.69	1	1.095	0	2.095	1.000	8	8.430	
Snowblower	2265004036	Gasoline	G4N2O	11	0	0	468	5148	5616	5616	5616	5616	3276	0.94	5.2	3.5	0.35	1	1.095	0	2.095	1.000	11	3.500	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	6	0	0	6318	16146	16848	16848	11700	9360	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	8	0	0	6318	16146	16848	16848	11700	9360	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Concrete Equipment	2260002039	Gasoline	G4N1O2	3	0	0	5850	23868	33462	33696	33696	27378	0	0.921	6.13	2.446	0.63	1	1.753	0	2.753	1.000	17	2.446	
Chain Saw	2260004021	Gasoline	G2H52	3	11700	35100	0	0	0	0	0	0	0	0.608	47.98	0.91	0.59	1	0.266	0	1.266	1.000	61	0.910	
Roller	2265002015	Gasoline	G4N1O2	6	2340	9360	3900	0	0	0	0	0	0	0.781	6.51	2.446	0.62	1	1.095	0	2.095	1.000	14	2.446	
Pump	2265006010	Gasoline	G4GT25	4	3120	12480	0	0	0	0	0	0	0	0.605	3.85	8.43	0.69	1	1.753	0	2.753	1.000	11	8.430	
TOTAL (Tons)																									

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment. EFss from NMIM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA-420-R-05R-019.

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", December 2005, EPA-420-R-05-023.

Age Factor = $LF \cdot \text{cumulative hours} / \text{median life}$ (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor = $1 + (A \cdot \text{Age Factor})^b$, where $b = 1$ for 2-stroke engines and $b = 0.5$ for 4-stroke engines and A is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009.

Adjusted EF = $\text{EFss} \cdot \text{TAF} \cdot \text{DF}$ (as stated in Note 2, EFss have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation (VOC/HC * Adj. HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

VOC/HR is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015. 0.933 for 4-stroke engines and 1.034 for 2-stroke engines

Note 6: Annual NOx Emissions are calculated using the following calculation (Adj. NOx emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Table B-2a Gasoline NonRoad Engine Emissions

Equipment category based on NONROAD classification	VOC tons 2010	VOC tons 2011	VOC tons 2012	VOC tons 2013	VOC tons 2014	VOC tons 2015	VOC tons 2016	VOC tons 2017	VOC tons 2018	NOx tons 2010	NOx tons 2011	NOx tons 2012	NOx tons 2013	NOx tons 2014	NOx tons 2015	NOx tons 2016	NOx tons 2017	NOx tons 2018
Forklift	0.00	0.00	0.02	0.13	0.16	0.16	0.16	0.16	0.07	0.00	0.00	0.05	0.24	0.31	0.31	0.31	0.30	0.13
Aerial Lift	0.00	0.00	0.00	0.02	0.07	0.07	0.07	0.07	0.05	0.00	0.00	0.00	0.05	0.14	0.14	0.14	0.14	0.09
Plate Compactor	0.00	0.00	0.15	0.75	1.06	1.02	1.07	1.36	0.43	0.00	0.00	0.05	0.26	0.36	0.35	0.36	0.46	0.15
Chipper/Stump Grinder	0.00	0.00	0.03	0.15	0.15	0.15	0.15	0.13	0.00	0.00	0.00	0.02	0.10	0.10	0.10	0.10	0.09	0.00
Lawn Mower	0.00	0.00	0.04	0.24	0.24	0.24	0.24	0.24	0.14	0.00	0.00	0.01	0.04	0.04	0.04	0.04	0.04	0.02
Cement & Mortar Mixer	0.00	0.00	0.04	0.27	0.32	0.32	0.32	0.32	0.15	0.00	0.00	0.01	0.09	0.11	0.11	0.11	0.11	0.05
Pump	0.00	0.00	0.10	0.56	0.77	0.77	0.77	0.66	0.32	0.00	0.00	0.11	0.63	0.86	0.86	0.86	0.74	0.36
Snowblower	0.00	0.00	0.02	0.22	0.24	0.24	0.24	0.24	0.14	0.00	0.00	0.01	0.08	0.08	0.08	0.08	0.08	0.05
Cement & Mortar Mixer	0.00	0.00	0.11	0.29	0.30	0.30	0.21	0.17	0.00	0.00	0.00	0.04	0.10	0.10	0.10	0.07	0.06	0.00
Cement & Mortar Mixer	0.00	0.00	0.15	0.38	0.40	0.40	0.28	0.22	0.00	0.00	0.00	0.05	0.13	0.14	0.14	0.09	0.08	0.00
Concrete Equipment	0.00	0.00	0.19	0.78	1.10	1.11	1.11	0.90	0.00	0.00	0.00	0.03	0.12	0.17	0.17	0.17	0.14	0.00
Chain Saw	1.43	4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller	0.12	0.49	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Pump	0.09	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL (Tons)	1.65	5.17	1.05	3.80	4.82	4.79	4.62	4.48	1.30	0.12	0.48	0.41	1.83	2.41	2.40	2.34	2.23	0.85
	0	0	0.02	0.15	0.23	0.23	0.23	0.23	0.12	0.00	0	0.05	0.29	0.44	0.44	0.44	0.44	0.22

Total construction sum
10 CFR 50 construction total

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment.

EFss from NMIM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA420-R-05R-019

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", December 2005, EPA-420-R-05-023.

Age Factor = $LF * \text{cumulative hours} / \text{median life}$ (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor = $1 + (A * \text{Age Factor}^b)$, where b = 1 for 2-stroke engines = 0.5 for 4-stroke engines and A is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009.

Adjusted EF = $EF_{ss} * TAF * DF$ (as stated in Note 2, EFss have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the follow $(VOC/HC * Adj. HC \text{ emission factor (g/hp-hr)} * \text{horsepower} * \text{hours operated} * \text{load factor}) / (2000 \text{ lb/ton} * 453.6 \text{ g/lb})$

VOC/HR is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015. 0.933 for 4-stroke engines and 1.034 for 2-stroke engines

Note 6: Annual NOx Emissions are calculated using the follow $(Adj. NOx \text{ emission factor (g/hp-hr)} * \text{horsepower} * \text{hours operated} * \text{load factor}) / (2000 \text{ lb/ton} * 453.6 \text{ g/lb})$

Table B-2b Gasoline Non-Road Engine Emissions included in safety-related construction

Equipment category based on NONROAD classification	SCC ¹	Fuel Type	Engine Technology Type	Equipment Horsepower	Annual Activity (hrs)										BSFC ² lb/hp-hr	EFSS (g/hp-hr)		Load Factor ³	Age Factor ⁴	TAF ⁵		Deterioration factor ⁶		Adjusted EF ⁷ (g/hp-hr)	
					2010	2011	2012	2013	2014	2015	2016	2017	2018	HC		NOx	HC			NOx	HC	NOx	HC	NOx	
					hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs												
Forklift	2265003020	Gasoline	G4GT252	52	0	0	3369	17596	22464	22464	22464	22089	9734	0.484	0.27	0.69	0.3	1	0.64	0.15	1.640	1.150	0.443	0.79	
Aerial Lift	2265003010	Gasoline	G4GT252	75	0	0	0	1497	4492	4492	4492	4492	2995	0.484	0.27	0.69	0.46	1	0.64	0.15	1.640	1.150	0.443	0.79	
Plate Compactor	2260002009	Gasoline	G4N2O2	7	0	0	4212	21762	30654	29688	30888	39520	12402	0.74	4.16	2.77	0.55	1	1.095	0	2.095	1.000	9	2.770	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	11	0	0	468	2106	2106	2106	2106	1754	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	13	0	0	936	7020	8424	8424	8424	8424	3978	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Pump	2265006010	Gasoline	G4GT25	6	0	0	2808	16380	22464	22464	22464	19332	9360	0.605	3.85	8.43	0.69	1	1.095	0	2.095	1.000	8	8.430	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	6	0	0	6318	16146	16848	16848	11700	9360	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Cement & Mortar Mixer	2260002042	Gasoline	G4N2O2	8	0	0	6318	16146	16848	16848	11700	9360	0	0.74	4.16	2.77	0.33	1	1.095	0	2.095	1.000	9	2.770	
Concrete Equipment	2260002039	Gasoline	G4N1O2	3	0	0	5850	23868	33462	33696	33696	27378	0	0.921	6.13	2.446	0.63	1	1.753	0	2.753	1.000	17	2.446	
TOTAL (Tons)																									

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment. EFss from NMIM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA-420-R-05R-019

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", December 2005, EPA-420-R-05-023.

Age Factor = LF * cumulative hours / median life (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor = 1 + (A * Age Factor^b), where b = 1 for 2-stroke engines <0.5 for 4-stroke engines and A is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009.

Adjusted EF = EFss * TAF * DF (as stated in Note 2, EFss have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the following calculation (VOC/HC * Adj. HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

VOC/HC is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015. 0.933 for 4-stroke engines and 1.034 for 2-stroke engines

Note 6: Annual NOx Emissions are calculated using the following calculation (Adj. NOx emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Table B-2b Gasoline NonRoad Engine Emissions

Equipment category based on NONROAD classification	VOC ¹ tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	VOC tons	NOx ¹ tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons	NOx tons
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2010	2011	2012	2013	2014	2015	2016	2017	2018
Forklift	0.00	0.00	0.02	0.13	0.16	0.16	0.16	0.16	0.07	0.00	0.00	0.05	0.24	0.31	0.31	0.31	0.30	0.13
Aerial Lift	0.00	0.00	0.00	0.02	0.07	0.07	0.07	0.07	0.05	0.00	0.00	0.00	0.05	0.14	0.14	0.14	0.14	0.09
Plate Compactor	0.00	0.00	0.15	0.75	1.06	1.02	1.07	1.36	0.43	0.00	0.00	0.05	0.26	0.36	0.35	0.36	0.46	0.15
Cement & Mortar Mixer	0.00	0.00	0.02	0.07	0.07	0.07	0.07	0.06	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.00
Cement & Mortar Mixer	0.00	0.00	0.04	0.27	0.32	0.32	0.32	0.32	0.15	0.00	0.00	0.01	0.09	0.11	0.11	0.11	0.11	0.05
Pump	0.00	0.00	0.10	0.56	0.77	0.77	0.77	0.66	0.32	0.00	0.00	0.11	0.63	0.86	0.86	0.86	0.74	0.36
Cement & Mortar Mixer	0.00	0.00	0.29	0.30	0.30	0.21	0.17	0.00	0.00	0.00	0.00	0.04	0.10	0.10	0.10	0.07	0.06	0.00
Cement & Mortar Mixer	0.00	0.00	0.15	0.38	0.40	0.40	0.28	0.22	0.00	0.00	0.00	0.05	0.13	0.14	0.14	0.09	0.08	0.00
Concrete Equipment	0.00	0.00	0.19	0.78	1.10	1.11	1.11	0.90	0.00	0.00	0.00	0.03	0.12	0.17	0.17	0.17	0.14	0.00
TOTAL (Tons)	0.00	0.00	0.77	3.25	4.25	4.22	4.05	3.92	1.02	0.00	0.00	0.34	1.64	2.21	2.20	2.14	2.05	0.78

Total construction sum

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", April 2004, EPA-420-P-04-005.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated April 5, 2009. Except forklift, aerial lift and cement/concrete equipment. EFss from NMIM/NONROAD08 have transient adjustment factors built in.

Forklift, aerial lift, and concrete/cement equipment values are from Tables 1-7 of "Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", December 2005, EPA-420-R-05R-019

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", December 2005, EPA-420-R-05-023.

Age Factor = $LF * \text{cumulative hours} / \text{median life}$ (where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes).

Deterioration Factor = $1 + (A * \text{Age Factor}^b)$, where b = 1 for 2-stroke engines +0.5 for 4-stroke engines and A is taken from Tables 1-7 from source

Note 4: Adjusted Emission Factors for HC and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", April 2004, EPA-420-P-04-009.

Adjusted EF = $EF_{ss} * TAF * DF$ (as stated in Note 2, EFss have TAFs built in)

Note 5: Annual VOC Emissions are calculated using the follow $VOC/HC * Adj. HC \text{ emission factor (g/hp-hr)} * \text{horsepower} * \text{hours operated} * \text{load factor} / (2000 \text{ lb/ton} * 453.6 \text{ g/lb})$

VOC/HR is the ratio of VOC to HC from "Conversion Factors for Hydrocarbon Components", December 2005, EPA-420-P-05-015. 0.933 for 4-stroke engines and 1.034 for 2-stroke engines

Note 6: Annual NOx Emissions are calculated using the follow $(Adj. NOx \text{ emission factor (g/hp-hr)} * \text{horsepower} * \text{hours operated} * \text{load factor}) / (2000 \text{ lb/ton} * 453.6 \text{ g/lb})$

Table B-3a On-Road Vehicle Emissions 2010

Vehicle Classification	Fuel Type	Vehicle Class	SCC	2010 Total operated hrs	Avg: mph	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi) VOC	NOx	2010 Emissions (tons) ² VOC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	0	30.0	0	0.737	0.568	0.00	0.00
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	1404	20.0	28,080	0.785	0.731	0.02	0.02
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	0	20.0	0	0.785	0.731	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.421	1.375	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.421	1.375	0.00	0.00
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	0	20.0	0	1.363	1.07	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.421	1.375	0.00	0.00
Trucks - Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	15.0	0	0.411	7.776	0.00	0.00
Heavy-Duty Diesel Vehicle 2B	Diesel	HDDV2b	2230071	0	15.0	0	0.168	2.664	0.00	0.00
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.324	5.169	0.00	0.00
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.168	2.664	0.00	0.00
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.168	2.664	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.493	9.388	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.493	9.388	0.00	0.00
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.168	2.664	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.493	9.388	0.00	0.00
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	0	15.0	0	0.402	6.444	0.00	0.00
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	0	2.0	0	0.252	4.043	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	936	20.0	18,720	2.587	2.725	0.05	0.06
Diesel Commercial Bus	Diesel	HDDBT	2230075	0	35.0	0	0.29	13.105	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	20.0	0	2.587	2.725	0.00	0.00
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.587	2.725	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	20.0	0	0.18	2.831	0.00	0.00
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.493	9.388	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.493	9.388	0.00	0.00
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.324	5.169	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.493	9.388	0.00	0.00
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	2340	25.0	58,500	0.18	2.831	0.01	0.18
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	2340	20.0	46,800	0.411	7.776	0.02	0.40
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	1560	25.0	39,000	0.18	2.831	0.01	0.12
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	11700	30.0	351,000	2.587	2.725	1.00	1.05
Summary of 2010 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi) VOC	NOx	2010 Emissions (tons) ² VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	275	40.0	3432000	0.737	0.568	2.79	2.15
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	0	100.0	0	0.493	9.388	0.00	0.00
DC NA Area onroad vehicle total (direct & indirect)									3.91	3.99
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	69	20.0	430560	0.737	0.568	0.35	0.27
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	0	50.0	0	0.493	9.388	0.00	0.00
Baltimore NA Area onroad vehicle total									0.35	0.27

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation (VMT (miles) * Emission factor (g/mi)) / (2000 lb/ton * 453.6 g/lb)

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2010 Onroad Emissions			2010 Emissions (tons)	
			VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)			3.91	3.99
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)			0.35	0.27
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)			0.00	0.00

Table B-3b On-Road Vehicle Emissions 2011

Vehicle Classification	Fuel Type	Vehicle Class	SCC	2011 Total operated	Avg. Speed	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi)		2011 Emissions (tons)	
				hrs	mph	VMT	VOC	NOx	VOC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	0	30.0	0	0.743	0.571	0.00	0.00
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	5616	20.0	112,320	0.827	0.715	0.10	0.09
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	0	20.0	0	0.827	0.715	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	1.488	1.182	0.00	0.00
Trucks - Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	15.0	0	0.39	6.593	0.00	0.00
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.304	4.409	0.00	0.00
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	0	15.0	0	0.156	2.238	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	0	15.0	0	0.376	5.501	0.00	0.00
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	0	2.0	0	0.241	3.562	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	7488	20.0	149,760	2.595	2.727	0.43	0.45
Diesel Commercial Bus	Diesel	HDDBT	2230075	0	35.0	0	0.278	11.752	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	20.0	0	2.595	2.727	0.00	0.00
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	20.0	0	0.168	2.329	0.00	0.00
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.467	8.081	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.304	4.409	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.467	8.081	0.00	0.00
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	9360	25.0	234,000	0.168	2.329	0.04	0.60
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	9360	20.0	187,200	0.39	6.593	0.08	1.36
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	6240	25.0	156,000	0.168	2.329	0.03	0.40
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	46800	30.0	1,404,000	2.595	2.727	4.02	4.22
Dredging Equipment										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	18000	30.0	540000	0.39	6.593	0.23	3.92
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	4320	45.0	194400	1.488	1.182	0.32	0.25
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	4320	45.0	194400	0.827	0.715	0.18	0.15
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	720	30.0	21600	0.168	2.329	0.00	0.06
Summary of 2011 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round-trip Distance	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi) ¹		2010 Emissions (tons) ²	
							VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	1161	40.0	14489280	0.743	0.571	11.87	9.12
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	0	100.0	0	0.168	2.329	0.00	0.00
DC NA Area onroad vehicle total (direct & indirect)									17.30	20.63
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	290	20.0	1809600	0.743	0.571	1.48	1.14
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	0	50.0	0	0.168	2.329	0.00	0.00
Baltimore NA Area onroad vehicle total									1.48	1.14

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation (VMT (miles) * Emission factor (g/mi)) / (2000 lb/ton * 453.6 g/lb)

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2011 Onroad Emissions			
		2011 Emissions (tons)	
		VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)		17.30	20.63
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)		1.48	1.14
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)		0.00	0.00

Table B-3c On-Road Vehicle Emissions 2012

Description	Fuel Type	Vehicle Class	SCC	2012 Total operated hrs	Avg. mph	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/ml) ¹		2012 Emissions (tons)	
							HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	811	30.0	24,330	0.612	0.47	0.02	0.01
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	8892	20.0	177,840	0.666	0.611	0.13	0.12
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	3900	20.0	78,000	0.666	0.611	0.06	0.05
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	3432	20.0	68,640	1.243	1.234	0.09	0.09
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	2184	20.0	43,680	1.243	1.234	0.06	0.06
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	2340	20.0	46,800	1.187	0.961	0.06	0.05
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	2808	20.0	56,160	1.243	1.234	0.08	0.08
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	9546	15.0	143,190	0.36	5.588	0.06	0.88
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	1872	15.0	28,080	0.146	1.874	0.00	0.06
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	1123	15.0	16,845	0.282	3.754	0.01	0.07
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	1871	15.0	28,065	0.146	1.874	0.00	0.06
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	1497	15.0	22,455	0.146	1.874	0.00	0.05
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	2106	15.0	31,590	0.429	6.98	0.01	0.24
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	2106	15.0	31,590	0.429	6.98	0.01	0.24
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	1885	15.0	28,275	0.146	1.874	0.00	0.06
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	2246	15.0	33,690	0.429	6.98	0.02	0.26
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	2808	15.0	42,120	0.349	4.705	0.02	0.22
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072		2.0	0	0.232	3.132	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	9672	20.0	193,440	2.595	2.727	0.55	0.58
Diesel Commercial Bus	Diesel	HDDBT	2230075		35.0	0	0.264	10.469	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	5928	20.0	118,560	2.595	2.727	0.34	0.36
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	561	30.0	16,830	2.595	2.727	0.05	0.05
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	62	20.0	1,240	0.155	1.871	0.00	0.00
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	624	15.0	9,360	0.429	6.98	0.00	0.07
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	1560	15.0	23,400	0.429	6.98	0.01	0.18
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.282	3.754	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	37440	10.0	374,400	0.429	6.98	0.18	2.88
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	2340	25.0	58,500	0.155	1.871	0.01	0.12
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	2340	20.0	46,800	0.36	5.588	0.02	0.29
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	1560	25.0	39,000	0.155	1.871	0.01	0.08
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	11700	30.0	351,000	2.595	2.727	1.00	1.06
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/ml) ¹		2010 Emissions (tons) ²	
							VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	2008	40.0	25059840	0.612	0.47	16.91	12.98
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	3930	100.0	393000	0.429	6.98	0.19	3.02
DC NA Area onroad vehicle total (direct & indirect)									19.90	24.28
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	502	20.0	3132480	0.612	0.47	2.11	1.62
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	1179	50.0	58950	0.429	6.98	0.03	0.45
Baltimore NA Area onroad vehicle total									2.14	2.08

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2012 Onroad Emissions			2012 Emissions (tons)	
			VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)			19.90	24.28
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)			2.14	2.08
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)			0.19	3.13

Table B-3d On-Road Vehicle Emissions 2013

Description	Fuel Type	Vehicle Class	SCC	2013 Total	Average	Vehicular	Criteria Pollutants		2013 Emissions	
				operated	Speed	Miles Trav	EFs (g/ml) ¹		(tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.563	0.428	0.03	0.02
Light-Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.624	0.554	0.13	0.11
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	14040	20.0	280,800	0.624	0.554	0.19	0.17
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14664	20.0	293,280	1.175	1.158	0.38	0.37
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	10296	20.0	205,920	1.175	1.158	0.27	0.26
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	1.12	0.9	0.09	0.07
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	7956	20.0	159,120	1.175	1.158	0.21	0.20
Trucks-Heavy-Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	15724	15.0	235,860	0.345	4.764	0.09	1.24
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	7862	15.0	117,930	0.14	1.601	0.02	0.21
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	6177	15.0	92,655	0.268	3.237	0.03	0.33
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	7113	15.0	106,695	0.14	1.601	0.02	0.19
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	7113	15.0	106,695	0.14	1.601	0.02	0.19
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	7020	15.0	105,300	0.41	6.028	0.05	0.70
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	7020	15.0	105,300	0.41	6.028	0.05	0.70
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4492	15.0	67,380	0.14	1.601	0.01	0.12
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	6240	15.0	93,600	0.41	6.028	0.04	0.62
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	12324	15.0	184,860	0.331	4.054	0.07	0.83
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	1684	2.0	3,368	0.225	2.792	0.00	0.01
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	35888	20.0	717,760	2.595	2.727	2.05	2.16
Diesel Commercial Bus	Diesel	HDDBT	2230075		35.0	0	0.258	9.26	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	16692	20.0	333,840	2.595	2.727	0.95	1.00
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	1591	30.0	47,730	2.595	2.727	0.14	0.14
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.148	1.556	0.00	0.01
Concrete/Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	936	15.0	14,040	0.41	6.028	0.01	0.09
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	3900	15.0	58,500	0.41	6.028	0.03	0.39
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.268	3.237	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	74880	10.0	748,800	0.41	6.028	0.34	4.98
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.148	1.556	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.345	4.764	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.148	1.556	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/ml) ¹		2010 Emissions (tons) ²	
							VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	2769	40.0	34557120	0.563	0.428	21.45	16.30
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	4400	100.0	440000	0.41	6.028	0.20	2.92
DC NA Area onroad vehicle total (direct & indirect)									26.84	34.35
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	692	20.0	4318080	0.563	0.428	2.68	2.04
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	1320	50.0	66000	0.41	6.028	0.03	0.44
Baltimore NA Area onroad vehicle total									2.71	2.48

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2013 Onroad Emissions		
	2013 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)	26.84	34.35
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	2.71	2.48
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.37	5.46

Table B-3e On-Road Vehicle Emissions 2014

Description	Fuel Type	Vehicle Class	SCC	2014 Total	Average	Vehicular	Criteria Pollutants		2014 Emissions	
				operated hrs	Speed mph	Miles Trav VMT	EFs (g/mi)	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.52	0.391	0.03	0.02
Light-Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.590	0.507	0.12	0.10
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	14976	20.0	299,520	0.590	0.507	0.19	0.17
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	1.113	1.092	0.37	0.36
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	11232	20.0	224,640	1.113	1.092	0.28	0.27
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	1.06	0.848	0.09	0.07
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	9360	20.0	187,200	1.113	1.092	0.23	0.23
Trucks - Heavy-Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	15724	15.0	235,860	0.332	3.998	0.09	1.04
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	11232	15.0	168,480	0.133	1.384	0.02	0.26
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	8985	15.0	134,775	0.254	2.774	0.04	0.41
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	11232	15.0	168,480	0.133	1.384	0.02	0.26
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	8985	15.0	134,775	0.133	1.384	0.02	0.21
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.392	5.122	0.05	0.71
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.392	5.122	0.05	0.71
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4492	15.0	67,380	0.133	1.384	0.01	0.10
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8985	15.0	134,775	0.392	5.122	0.06	0.76
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	12048	15.0	180,720	0.312	3.454	0.06	0.69
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	4492	2.0	8,984	0.213	2.491	0.00	0.02
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	53352	20.0	1,067,040	2.595	2.727	3.05	3.21
Diesel Commercial Bus	Diesel	HDDBT	2230075	28080	35.0	982,800	0.253	8.118	0.27	8.79
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	18720	20.0	374,400	2.595	2.727	1.07	1.13
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	2246	30.0	67,380	2.595	2.727	0.19	0.20
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.142	1.309	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	936	15.0	14,040	0.392	5.122	0.01	0.08
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	4212	15.0	63,180	0.392	5.122	0.03	0.36
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.254	2.774	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	74880	10.0	748,800	0.392	5.122	0.32	4.23
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.142	1.309	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.332	3.998	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.142	1.309	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Summary of 2014 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi)		2010 Emissions (tons)	
							VOC	NOx	VOC	NOx
Employee Commute/Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	3167	40.0	39524160	0.52	0.391	22.66	17.04
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	2940	100.0	294000	0.392	5.122	0.13	1.66
DC NA Area onroad vehicle total (direct & indirect)									29.47	43.09
Employee Commute/Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	792	20.0	4942080	0.52	0.391	2.83	2.13
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	882	50.0	44100	0.392	5.122	0.02	0.25
Baltimore NA Area onroad vehicle total									2.85	2.38

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2014 Onroad Emissions		
	2014 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)	29.47	43.09
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	2.85	2.38
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.36	4.66

Table B-3f On-Road Vehicle Emissions 2015

Description	Fuel Type	Vehicle Class	SCC	2015 Total operated hrs	Average Speed mph	Vehicular Miles Trav VMT	Criteria Pollutants EFs (g/mi) ¹		2015 Emissions (tons)	
							HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.483	0.359	0.02	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.561	0.468	0.12	0.10
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	16848	20.0	336,960	0.561	0.468	0.21	0.17
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	1.056	1.033	0.35	0.34
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	11232	20.0	224,640	1.056	1.033	0.26	0.26
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	1.004	0.802	0.08	0.07
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	9360	20.0	187,200	1.056	1.033	0.22	0.21
Trucks - Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	15724	15.0	235,860	0.316	3.425	0.08	0.89
Heavy-Duty Diesel Vehicle 2B	Diesel	HDDV2b	2230071	11232	15.0	168,480	0.128	1.188	0.02	0.22
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	8985	15.0	134,775	0.241	2.397	0.04	0.36
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	11232	15.0	168,480	0.128	1.188	0.02	0.22
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	8985	15.0	134,775	0.128	1.188	0.02	0.18
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.37	4.455	0.05	0.62
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.37	4.455	0.05	0.62
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	4922	15.0	73,830	0.128	1.188	0.01	0.10
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8985	15.0	134,775	0.37	4.455	0.05	0.66
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	12048	15.0	180,720	0.297	2.983	0.06	0.59
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	4492	2.0	8,984	0.204	2.183	0.00	0.02
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	56160	20.0	1,123,200	2.595	2.727	3.21	3.38
Diesel Commercial Bus	Diesel	HDDBT	2230075	40524	35.0	1,418,340	0.25	7.082	0.39	11.07
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	18720	20.0	374,400	2.595	2.727	1.07	1.13
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	2246	30.0	67,380	2.595	2.727	0.19	0.20
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.137	1.095	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.37	4.455	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	5616	15.0	84,240	0.37	4.455	0.03	0.41
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.241	2.397	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	74880	10.0	748,800	0.37	4.455	0.31	3.68
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.137	1.095	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.316	3.425	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.137	1.095	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Employee Commute/ Delivery										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/mi) ¹		2010 Emissions (tons) ²	
							VOC	NOx	VOC	NOx
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	2838	40.0	35418240	0.483	0.359	18.86	14.02
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	500	100.0	50000	0.37	4.455	0.02	0.25
DC NA Area onroad vehicle total (direct & indirect)									25.76	39.78
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	710	20.0	4430400	0.483	0.359	2.36	1.75
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	150	50.0	7500	0.37	4.455	0.00	0.04
Baltimore NA Area onroad vehicle total									2.36	1.79

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2015 Onroad Emissions		
	2015 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)	25.76	39.78
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	2.36	1.79
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.34	4.09

Table B-3g On-Road Vehicle Emissions 2016

Description	Fuel Type	Vehicle Class	SCC	2016 Total operated	Average Speed	Vehicular Miles Trav	Criteria Pollutants EFs (g/ml) ¹		2016 Emissions (tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.453	0.33	0.02	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.536	0.431	0.11	0.09
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	18720	20.0	374,400	0.536	0.431	0.22	0.18
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	0.997	0.97	0.33	0.32
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	11232	20.0	224,640	0.997	0.97	0.25	0.24
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	0.947	0.752	0.08	0.06
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	7800	20.0	156,000	0.997	0.97	0.17	0.17
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	15537	15.0	233,055	0.308	2.973	0.08	0.76
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	11232	15.0	168,480	0.124	1.019	0.02	0.19
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	8985	15.0	134,775	0.232	2.073	0.03	0.31
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	11232	15.0	168,480	0.124	1.019	0.02	0.19
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	8985	15.0	134,775	0.124	1.019	0.02	0.15
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.359	3.942	0.05	0.55
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.359	3.942	0.05	0.55
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	4922	15.0	73,830	0.124	1.019	0.01	0.08
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8985	15.0	134,775	0.359	3.942	0.05	0.59
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	12048	15.0	180,720	0.286	2.587	0.06	0.52
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	2620	2.0	5,240	0.198	1.957	0.00	0.01
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	56160	20.0	1,123,200	2.595	2.727	3.21	3.38
Diesel Commercial Bus	Diesel	HDDBT	2230075	23712	35.0	829,920	0.247	6.117	0.23	5.60
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	18720	20.0	374,400	2.595	2.727	1.07	1.13
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	2246	30.0	67,380	2.595	2.727	0.19	0.20
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.133	0.927	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.359	3.942	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	1482	15.0	22,230	0.359	3.942	0.01	0.10
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.232	2.073	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	74880	10.0	748,800	0.359	3.942	0.30	3.25
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.133	0.927	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.308	2.973	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.133	0.927	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Summary of 2016 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/ml) ¹		2010 Emissions (tons) ²	
							VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	2352	40.0	29352960	0.453	0.33	14.66	10.68
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	70	100.0	7000	0.359	3.942	0.00	0.03
DC NA Area onroad vehicle total (direct & indirect)									21.25	29.33
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	588	20.0	3669120	0.453	0.33	1.83	1.33
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	21	50.0	1050	0.359	3.942	0.00	0.00
Baltimore NA Area onroad vehicle total									1.83	1.34

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2016 Onroad Emissions			
		2016 Emissions (tons)	
		VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)		21.25	29.33
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)		1.83	1.34
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)		0.31	3.35

Table B-3h On-Road Vehicle Emissions 2017

Description	Fuel Type	Vehicle Class	SCC	2017 Total operated	Average Speed	Vehicular Miles Trav	Criteria Pollutants EFs (g/mi) ¹		2017 Emissions (tons)	
				hrs	mph	VMT	HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,497	30.0	44,910	0.428	0.306	0.02	0.02
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	9360	20.0	187,200	0.514	0.404	0.11	0.08
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	17940	20.0	358,800	0.514	0.404	0.20	0.16
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	14976	20.0	299,520	0.946	0.92	0.31	0.30
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	6864	20.0	137,280	0.946	0.92	0.14	0.14
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3744	20.0	74,880	0.896	0.712	0.07	0.06
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	4992	20.0	99,840	0.946	0.92	0.10	0.10
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	10296	15.0	154,440	0.301	2.578	0.05	0.44
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	11044	15.0	165,660	0.121	0.891	0.02	0.16
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	7300	15.0	109,500	0.225	1.817	0.03	0.22
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	7862	15.0	117,930	0.121	0.891	0.02	0.12
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	5616	15.0	84,240	0.121	0.891	0.01	0.08
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	8424	15.0	126,360	0.349	3.401	0.05	0.47
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	5616	15.0	84,240	0.349	3.401	0.03	0.32
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	4922	15.0	73,830	0.121	0.891	0.01	0.07
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	7826	15.0	117,390	0.349	3.401	0.05	0.44
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	14976	15.0	224,640	0.278	2.261	0.07	0.56
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	748	2.0	1,496	0.193	1.757	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	26208	20.0	524,160	2.595	2.727	1.50	1.58
Diesel Commercial Bus	Diesel	HDDBT	2230075	19344	35.0	677,040	0.24	5.21	0.18	3.89
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	6240	20.0	124,800	2.595	2.727	0.36	0.38
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	2246	30.0	67,380	2.595	2.727	0.19	0.20
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	374	20.0	7,480	0.131	0.794	0.00	0.01
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.349	3.401	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.349	3.401	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.225	1.817	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.349	3.401	0.00	0.00
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.131	0.794	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.301	2.578	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.131	0.794	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Summary of 2017 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round Distance	Vehicular Miles Trav	Mobile 6.2 EFs (g/mi)		2010 Emissions (tons) ²	
					miles	VMT	VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	1108	40.0	13827840	0.428	0.306	6.52	4.66
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	0	100.0	0	0.349	3.401	0.00	0.00
DC NA Area onroad vehicle total (direct & indirect)									10.05	14.46
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	277	20.0	1728480	0.428	0.306	0.82	0.58
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	0	50.0	0	0.349	3.401	0.00	0.00
Baltimore NA Area onroad vehicle total									0.82	0.58

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2017 Onroad Emissions			2017 Emissions (tons)	
			VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)			10.05	14.46
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)			0.82	0.58
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)			0.00	0.00

Table B-31 On-Road Vehicle Emissions 2018

Description	Fuel Type	Vehicle Class	SCC	2018 operating hrs	Average Speed mph	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/ml) ¹		2018 Emissions (tons)	
							HC	NOx	HC	NOx
Automotive										
Light-Duty Gasoline Vehicle	Gasoline	LDGV	2201011	1,372	30.0	41,160	0.407	0.285	0.02	0.01
Light Duty										
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	8580	20.0	171,600	0.494	0.381	0.09	0.07
Light-Duty Gasoline Truck 2	Gasoline	LDGT2	2201020	7800	20.0	156,000	0.494	0.381	0.08	0.07
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	7488	20.0	149,760	0.891	0.866	0.15	0.14
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	0	20.0	0	0.891	0.866	0.00	0.00
Light-Duty Gasoline Truck 3	Gasoline	LDGT3	2201040	3432	20.0	68,640	0.843	0.669	0.06	0.05
Light-Duty Gasoline Truck 4	Gasoline	LDGT4	2201040	2184	20.0	43,680	0.891	0.866	0.04	0.04
Trucks -Heavy Duty										
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	5990	15.0	89,850	0.295	2.183	0.03	0.22
Heavy-Duty Deisel Vehicle 2B	Diesel	HDDV2b	2230071	4492	15.0	67,380	0.115	0.754	0.01	0.06
Heavy-Duty Diesel Vehicle 6	Diesel	HDDV6	2230073	1872	15.0	28,080	0.217	1.577	0.01	0.05
Heavy-Duty Deisel Vehicle 2B	Diesel	LDDT12	2230060	3556	15.0	53,340	0.115	0.754	0.01	0.04
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	1497	15.0	22,455	0.115	0.754	0.00	0.02
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	3978	15.0	59,670	0.341	2.843	0.02	0.19
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	1872	15.0	28,080	0.341	2.843	0.01	0.09
Heavy-Duty Diesel Vehicle 2B	Diesel	LDDT12	2230060	1872	15.0	28,080	0.115	0.754	0.00	0.02
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	2620	15.0	39,300	0.341	2.843	0.01	0.12
Heavy-Duty Diesel Vehicle 7	Diesel	HDDV7	2230073	2808	15.0	42,120	0.268	1.968	0.01	0.09
Trailers										
Heavy-Duty Diesel Vehicle 5	Diesel	HDDV5	2230072	0	2.0	0	0.181	1.533	0.00	0.00
Personnel Carrier										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	12792	20.0	255,840	2.595	2.727	0.73	0.77
Diesel Commercial Bus	Diesel	HDDBT	2230075	2808	35.0	98,280	0.236	4.41	0.03	0.48
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	20.0	0	2.595	2.727	0.00	0.00
Emergency Vehicles										
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	842	30.0	25,260	2.595	2.727	0.07	0.08
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	218	20.0	4,360	0.127	0.682	0.00	0.00
Concrete / Aggregate										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.341	2.843	0.00	0.00
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	15.0	0	0.341	2.843	0.00	0.00
Heavy-Duty Deisel Vehicle 6	Diesel	HDDV6	2230073	0	15.0	0	0.217	1.577	0.00	0.00
Concrete Batch Plant										
Heavy-Duty Diesel Vehicle 8B	Diesel	HDDV8b	2230074	0	10.0	0	0.341	2.843	0.00	0.00
Site Preparation										
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.127	0.682	0.00	0.00
Heavy-Duty Diesel Vehicle 8A	Diesel	HDDV8a	2230074	0	20.0	0	0.295	2.183	0.00	0.00
Heavy-Duty Diesel Vehicle 3	Diesel	HDDV3	2230072	0	25.0	0	0.127	0.682	0.00	0.00
Light-Duty Diesel Truck 1 and 2	Diesel	LDDT12	2230060	0	30.0	0	2.595	2.727	0.00	0.00
Summary of 2018 Onroad Emissions										
Description	Fuel Type	Vehicle Class	SCC	Number of Vehicles ³	Round-Distance miles	Vehicular Miles Trav VMT	Mobile 6.2 EFs (g/ml) ¹		2010 Emissions (tons) ²	
							VOC	NOx	VOC	NOx
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in DC NA Area	Gasoline	LDGV	2201011	379	40.0	4729920	0.407	0.285	2.12	1.49
Heavy-Duty Diesel Vehicle 8B in DC NA Area	Diesel	HDDV8b	2230074	0	100.0	0	0.341	2.843	0.00	0.00
DC NA Area onroad vehicle total (direct & indirect)									3.52	4.09
Employee Commute/ Delivery										
Light-Duty Gasoline Vehicle in Balt. NA Area	Gasoline	LDGV	2201011	95	20.0	592800	0.407	0.285	0.27	0.19
Heavy-Duty Diesel Vehicle 8B in Balt. NA Area	Diesel	HDDV8b	2230074	0	50.0	0	0.341	2.843	0.00	0.00
Baltimore NA Area onroad vehicle total									0.27	0.19

Notes

Note 1: U.S. Environmental Protection Agency "Mobile Source Emission Factor Model". Values generated by simulating the model at the project conditions

Note 2: Annual Emissions are calculated using the following calculation

Note 3: Number of vehicles is daily vehicles for employee commuting and annual number of trips for commercial deliveries

Summary of 2018 Onroad Emissions		
	2018 Emissions (tons)	
	VOC	NOx
Total Onroad DC NA Area Emissions (Report in Table 3-1)	3.52	4.09
Baltimore Onroad NA Area Emissions (Reported in Table 3-2)	0.27	0.19
Onroad DC NA Area Construction Emissions (Reported in Table 3-3)	0.00	0.00

Table B-4 Marine Engine Emissions

Description	Fuel Type	Equipment Horsepower hp	2011	2012	2013	2014	2015	2016	Load Factor ¹	Emission Factor (g/kW-hr) ²		Correction Factor ³		VOC	VOC	VOC	VOC	VOC	VOC	NOx	NOx	NOx	NOx	NOx	NOx
			hrs	hrs	hrs	hrs	hrs	hrs		HC (voc)	NOx	HC	NOx	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
Barge - in DC-MD-VA nonattainment area	Diesel	2400	0	135	135	135	135	135	0.79	0.50	9.8	1.00	1.00	0.00	0.11	0.11	0.11	0.11	0.11	0.00	2.06	2.06	2.06	2.06	2.06
Barge Auxiliary - in DC-MD-VA NA area	Diesel	205	0	135	135	135	135	135	0.56	0.27	6.8	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09	0.09	0.09	0.09
TugBoat - for degding activity	Diesel	1200	720	0	0	0	0	0	0.79	0.50	9.8	1.00	1.00	0.28	0.00	0.00	0.00	0.00	0.00	5.50	0.00	0.00	0.00	0.00	0.00
TugBoat Auxiliary - for dredging activity	Diesel	100	720	0	0	0	0	0	0.56	0.27	6.8	1.00	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
18' Boat - for dredging activity	Gasoline	225	720	0	0	0	0	0	0.79	0.50	9.8	1.00	1.00	0.05	0.00	0.00	0.00	0.00	0.00	1.03	0.00	0.00	0.00	0.00	0.00
TOTAL DC area(Tons)														0.34	0.11	0.11	0.11	0.11	0.11	6.75	2.15	2.15	2.15	2.15	2.15

Description	Fuel Type	Equipment Horsepower hp	2011	2012	2013	2014	2015	2016	Load Factor ¹	Emission Factor (g/kW-hr) ²		Correction Factor ³		VOC	VOC	VOC	VOC	VOC	VOC	NOx	NOx	NOx	NOx	NOx	NOx
			hrs	hrs	hrs	hrs	hrs	hrs		HC (voc)	NOx	HC	NOx	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
Barge - in Baltimore nonattainment area	Diesel	2400	0	430	430	430	430	430	0.79	0.50	9.8	1.00	1.00	0.00	0.34	0.34	0.34	0.34	0.34	0.00	6.57	6.57	6.57	6.57	6.57
Barge Auxiliary - in Baltimore NA area	Diesel	205	0	430	430	430	430	430	0.56	0.27	6.8	1.00	1.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.28	0.28	0.28	0.28	0.28
TOTAL Baltimore area(Tons)														0.00	0.35	0.35	0.35	0.35	0.35	0.00	6.84	6.84	6.84	6.84	6.84

NOTES:

Note 1: EPA Load Factors for Harbor Crafts from Table 3-3 of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009

Note 2: Harbor Craft Emission Factors from Table 3-8 of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009

Note 3: Harbor Craft Fuel Correction Factors from Offroad Diesel Fuel from Table 3-9 of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009

Note 4: Annual Emissions are calculated using the following equation from Section 3.0 Harbor Craft of "USEPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories Final Report" April 2009
(Emission factor (g/kW-hr) * horsepower * hours operated * load factor*correction factor) / (1.341 hp-hr/kWh*2000 lb/ton * 453.59 g/lb)

Table B-5 Boiler Emissions

	2010 hrs	2011 hrs	2012 hrs	2013 hrs	2014 hrs	2015 hrs	2016 hrs	2017 hrs	2018 hrs
Concrete Batch Plant Auxiliary Oil-fired Boiler	0	0	1040	3120	3120	3120	2080	0	0
NOx emissions (tons)	0	0	1.54	4.62	4.62	4.62	3.08	0	0
VOC emissions (tons)	0	0	0.02	0.05	0.05	0.05	0.03	0	0

Boiler Heat Input Rating 20 MMBtu/hr (assumed)
 Typical Distillate Oil HHV 0.135 MMBtu/gallon

NOx emission factor 20 lb/1,000 gallons AP-42 Section 1.3 9/98, Table 1.3-1
 VOC emission factor 0.2 lb/1,000 gallons AP-42 Section 1.3 9/98, Table 1.3-3