
Appendix G: Air Quality Technical Report

Air Quality Technical Report

Manassas Regional Airport (HEF) Part 139 Certification and Terminal Redevelopment Environmental Assessment (EA)

PREPARED BY:



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Executive Summary

This document, referred to as the Air Quality Technical Report, describes the overall approach and methods to conducting the air emissions analysis prepared in support of the Manassas Regional Airport (HEF) Part 139 Certification and Terminal Redevelopment Environment Assessment (EA). Prepared in accordance with Federal Aviation Administration (FAA) orders for compliance with the National Environmental Policy Act (NEPA) and the Clean Air Act (CAA), the analysis includes the Affected Environment and the Environmental Consequences components of the EA. For the CAA General Conformity Rule, the aim was to demonstrate that project-related emissions conform to the applicable State Implementation Plan (SIP).

The analysis is aimed at developing and computing construction and operational emissions inventories associated with the Alternatives #1 and #2 referred to as Alternative #1 and Alternative #2 (both are described in detail in the EA). The construction-related sources analyzed are on-road motor vehicles (e.g., haul trucks, worker trips), off-road equipment (e.g., dozers, backhoes, tractors), and fugitives which result from site preparation, earth moving and asphalt paving activities. The operational-related sources include aircraft, auxiliary power units (APUs), ground support equipment (GSE), and motor vehicles.

For Alternative #1, construction emissions are expected to occur during the years 2027, 2028 and 2032 through 2034. Alternative #2 includes both construction and operational emissions to evaluate the addition of new commercial aircraft activities, with the analysis years spanning from 2026 through 2036. Notably, no construction activities are scheduled for 2031. Additionally, for Alternative #2, a five-year build-out year of 2041 is also analyzed for aircraft-related and motor vehicle operational emissions.

Other important features of the air quality analysis include the following:

- **Approach:** The overall approach follows FAA's 1050.1 *Desk Reference*, and the *Aviation Emissions and Air Quality Handbook*, Version 4.
- **Data and Models:** Aircraft-related sources included in the analysis consist of aircraft, APUs, and GSE. Emissions from these sources are assessed using the latest version of the FAA's Aviation Environmental Design Tool (AEDT) at the time of the analysis (AEDT version 3f). Emission factors for motor vehicles and construction equipment are derived from the U.S. Environmental Protection Agency (EPA) MOtor Vehicle Emissions Simulator (MOVES, Version 4). Construction equipment types and activity levels are obtained from the Airport Construction Emissions Inventory Tool (ACEIT). Fugitive emissions are based on EPA's AP-42: *Compilation of Air Emissions Factors*. In all cases, the most up-to-date model versions, at the onset of the analysis, were applied.
- **Pollutants:** The pollutants analyzed comprise the EPA criteria air pollutants: carbon monoxide (CO), particulate matter (PM_{10/2.5}), sulfur dioxide (SO₂) and ozone (O₃) precursors nitrogen oxides (NO_x) and volatile organic compounds (VOCs).
- **NEPA and CAA Compliance:** Conformance with NEPA is accomplished by disclosing in the EA the emissions associated with Alternatives #1 and #2. Because Alternatives #1 and #2 are within the City of Manassas, Virginia, which is currently designated as a "moderate" nonattainment area for the 2015 8-hour O₃ standard and a maintenance area for the 2008 8-hour O₃ standard the CAA General Conformity Rule applies. In nonattainment and maintenance areas, a proposed action's compliance with the CAA General Conformity Rule can be determined by demonstrating that project emissions are below (i.e., within) the CAA *de minimis* threshold levels for the applicable criteria air pollutants; and, therefore assumed to conform to the applicable EPA approved SIP.

- **CAA *de minimis* Threshold Levels:** Under General Conformity, the applicable *de minimis* thresholds are based on the pollutants for which the area is designated as nonattainment or maintenance. In this analysis, O₃ is the relevant pollutant, and its precursor pollutants, NO_x and VOCs, are subject to thresholds of 100 and 50 tons per year for NO_x and VOCs, respectively. These thresholds determine whether a conformity determination is required for the proposed federal action.

The main results of the analysis are summarized as follows:

- **NEPA Requirements:** Conformance with NEPA was accomplished by disclosing the potential impacts of all criteria air/precursor pollutants, associated with the construction and operational activities of Alternatives #1 and #2.
- **CAA General Conformity Requirements:** For NO_x and VOCs, total construction and operational emissions associated with the Alternatives #1 and #2 are all within the applicable CAA General Conformity Rule *de minimis* thresholds. Therefore, the project meets the rule's requirements, and no further analysis is needed.

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1. Introduction

This document, referred to as the *Air Quality Technical Report*, provides the data, and describes the overall approach and methods to conducting the air quality analysis for the Environmental Assessment (EA) of the Manassas Regional Airport (HEF) Part 139 Certification and Terminal Redevelopment. The results are intended to demonstrate compliance with the two following regulations:

- National Environmental Policy Act (NEPA) – “Federal agencies (including the FAA) shall disclose to the public...a clear and accurate description of potential environmental impacts (including Air Quality) ...that those actions and alternatives...would cause”.¹
- Federal Clean Air Act (CAA) General Conformity Rule – “No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an implementation plan”.²

In addition, this report is designed to (i) identify the pertinent regulations and guidelines for conducting the analysis, (ii) describe the sources of data, information and assumptions used for the analysis, and (iii) present the results of the air quality analysis, which will serve as the basis of the information presented in the Air Quality Sections of the EA.

2. Regulatory Setting

The overall approach for conducting the air quality analysis, presented in **Section 3**, follows Federal Aviation Administration (FAA) orders and guidelines for preparing NEPA documents, which include:

- FAA 1050.1, Desk Reference - This document provides guidelines for air quality assessments of all airport-related projects or actions evaluated under NEPA.³
- Air Quality Handbook, Aviation Emissions and Air Quality Handbook, Version 4 - This handbook is a comprehensive guide intended to assist the air quality analyst/environmental specialist in assessing air quality impacts of FAA actions at airports. It provides guidance, procedures, and methodologies for use in conducting NEPA and CAA-related assessments.⁴

In accordance with these orders and guidelines, **Section 4** of this report and the Air Quality sections of the EA present the potential air emissions associated with Alternatives #1 and #2.

2.1. Air Quality

As stated in **Section 1**, NEPA requires environmental review of federally funded projects that have the potential to affect the environment irrespective of location (i.e., nonattainment/maintenance areas). The emission inventories, which disclose project-related construction and operational emissions of criteria air/precursor pollutants precursors were prepared for the required environmental review.

In addition, the General Conformity Rule of the Federal CAA prohibits federal agencies (including the FAA) from permitting or funding projects that do not conform to an applicable SIP. The General Conformity Rule applies only to areas that are designated nonattainment or maintenance. The results of the air quality analysis

¹ U.S. EPA, 42 U.S.C 4321 et. seq. (1969) National Environmental Policy Act (NEPA).

² U.S. EPA, 40 CFR Parts 51 & 93 *Revisions to the General Conformity Regulations*, April 2010.

³ FAA. 1050.1 Desk Reference. [Online] July 7, 2025.

https://www.faa.gov/about/office_org/headquarters_offices/apl/envir_policy_guidance/policy/faq_nepa_order/desk_ref.

⁴ FAA Aviation Emissions and Air Quality Handbook, Version 4,

https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/airquality_handbook.

are used to demonstrate compliance with the SIP. If project-related emissions exceed the CAA *de minimis* thresholds, a formal Conformity Determination is required to demonstrate that the project conforms to the applicable SIP. Conversely, if project-related emissions are below *de minimis* thresholds the project is assumed to conform to the SIP.

In accordance with the CAA, the U.S. Environmental Protection Agency (EPA) sets standards and policies to achieve and maintain acceptable air quality conditions nationwide. Called the National Ambient Air Quality Standards (NAAQS), these standards apply to six air pollutants (known as “criteria air pollutants”) that represent outdoor concentrations considered safe for the human and natural environments. The criteria air pollutants are carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM_{2.5} and PM₁₀), sulfur dioxide (SO₂) and lead (Pb). Ozone is a secondary pollutant, meaning it is formed from chemical reactions in the atmosphere of other pollutants, primarily nitrogen oxides (NO_x) and volatile organic compounds (VOCs). NO_x and VOCs are referred to as O₃ precursor pollutants.

Under the CAA, areas having criteria air pollutant concentration levels that are either lower or meeting the NAAQS are designated as attainment, those that exceed the standards are designated as nonattainment. After air pollutant concentrations in a nonattainment area are reduced to levels that meet or are below the NAAQS, the EPA re-designates the area as maintenance for a period of 20 years. Furthermore, the EPA uses a classification system to indicate the severity of O₃ pollution in nonattainment areas. These classifications, in increasing order of seriousness, are marginal, moderate, serious, severe, and extreme.

Alternatives #1 and #2 are located within the City of Manassas, Virginia, which is currently designated as a “moderate” nonattainment area for the 2015 8-hour O₃ standard and a maintenance area for the 2008 8-hour O₃ standard as presented in **Table 1**.

Pollutant		Status
Carbon Monoxide (CO)		Attainment
Lead (Pb)		Attainment
Nitrogen Dioxide (NO ₂)		Attainment
Ozone (O ₃)	8-Hour (2008)	Maintenance
	8-Hour (2015)	Moderate Nonattainment
Particulate Matter (PM ₁₀)		Attainment
Particulate Matter (PM _{2.5})		Attainment
Sulfur Dioxide (SO ₂)		Attainment
Source: Nonattainment Areas for Criteria Pollutants (Green Book), EPA, 2025.		

Because Alternatives #1 and #2 are within an area designated as nonattainment for O₃, a General Conformity applicability analysis is required. An applicability analysis involves comparing project-related emissions of the pollutant for which an area is designated nonattainment and/or maintenance against the relevant *de minimis* threshold levels established under the CAA General Conformity Rule. Based on current air quality designations, O₃ is the pollutant of concern, and its precursor pollutants, NO_x and VOCs, are subject to the following *de minimis* thresholds:

- NO_x: 100 tons per year
- VOC: 50 tons per year

3. Methodology

The following sections describe the sources of data, information, assumptions, and methodology used to estimate the emissions associated with the construction and operation of the two Build Alternatives. As previously noted, construction emissions are assessed for both Alternatives #1 and #2, while operational emissions are evaluated only for Alternative #2.

3.1. Construction Emissions Inventory

Construction Projects and Schedule

Construction-related emissions are based on the types of projects and associated activities, counts and types of equipment/vehicles used, activity levels, and the construction schedule. Construction of Alternatives #1 and #2 consists of multiple subcomponents occurring from 2026 through 2036, with no construction occurring in year 2031. Notably, projects are separated by Tiers, where Tier 1 projects occur from 2026 to 2030, and Tier 2 projects occur from 2032 to 2036.

Table 2 presents the full construction projects list, associated project components, footprints, and approximate schedules for both Alternatives #1 and #2.

Table 2. Construction Projects, Footprint, and Schedule

ID	Construction Project	Sub-Component (if applicable)	Tier	Alt. 1	Alt. 2	Footprint (Sq. Ft)	Start Year	End Year
1	Terminal Building Expansion (north, south, and west)	Demolition of Building 13	1	No	Yes	13,000	2026	2026
		Terminal Building Expansion				75,099		
2	West Ramp General Aviation Tie-Down Relocation			^a				
3	East Ramp Strengthening, Reconfiguration, and Rehabilitation	Removal of existing asphalt and concrete		No	Yes	840,000	2026	2028
		Strengthening, Reconfiguration, and Rehabilitation						
4	Terminal Parking Lot Rehabilitation and Expansion			No	Yes	82,500	2026	2026
5	Economy Parking Lot Construction			No	Yes	590,000	2026	2026
6	Bridge Rehabilitation - Runway 16L/34R and Taxiway Bravo	Bridge Strengthening		No	Yes	420,000	2026	2027
		Bypass Channel				660,000		
7	Construction of a new Snow Removal Equipment (SRE) Building			Yes	Yes	12,000	2027	2028
8	Taxiway Bravo Widening			Yes	Yes	180,000	2027	2028
9	Runway 16L/34R Reconstruction and Strengthening	Reconstruction and Strengthening		No	Yes	952,000	2027	2029
		Floodplain Offset System		No	Yes	168,500	2028	2028
10	Taxiway Echo Fillet Widening			No	Yes	2,400	2027	2029
11	Taxiway B Reconstruction and Strengthening			No	Yes	965,000	2029	2030
12	Construction of a new East Ramp Taxiway			Yes	Yes	29,906	2032	2034
13	Runway 16L/34R Widening		No	Yes	325,000	2033	2033	
14	Construction of an Aircraft Deicing Pad and Apron Expansion between Taxiways Delta and Echo	Deicing Pad	No	Yes	141,900	2033	2034	
		Apron Expansion			21,100			
15	Construction of New Expanded East Ramp and Taxilane between Taxiways Delta and Echo		No	Yes	110,000	2033	2036	
16	Construction of new Aircraft Rescue and Fire Fighting (ARFF) Facility		No	Yes	6,000	2035	2036	

Notes: ^a No construction is required for this project. For additional information see Chapter 1 of the EA, *Introduction and Program Description*.
Source: HEF, 2025.

Modeling Approach

Construction emissions were developed using equipment and vehicle activity data from the Airport Construction Emissions Inventory Tool (ACEIT)⁵ and emission factors from the EPA's MOTO Vehicle Emission Simulator (i.e., MOVES, Version 4)⁶.

ACEIT is a tool developed by the Transportation Research Board (TRB), under the Airport Cooperative Research Program (ACRP). ACEIT provides data for the number and types of construction equipment, the horsepower of the equipment, and the operating hours, as well as the vehicle-miles travelled (VMT) of worker and haul trips based on the type and size of construction project(s). The tool provides default values for these inputs so that emissions can be estimated for projects that lack project-specific data due to the construction project being in the early stages of design.

MOVES is an emission modeling system that estimates emissions for mobile sources at the national, county, and project level for air pollutants. Emissions factors for both on-road vehicles (e.g., haul trucks, worker trips), and off-road construction equipment (e.g., dozers, backhoes, tractors), were developed using MOVES as those currently applied by ACEIT are outdated.

Fugitive dust emissions (PM₁₀/PM_{2.5}) were calculated using emission factors within EPA's Compilation of Air Pollutant Emission Factors (AP-42)⁷ and fugitive evaporative emissions (VOCs) were developed using EPA guidance on asphalt paving.⁸

Construction Vehicles/Equipment Types and Activity Levels

The construction phases for Alternatives #1 and #2 involved a variety of air emissions sources including on-road construction vehicles and off-road construction equipment. The activity levels for on-road construction vehicles and off-road construction equipment are represented in the analysis by VMTs and hours of operation, respectively.

Table 3 presents the activity levels of on-road construction vehicles, expressed in VMT, categorized by construction project and year. For the purpose of this analysis, passenger cars were assumed to be fueled by gasoline, while all other on-road vehicles were assumed to operate on diesel fuel.

Table 4 lists the off-road construction equipment developed for each construction project, including associated horsepower ratings, load factors, and hours of operation for the construction period. For this analysis, it was assumed that off-road construction equipment is fueled by diesel.

⁵ ACEIT is the companion tool to the Airport Cooperative Research Program Report 102 - Guidance for Estimating Airport Construction Emissions, <https://www.trb.org/Publications/Blurbs/170234.aspx>.

⁶ U.S. EPA's MOVES4 is the latest version of MOVES. Additional information on MOVES4, <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>.

⁷ U.S. EPA, AP-42: Compilation of Air Emissions Factors, <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors>.

⁸ U.S. EPA, Emission Inventory Improvement Program, Asphalt Paving, Chapter 17, Volume III, April 2001.

Table 3. On-Road Construction Vehicle Activity Levels (VMT)

On-Road Vehicle Type	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Project #1. Terminal Building Expansion (north, south, and west)										
Dump Truck	58,732	--	--	--	--	--	--	--	--	--
Cement Mixer	17,368	--	--	--	--	--	--	--	--	--
Dump Truck Subbase Material	9,262	--	--	--	--	--	--	--	--	--
Passenger Car	250,447	--	--	--	--	--	--	--	--	--
Material Deliveries	2,253	--	--	--	--	--	--	--	--	--
Pickup Truck	182	--	--	--	--	--	--	--	--	--
Survey Crew Trucks	372	--	--	--	--	--	--	--	--	--
Tool Truck	27,869	--	--	--	--	--	--	--	--	--
Tractor Trailer	33,055	--	--	--	--	--	--	--	--	--
Project #3. East Ramp Strengthening, Reconfiguration, and Rehabilitation										
Asphalt 18 Wheeler	4,063	4,063	4,063	--	--	--	--	--	--	--
Cement Mixer	64,750	64,750	64,750	--	--	--	--	--	--	--
Dump Truck - Asphalt	5,757	5,757	5,757	--	--	--	--	--	--	--
Dump Truck Subbase Material	34,532	34,532	34,532	--	--	--	--	--	--	--
Passenger Car	536,963	493,425	493,425	--	--	--	--	--	--	--
Dump Truck	176,312	57,053	57,053	--	--	--	--	--	--	--
Distributing Tanker	1,243	1,243	1,243	--	--	--	--	--	--	--
Flatbed Truck	9,600	9,600	9,600	--	--	--	--	--	--	--
Pickup Truck	54,317	24,917	24,917	--	--	--	--	--	--	--
Project #4. Terminal Parking Lot Rehabilitation and Expansion										
Cement Mixer	19,082	--	--	--	--	--	--	--	--	--
Dump Truck - Asphalt	1,700	--	--	--	--	--	--	--	--	--
Dump Truck Subbase Material	10,172	--	--	--	--	--	--	--	--	--
Passenger Car	253,969	--	--	--	--	--	--	--	--	--
Flat Bed or Dump Trucks	4,950	--	--	--	--	--	--	--	--	--
Line Painting Truck and Sprayer	990	--	--	--	--	--	--	--	--	--
Material Deliveries	2,970	--	--	--	--	--	--	--	--	--
Survey Crew Trucks	495	--	--	--	--	--	--	--	--	--
Ten Wheelers	5,940	--	--	--	--	--	--	--	--	--
Tractor Trailer	11,385	--	--	--	--	--	--	--	--	--
Project #5. Economy Parking Lot Construction										
Cement Mixer	136,467	--	--	--	--	--	--	--	--	--
Dump Truck - Asphalt	12,154	--	--	--	--	--	--	--	--	--

Table 3. On-Road Construction Vehicle Activity Levels (VMT)

On-Road Vehicle Type	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Dump Truck Subbase Material	72,747	--	--	--	--	--	--	--	--	--
Passenger Car	253,969	--	--	--	--	--	--	--	--	--
Flat Bed or Dump Trucks	35,400	--	--	--	--	--	--	--	--	--
Line Painting Truck and Sprayer	7,080	--	--	--	--	--	--	--	--	--
Material Deliveries	21,240	--	--	--	--	--	--	--	--	--
Survey Crew Trucks	3,540	--	--	--	--	--	--	--	--	--
Ten Wheelers	42,480	--	--	--	--	--	--	--	--	--
Tractor Trailer	81,420	--	--	--	--	--	--	--	--	--
Project #6. Bridge Rehabilitation - Runway 16L/34R and Taxiway Bravo										
Asphalt 18 Wheeler	3,047	3,047	--	--	--	--	--	--	--	--
Cement Mixer	48,563	48,563	--	--	--	--	--	--	--	--
Dump Truck - Asphalt	4,317	4,317	--	--	--	--	--	--	--	--
Dump Truck Subbase Material	25,900	25,900	--	--	--	--	--	--	--	--
Passenger Car	696,600	696,600	--	--	--	--	--	--	--	--
Cement Truck for Fencing	76,313	76,313	--	--	--	--	--	--	--	--
Dump Truck	18,696	18,696	--	--	--	--	--	--	--	--
Flatbed Truck	7,290	7,290	--	--	--	--	--	--	--	--
Pickup Truck	23,537	23,537	--	--	--	--	--	--	--	--
Water Truck	2,139	2,139	--	--	--	--	--	--	--	--
Project #7. Construction of a New Snow Removal Equipment (SRE) Building										
Cement Mixer	--	1,388	1,388	--	--	--	--	--	--	--
Dump Truck Subbase Material	--	740	740	--	--	--	--	--	--	--
Passenger Car	--	181,406	181,406	--	--	--	--	--	--	--
Material Deliveries	--	72	72	--	--	--	--	--	--	--
Survey Crew Trucks	--	90	90	--	--	--	--	--	--	--
Tool Truck	--	3,600	3,600	--	--	--	--	--	--	--
Tractor Trailer	--	1,824	1,824	--	--	--	--	--	--	--
Project #8. Taxiway Bravo Widening										
Asphalt 18 Wheeler	--	1,306	1,306	--	--	--	--	--	--	--
Cement Mixer	--	20,813	20,813	--	--	--	--	--	--	--
Dump Truck - Asphalt	--	1,850	1,850	--	--	--	--	--	--	--
Dump Truck Subbase Material	--	11,100	11,100	--	--	--	--	--	--	--
Passenger Car	--	529,706	529,706	--	--	--	--	--	--	--
Dump Truck	--	7,220	7,220	--	--	--	--	--	--	--

Table 3. On-Road Construction Vehicle Activity Levels (VMT)

On-Road Vehicle Type	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Flatbed Truck	--	3,086	3,086	--	--	--	--	--	--	--
Pickup Truck	--	9,068	9,036	--	--	--	--	--	--	--
Project #9. Runway 16L/34R Reconstruction and Strengthening										
Asphalt 18 Wheeler	--	4,605	4,605	4,605	--	--	--	--	--	--
Cement Mixer	--	73,383	73,383	73,383	--	--	--	--	--	--
Dump Truck - Asphalt	--	6,523	6,523	6,523	--	--	--	--	--	--
Dump Truck Subbase Material	--	39,138	39,138	39,138	--	--	--	--	--	--
Passenger Car	--	457,144	457,144	457,144	--	--	--	--	--	--
Dump Truck	--	22,872	22,998	22,872	--	--	--	--	--	--
Flatbed Truck	--	11,016	11,016	11,016	--	--	--	--	--	--
Pickup Truck	--	30,107	30,272	30,107	--	--	--	--	--	--
Water Truck	--	1,057	1,057	1,057	--	--	--	--	--	--
Project #10. Taxiway Echo Fillet Widening										
Asphalt 18 Wheeler	--	12	12	12	--	--	--	--	--	--
Cement Mixer	--	185	185	185	--	--	--	--	--	--
Dump Truck - Asphalt	--	16	16	16	--	--	--	--	--	--
Dump Truck Subbase Material	--	99	99	99	--	--	--	--	--	--
Passenger Car	--	529,706	529,706	529,706	--	--	--	--	--	--
Dump Truck	--	105	105	105	--	--	--	--	--	--
Flatbed Truck	--	27	27	27	--	--	--	--	--	--
Pickup Truck	--	123	123	123	--	--	--	--	--	--
Project #11. Taxiway B Reconstruction and Strengthening (south of the bridge)										
Asphalt 18 Wheeler	--	--	--	7,001	7,001	--	--	--	--	--
Cement Mixer	--	--	--	111,578	111,578	--	--	--	--	--
Dump Truck - Asphalt	--	--	--	9,919	9,919	--	--	--	--	--
Dump Truck Subbase Material	--	--	--	59,508	59,508	--	--	--	--	--
Passenger Car	--	--	--	529,706	529,706	--	--	--	--	--
Dump Truck	--	--	--	38,707	38,707	--	--	--	--	--
Flatbed Truck	--	--	--	16,543	16,543	--	--	--	--	--
Pickup Truck	--	--	--	48,612	48,612	--	--	--	--	--
Project #12. Construction of a New East Ramp Taxiway										
Asphalt 18 Wheeler	--	--	--	--	--	202	202	202	--	--
Cement Mixer	--	--	--	--	--	3,217	3,217	3,217	--	--
Dump Truck - Asphalt	--	--	--	--	--	287	287	287	--	--

Table 3. On-Road Construction Vehicle Activity Levels (VMT)

On-Road Vehicle Type	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Dump Truck Subbase Material	--	--	--	--	--	1,715	1,715	1,715	--	--
Passenger Car	--	--	--	--	--	529,706	529,706	529,706	--	--
Dump Truck	--	--	--	--	--	1,215	1,215	1,215	--	--
Flatbed Truck	--	--	--	--	--	318	318	318	--	--
Pickup Truck	--	--	--	--	--	1,421	1,421	1,421	--	--
Project #13. Runway 16L/34R Widening										
Asphalt 18 Wheeler	--	--	--	--	--	--	4,716	--	--	--
Cement Mixer	--	--	--	--	--	--	75,156	--	--	--
Dump Truck - Asphalt	--	--	--	--	--	--	6,681	--	--	--
Dump Truck Subbase Material	--	--	--	--	--	--	40,083	--	--	--
Passenger Car	--	--	--	--	--	--	457,144	--	--	--
Dump Truck	--	--	--	--	--	--	23,425	--	--	--
Flatbed Truck	--	--	--	--	--	--	11,282	--	--	--
Pickup Truck	--	--	--	--	--	--	30,834	--	--	--
Water Truck	--	--	--	--	--	--	1,082	--	--	--
Project #14. Construction of an Aircraft Deicing Pad and Apron Expansion between Taxiways Delta and Echo										
Asphalt 18 Wheeler	--	--	--	--	--	--	1,183	1,183	--	--
Cement Mixer	--	--	--	--	--	--	18,847	18,847	--	--
Dump Truck - Asphalt	--	--	--	--	--	--	1,676	1,676	--	--
Dump Truck Subbase Material	--	--	--	--	--	--	10,051	10,051	--	--
Passenger Car	--	--	--	--	--	--	986,850	986,850	--	--
Distributing Tanker	--	--	--	--	--	--	362	362	--	--
Dump Truck	--	--	--	--	--	--	6,555	6,555	--	--
Flatbed Truck	--	--	--	--	--	--	2,794	2,794	--	--
Pickup Truck	--	--	--	--	--	--	7,253	7,253	--	--
Project #15. Construction of New Expanded East Ramp and Taxilane between Taxiways Delta and Echo										
Asphalt 18 Wheeler	--	--	--	--	--	--	532	532	532	532
Cement Mixer	--	--	--	--	--	--	8,479	8,479	8,479	8,479
Dump Truck - Asphalt	--	--	--	--	--	--	754	754	754	754
Dump Truck Subbase Material	--	--	--	--	--	--	4,522	4,522	4,522	4,522
Passenger Car	--	--	--	--	--	--	493,425	493,425	493,425	493,425
Distributing Tanker	--	--	--	--	--	--	163	163	163	163
Dump Truck	--	--	--	--	--	--	2,949	2,949	2,949	2,949
Flatbed Truck	--	--	--	--	--	--	1,257	1,257	1,257	1,257

Table 3. On-Road Construction Vehicle Activity Levels (VMT)										
On-Road Vehicle Type	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Pickup Truck	--	--	--	--	--	--	3,263	3,263	3,263	3,263
Project #16. Construction of new Aircraft Rescue and Fire Fighting (ARFF) Facility										
Cement Mixer	--	--	--	--	--	--	--	--	3,701	3,701
Dump Truck Subbase Material	--	--	--	--	--	--	--	--	1,973	1,973
Passenger Car	--	--	--	--	--	--	--	--	181,406	181,406
Material Deliveries	--	--	--	--	--	--	--	--	192	192
Survey Crew Trucks	--	--	--	--	--	--	--	--	240	240
Tool Truck	--	--	--	--	--	--	--	--	9,600	9,600
Tractor Trailer	--	--	--	--	--	--	--	--	4,864	4,864
Notes: VMT = vehicle-mile-traveled. No construction anticipated in 2031 (see Table 2 - Construction Projects, Footprint, and Schedule), therefore no activity levels presented in table for this year. Sources: ACRP Report 102 – Guidance for Estimating Airport Construction Emissions, CMT and HEF, 2025.										

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Project #1. Terminal Building Expansion (north, south, and west)												
Backhoe	100	0.21	801	--	--	--	--	--	--	--	--	--
Concrete Ready Mix Trucks	600	0.59	150	--	--	--	--	--	--	--	--	--
Fork Truck	100	0.59	8,512	--	--	--	--	--	--	--	--	--
Generator	40	0.43	751	--	--	--	--	--	--	--	--	--
Man Lift	75	0.21	7,510	--	--	--	--	--	--	--	--	--
High Lift	100	0.59	2,303	--	--	--	--	--	--	--	--	--
Man Lift (Fascia Const.)	75	0.21	60	--	--	--	--	--	--	--	--	--
90 Ton Crane	300	0.43	801	--	--	--	--	--	--	--	--	--
Concrete Pump	11	0.43	30	--	--	--	--	--	--	--	--	--
Concrete Truck	600	0.59	60	--	--	--	--	--	--	--	--	--
Trowel Machine	600	0.59	30	--	--	--	--	--	--	--	--	--
Bob Cat	75	0.21	312	--	--	--	--	--	--	--	--	--
Excavator with Bucket	175	0.59	156	--	--	--	--	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Generator Sets	40	0.43	156	--	--	--	--	--	--	--	--	--
Project #3. East Ramp Strengthening, Reconfiguration, and Rehabilitation												
Asphalt Paver	175	0.59	39	39	39	--	--	--	--	--	--	--
Other General Equipment	175	0.43	1,136	1,136	1,136	--	--	--	--	--	--	--
Roller	100	0.59	411	411	411	--	--	--	--	--	--	--
Skid Steer Loader	75	0.21	204	204	204	--	--	--	--	--	--	--
Surfacing Equip. (Grooving)	25	0.59	50	50	50	--	--	--	--	--	--	--
Chain Saw	11	0.7	87	87	87	--	--	--	--	--	--	--
Chipper/Stump Grinder	100	0.43	87	87	87	--	--	--	--	--	--	--
Dozer	175	0.59	618	618	618	--	--	--	--	--	--	--
Excavator	175	0.59	194	194	194	--	--	--	--	--	--	--
Loader	175	0.59	182	182	182	--	--	--	--	--	--	--
Tractors/Loader/Backhoe	100	0.21	245	245	245	--	--	--	--	--	--	--
Scraper	600	0.59	130	130	130	--	--	--	--	--	--	--
Concrete Truck	600	0.59	31	31	31	--	--	--	--	--	--	--
Grader	300	0.59	35	35	35	--	--	--	--	--	--	--
Hydroseeder	600	0.59	31	31	31	--	--	--	--	--	--	--
Off-Road Truck	600	0.59	31	31	31	--	--	--	--	--	--	--
Pumps	11	0.43	29	29	29	--	--	--	--	--	--	--
Dozer	175	0.59	420	--	--	--	--	--	--	--	--	--
Excavator	175	0.59	420	--	--	--	--	--	--	--	--	--
Excavator with Bucket	175	0.59	560	--	--	--	--	--	--	--	--	--
Excavator with Hoe Ram	175	0.59	560	--	--	--	--	--	--	--	--	--
Project #4. Terminal Parking Lot Rehabilitation and Expansion												
Paving Machine	175	0.59	264	--	--	--	--	--	--	--	--	--
Bob Cat	75	0.21	198	--	--	--	--	--	--	--	--	--
Concrete Ready Mix Trucks	600	0.59	198	--	--	--	--	--	--	--	--	--
Bulldozer	175	0.59	462	--	--	--	--	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Front Loader	100	0.21	330	--	--	--	--	--	--	--	--	--
Auger Drill	175	0.43	198	--	--	--	--	--	--	--	--	--
Fork Truck	100	0.59	396	--	--	--	--	--	--	--	--	--
Chain Saws	11	0.7	198	--	--	--	--	--	--	--	--	--
Log Chipper	100	0.43	198	--	--	--	--	--	--	--	--	--
Mulcher	100	0.43	198	--	--	--	--	--	--	--	--	--
Tractor	100	0.21	330	--	--	--	--	--	--	--	--	--
Compacting Equipment	6	0.43	132	--	--	--	--	--	--	--	--	--
Small Dozer	175	0.59	132	--	--	--	--	--	--	--	--	--
40 Ton Rough Terrain Crane	300	0.43	132	--	--	--	--	--	--	--	--	--
High Lift	100	0.59	132	--	--	--	--	--	--	--	--	--
Backhoe	100	0.21	330	--	--	--	--	--	--	--	--	--
Roller	100	0.59	132	--	--	--	--	--	--	--	--	--
Project #5. Economy Parking Lot Construction												
Paving Machine	175	0.59	1,888	--	--	--	--	--	--	--	--	--
Bob Cat	75	0.21	1,416	--	--	--	--	--	--	--	--	--
Concrete Ready Mix Trucks	600	0.59	1,416	--	--	--	--	--	--	--	--	--
Bulldozer	175	0.59	3,304	--	--	--	--	--	--	--	--	--
Front Loader	100	0.21	2,360	--	--	--	--	--	--	--	--	--
Auger Drill	175	0.43	1,416	--	--	--	--	--	--	--	--	--
Fork Truck	100	0.59	2,832	--	--	--	--	--	--	--	--	--
Chain Saws	11	0.7	1,416	--	--	--	--	--	--	--	--	--
Log Chipper	100	0.43	1,416	--	--	--	--	--	--	--	--	--
Mulcher	100	0.43	1,416	--	--	--	--	--	--	--	--	--
Tractor	100	0.21	2,360	--	--	--	--	--	--	--	--	--
Compacting Equipment	6	0.43	944	--	--	--	--	--	--	--	--	--
Small Dozer	175	0.59	944	--	--	--	--	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
40 Ton Rough Terrain Crane	300	0.43	944	--	--	--	--	--	--	--	--	--
High Lift	100	0.59	944	--	--	--	--	--	--	--	--	--
Backhoe	100	0.21	2,360	--	--	--	--	--	--	--	--	--
Roller	100	0.59	944	--	--	--	--	--	--	--	--	--
Project #6. Bridge Rehabilitation - Runway 16L/34R and Taxiway Bravo												
Asphalt Paver	175	0.59	29	29	--	--	--	--	--	--	--	--
Other General Equipment	175	0.43	1,153	1,153	--	--	--	--	--	--	--	--
Roller	100	0.59	98	98	--	--	--	--	--	--	--	--
Skid Steer Loader	75	0.21	58	58	--	--	--	--	--	--	--	--
Surfacing Equipment	25	0.59	115	115	--	--	--	--	--	--	--	--
Cold Planer	175	0.59	47	47	--	--	--	--	--	--	--	--
Sweepers	175	0.43	47	47	--	--	--	--	--	--	--	--
Concrete Saws	40	0.59	498	498	--	--	--	--	--	--	--	--
Excavator	175	0.59	436	436	--	--	--	--	--	--	--	--
Hydraulic Hammer	175	0.59	420	420	--	--	--	--	--	--	--	--
Air Compressor	100	0.43	78	78	--	--	--	--	--	--	--	--
Concrete Truck	600	0.59	324	324	--	--	--	--	--	--	--	--
Rubber Tired Loader	175	0.59	78	78	--	--	--	--	--	--	--	--
Slip Form Paver	175	0.59	78	78	--	--	--	--	--	--	--	--
Dozer	175	0.59	89	89	--	--	--	--	--	--	--	--
Grader	300	0.59	5	5	--	--	--	--	--	--	--	--
Hydroseeder	600	0.59	1	1	--	--	--	--	--	--	--	--
Off-Road Truck	600	0.59	1	1	--	--	--	--	--	--	--	--
Loader	175	0.59	29	29	--	--	--	--	--	--	--	--
Tractors/Loader/Backhoe	100	0.21	33	33	--	--	--	--	--	--	--	--
Crack Cleaner	40	0.59	6	6	--	--	--	--	--	--	--	--
Crack Filler	100	0.43	6	6	--	--	--	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Pumps	11	0.43	4	4	--	--	--	--	--	--	--	--
Grader	300	0.59	5	5	--	--	--	--	--	--	--	--
Chain Saw	11	0.7	97	97	--	--	--	--	--	--	--	--
Chipper/Stump Grinder	100	0.43	97	97	--	--	--	--	--	--	--	--
Excavator	175	0.59	1,105	1,105	--	--	--	--	--	--	--	--
Dozer	175	0.59	1,493	1,493	--	--	--	--	--	--	--	--
Loader	175	0.59	128	128	--	--	--	--	--	--	--	--
Other General Equipment	175	0.43	249	249	--	--	--	--	--	--	--	--
Roller	100	0.59	1,105	1,105	--	--	--	--	--	--	--	--
Scraper	600	0.59	1,221	1,221	--	--	--	--	--	--	--	--
Concrete Truck	600	0.59	22	22	--	--	--	--	--	--	--	--
Skid Steer Loader	75	0.21	89	89	--	--	--	--	--	--	--	--
Tractors/Loader/Backhoe	100	0.21	121	121	--	--	--	--	--	--	--	--
Hydroseeder	600	0.59	35	35	--	--	--	--	--	--	--	--
Off-Road Truck	600	0.59	35	35	--	--	--	--	--	--	--	--
Pumps	11	0.43	32	32	--	--	--	--	--	--	--	--
Project #7. Construction of a new Snow Removal Equipment (SRE) Building												
Backhoe	100	0.21	--	192	192	--	--	--	--	--	--	--
Concrete Ready Mix Trucks	600	0.59	--	36	36	--	--	--	--	--	--	--
Fork Truck	100	0.59	--	984	984	--	--	--	--	--	--	--
Man Lift	75	0.21	--	720	720	--	--	--	--	--	--	--
High Lift	100	0.59	--	264	264	--	--	--	--	--	--	--
Man Lift (Fascia Constr.)	75	0.21	--	72	72	--	--	--	--	--	--	--
40 Ton Crane	300	0.43	--	144	144	--	--	--	--	--	--	--
Project 8. Taxiway Bravo Widening												
Asphalt Paver	175	0.59	--	12	12	--	--	--	--	--	--	--
Other General Equipment	175	0.43	--	404	404	--	--	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Roller	100	0.59	--	132	132	--	--	--	--	--	--	--
Skid Steer Loader	75	0.21	--	65	65	--	--	--	--	--	--	--
Surfacing Equip. (Grooving)	25	0.59	--	49	49	--	--	--	--	--	--	--
Chain Saw	11	0.7	--	27	27	--	--	--	--	--	--	--
Chipper/Stump Grinder	100	0.43	--	27	27	--	--	--	--	--	--	--
Air Compressor	100	0.43	--	33	33	--	--	--	--	--	--	--
Concrete Saws	40	0.59	--	33	33	--	--	--	--	--	--	--
Concrete Truck	600	0.59	--	149	149	--	--	--	--	--	--	--
Rubber Tired Loader	175	0.59	--	33	33	--	--	--	--	--	--	--
Slip Form Paver	175	0.59	--	33	33	--	--	--	--	--	--	--
Dozer	175	0.59	--	198	198	--	--	--	--	--	--	--
Excavator	175	0.59	--	62	62	--	--	--	--	--	--	--
Loader	175	0.59	--	57	57	--	--	--	--	--	--	--
Tractors/Loader/Backhoe	100	0.21	--	78	78	--	--	--	--	--	--	--
Scraper	600	0.59	--	42	42	--	--	--	--	--	--	--
Grader	300	0.59	--	11	11	--	--	--	--	--	--	--
Hydroseeder	600	0.59	--	10	10	--	--	--	--	--	--	--
Off-Road Truck	600	0.59	--	10	10	--	--	--	--	--	--	--
Pumps	11	0.43	--	9	9	--	--	--	--	--	--	--
Project #9. Runway 16L/34R Reconstruction and Strengthening												
Asphalt Paver	175	0.59	--	44	44	44	--	--	--	--	--	--
Other General Equipment	175	0.43	--	1,742	1,849	1,742	--	--	--	--	--	--
Roller	100	0.59	--	148	225	148	--	--	--	--	--	--
Skid Steer Loader	75	0.21	--	88	88	88	--	--	--	--	--	--
Surfacing Equip. (Grooving)	25	0.59	--	174	174	174	--	--	--	--	--	--
Cold Planer	175	0.59	--	70	70	70	--	--	--	--	--	--
Sweepers	175	0.43	--	70	70	70	--	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)

Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Concrete Saws	40	0.59	--	752	752	752	--	--	--	--	--	--
Excavator	175	0.59	--	658	742	658	--	--	--	--	--	--
Hydraulic Hammer	175	0.59	--	635	635	635	--	--	--	--	--	--
Air Compressor	100	0.43	--	117	117	117	--	--	--	--	--	--
Concrete Truck	600	0.59	--	489	489	489	--	--	--	--	--	--
Rubber Tired Loader	175	0.59	--	117	117	117	--	--	--	--	--	--
Slip Form Paver	175	0.59	--	117	117	117	--	--	--	--	--	--
Dozer	175	0.59	--	134	253	134	--	--	--	--	--	--
Grader	300	0.59	--	8	8	8	--	--	--	--	--	--
Hydroseeder	600	0.59	--	1	18	1	--	--	--	--	--	--
Off-Road Truck	600	0.59	--	1	18	1	--	--	--	--	--	--
Loader	175	0.59	--	44	121	44	--	--	--	--	--	--
Tractors/Loader/Backhoe	100	0.21	--	50	66	50	--	--	--	--	--	--
Crack Cleaner	40	0.59	--	9	9	9	--	--	--	--	--	--
Crack Filler	100	0.43	--	9	9	9	--	--	--	--	--	--
Pumps	11	0.43	--	6	22	6	--	--	--	--	--	--
Project #10. Taxiway Echo Fillet Widening												
Asphalt Paver	175	0.59	--	<1	<1	<1	--	--	--	--	--	--
Other General Equipment	175	0.43	--	6	6	6	--	--	--	--	--	--
Roller	100	0.59	--	2	2	2	--	--	--	--	--	--
Skid Steer Loader	75	0.21	--	2	2	2	--	--	--	--	--	--
Surfacing Equip. (Grooving)	25	0.59	--	1	1	1	--	--	--	--	--	--
Chain Saw	11	0.7	--	1	1	1	--	--	--	--	--	--
Chipper/Stump Grinder	100	0.43	--	1	1	1	--	--	--	--	--	--
Air Compressor	100	0.43	--	1	1	1	--	--	--	--	--	--
Concrete Saws	40	0.59	--	1	1	1	--	--	--	--	--	--
Concrete Truck	600	0.59	--	2	2	2	--	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Rubber Tired Loader	175	0.59	--	1	1	1	--	--	--	--	--	--
Slip Form Paver	175	0.59	--	1	1	1	--	--	--	--	--	--
Dozer	175	0.59	--	3	3	3	--	--	--	--	--	--
Excavator	175	0.59	--	1	1	1	--	--	--	--	--	--
Loader	175	0.59	--	2	2	2	--	--	--	--	--	--
Tractors/Loader/Backhoe	100	0.21	--	3	3	3	--	--	--	--	--	--
Scraper	600	0.59	--	1	1	1	--	--	--	--	--	--
Grader	300	0.59	--	1	1	1	--	--	--	--	--	--
Hydroseeder	600	0.59	--	1	1	1	--	--	--	--	--	--
Off-Road Truck	600	0.59	--	1	1	1	--	--	--	--	--	--
Pumps	11	0.43	--	1	1	1	--	--	--	--	--	--
Project #11. Taxiway B Reconstruction and Strengthening (south of the bridge)												
Asphalt Paver	175	0.59	--	--	--	67	67	--	--	--	--	--
Other General Equipment	175	0.43	--	--	--	2,165	2,165	--	--	--	--	--
Roller	100	0.59	--	--	--	707	707	--	--	--	--	--
Skid Steer Loader	75	0.21	--	--	--	348	348	--	--	--	--	--
Surfacing Equip. (Grooving)	25	0.59	--	--	--	264	264	--	--	--	--	--
Chain Saw	11	0.7	--	--	--	147	147	--	--	--	--	--
Chipper/Stump Grinder	100	0.43	--	--	--	147	147	--	--	--	--	--
Air Compressor	100	0.43	--	--	--	179	179	--	--	--	--	--
Concrete Saws	40	0.59	--	--	--	179	179	--	--	--	--	--
Concrete Truck	600	0.59	--	--	--	797	797	--	--	--	--	--
Rubber Tired Loader	175	0.59	--	--	--	179	179	--	--	--	--	--
Slip Form Paver	175	0.59	--	--	--	179	179	--	--	--	--	--
Dozer	175	0.59	--	--	--	1,063	1,063	--	--	--	--	--
Excavator	175	0.59	--	--	--	333	333	--	--	--	--	--
Loader	175	0.59	--	--	--	307	307	--	--	--	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Tractors/Loader/Backhoe	100	0.21	--	--	--	416	416	--	--	--	--	--
Scraper	600	0.59	--	--	--	223	223	--	--	--	--	--
Grader	300	0.59	--	--	--	59	59	--	--	--	--	--
Hydroseeder	600	0.59	--	--	--	53	53	--	--	--	--	--
Off-Road Truck	600	0.59	--	--	--	53	53	--	--	--	--	--
Pumps	11	0.43	--	--	--	49	49	--	--	--	--	--
Project #12. Construction of a New East Ramp Taxiway												
Asphalt Paver	175	0.59	--	--	--	--	--	1	1	1	--	--
Other General Equipment	175	0.43	--	--	--	--	--	72	72	72	--	--
Roller	100	0.59	--	--	--	--	--	23	23	23	--	--
Skid Steer Loader	75	0.21	--	--	--	--	--	23	23	23	--	--
Surfacing Equipment (Grooving)	25	0.59	--	--	--	--	--	5	5	5	--	--
Chain Saw	11	0.7	--	--	--	--	--	3	3	3	--	--
Chipper/Stump Grinder	100	0.43	--	--	--	--	--	3	3	3	--	--
Air Compressor	100	0.43	--	--	--	--	--	3	3	3	--	--
Concrete Saws	40	0.59	--	--	--	--	--	3	3	3	--	--
Concrete Truck	600	0.59	--	--	--	--	--	18	18	18	--	--
Rubber Tired Loader	175	0.59	--	--	--	--	--	3	3	3	--	--
Slip Form Paver	175	0.59	--	--	--	--	--	3	3	3	--	--
Dozer	175	0.59	--	--	--	--	--	31	31	31	--	--
Excavator	175	0.59	--	--	--	--	--	16	16	16	--	--
Loader	175	0.59	--	--	--	--	--	24	24	24	--	--
Tractors/Loader/Backhoe	100	0.21	--	--	--	--	--	30	30	30	--	--
Scraper	600	0.59	--	--	--	--	--	4	4	4	--	--
Grader	300	0.59	--	--	--	--	--	1	1	1	--	--
Hydroseeder	600	0.59	--	--	--	--	--	1	1	1	--	--
Off-Road Truck	600	0.59	--	--	--	--	--	1	1	1	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)												
Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Pumps	11	0.43	--	--	--	--	--	1	1	1	--	--
Project #13. Runway 16L/34R Widening												
Asphalt Paver	175	0.59	--	--	--	--	--	--	45	--	--	--
Other General Equipment	175	0.43	--	--	--	--	--	--	1,784	--	--	--
Roller	100	0.59	--	--	--	--	--	--	151	--	--	--
Skid Steer Loader	75	0.21	--	--	--	--	--	--	90	--	--	--
Surfacing Equip. (Grooving)	25	0.59	--	--	--	--	--	--	178	--	--	--
Cold Planer	175	0.59	--	--	--	--	--	--	72	--	--	--
Sweepers	175	0.43	--	--	--	--	--	--	72	--	--	--
Concrete Saws	40	0.59	--	--	--	--	--	--	770	--	--	--
Excavator	175	0.59	--	--	--	--	--	--	674	--	--	--
Hydraulic Hammer	175	0.59	--	--	--	--	--	--	650	--	--	--
Air Compressor	100	0.43	--	--	--	--	--	--	120	--	--	--
Concrete Truck	600	0.59	--	--	--	--	--	--	501	--	--	--
Rubber Tired Loader	175	0.59	--	--	--	--	--	--	120	--	--	--
Slip Form Paver	175	0.59	--	--	--	--	--	--	120	--	--	--
Dozer	175	0.59	--	--	--	--	--	--	137	--	--	--
Grader	300	0.59	--	--	--	--	--	--	8	--	--	--
Hydroseeder	600	0.59	--	--	--	--	--	--	1	--	--	--
Off-Road Truck	600	0.59	--	--	--	--	--	--	1	--	--	--
Loader	175	0.59	--	--	--	--	--	--	45	--	--	--
Tractors/Loader/Backhoe	100	0.21	--	--	--	--	--	--	51	--	--	--
Crack Cleaner	40	0.59	--	--	--	--	--	--	9	--	--	--
Crack Filler	100	0.43	--	--	--	--	--	--	9	--	--	--
Pumps	11	0.43	--	--	--	--	--	--	7	--	--	--
Project #14. Construction of an Aircraft Deicing Pad and Apron Expansion between Taxiways Delta and Echo												
Asphalt Paver	175	0.59	--	--	--	--	--	--	11	11	--	--

Table 4. Off-Road Construction Equipment Activity Levels (Hours)

Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Other General Equipment	175	0.43	--	--	--	--	--	--	331	331	--	--
Roller	100	0.59	--	--	--	--	--	--	120	120	--	--
Skid Steer Loader	75	0.21	--	--	--	--	--	--	59	59	--	--
Surfacing Equip. (Grooving)	25	0.59	--	--	--	--	--	--	14	14	--	--
Chain Saw	11	0.7	--	--	--	--	--	--	25	25	--	--
Chipper/Stump Grinder	100	0.43	--	--	--	--	--	--	25	25	--	--
Dozer	175	0.59	--	--	--	--	--	--	180	180	--	--
Excavator	175	0.59	--	--	--	--	--	--	56	56	--	--
Loader	175	0.59	--	--	--	--	--	--	53	53	--	--
Tractors/Loader/Backhoe	100	0.21	--	--	--	--	--	--	71	71	--	--
Scraper	600	0.59	--	--	--	--	--	--	38	38	--	--
Concrete Truck	600	0.59	--	--	--	--	--	--	9	9	--	--
Grader	300	0.59	--	--	--	--	--	--	10	10	--	--
Hydroseeder	600	0.59	--	--	--	--	--	--	9	9	--	--
Off-Road Truck	600	0.59	--	--	--	--	--	--	9	9	--	--
Pumps	11	0.43	--	--	--	--	--	--	9	9	--	--
Project #15. Construction of New Expanded East Ramp and Taxilane Between Taxiways Delta and Echo												
Asphalt Paver	175	0.59	--	--	--	--	--	--	5	5	5	5
Other General Equipment	175	0.43	--	--	--	--	--	--	149	149	149	149
Roller	100	0.59	--	--	--	--	--	--	54	54	54	54
Skid Steer Loader	75	0.21	--	--	--	--	--	--	27	27	27	27
Surfacing Equip. (Grooving)	25	0.59	--	--	--	--	--	--	7	7	7	7
Chain Saw	11	0.7	--	--	--	--	--	--	11	11	11	11
Chipper/Stump Grinder	100	0.43	--	--	--	--	--	--	11	11	11	11
Dozer	175	0.59	--	--	--	--	--	--	81	81	81	81
Excavator	175	0.59	--	--	--	--	--	--	25	25	25	25
Loader	175	0.59	--	--	--	--	--	--	24	24	24	24

Table 4. Off-Road Construction Equipment Activity Levels (Hours)

Off-Road Equipment Type	HP	LF	2026	2027	2028	2029	2030	2032	2033	2034	2035	2036
Tractors/Loader/Backhoe	100	0.21	--	--	--	--	--	--	32	32	32	32
Scraper	600	0.59	--	--	--	--	--	--	17	17	17	17
Concrete Truck	600	0.59	--	--	--	--	--	--	4	4	4	4
Grader	300	0.59	--	--	--	--	--	--	5	5	5	5
Hydroseeder	600	0.59	--	--	--	--	--	--	4	4	4	4
Off-Road Truck	600	0.59	--	--	--	--	--	--	4	4	4	4
Pumps	11	0.43	--	--	--	--	--	--	4	4	4	4
Project #16. Construction of new Aircraft Rescue and Fire Fighting (ARFF) Facility												
Backhoe	100	0.21	--	--	--	--	--	--	--	--	512	512
Concrete Ready Mix Trucks	600	0.59	--	--	--	--	--	--	--	--	96	96
Fork Truck	100	0.59	--	--	--	--	--	--	--	--	2,624	2,624
Man Lift	75	0.21	--	--	--	--	--	--	--	--	1,920	1,920
High Lift	100	0.59	--	--	--	--	--	--	--	--	704	704
Man Lift (Fascia Const.)	75	0.21	--	--	--	--	--	--	--	--	192	192
40 Ton Crane	300	0.43	--	--	--	--	--	--	--	--	384	384

Notes: HP = horsepower and LF = load factor.

No construction anticipated in 2031 (see Table 2 - Construction Projects, Footprint, and Schedule), therefore no activity levels presented in table for this year.

Sources: ACRP Report 102 – Guidance for Estimating Airport Construction Emissions, CMT and HEF, 2025.

On-Road and Off-Road Emission Factors

Criteria Air/Precursor Pollutants

As stated, for both on-road construction vehicles and off-road construction equipment, emission factors for the criteria air/precursor pollutants were developed using MOVES. The MOVES model input data were developed based on county-specific information (e.g., vehicle/fuel mix, fuel specifications, inspection maintenance program, meteorology data, etc.).

Table 5 and **Table 6** present the MOVES emission factors for on-road vehicles and off-road construction equipment, respectively, by vehicle/equipment type. The emission factors of on-road vehicles are expressed in grams per mile (g/mile) and the emission factors for off-road construction equipment are expressed in grams per horsepower-hour (g/hp-hr). These factors are derived from the MOVES model and cover criteria and precursor air pollutants for relevant construction years.

Table 5. On-Road Vehicle Emission Factors (g/mile)							
On-Road Vehicle Type	Fuel Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
2026							
Passenger Car	Gasoline	4.21	0.09	<0.01	0.03	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	1.16	1.76	<0.01	0.04	0.04	0.09
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		2.51	1.63	<0.01	0.07	0.07	0.22
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		2.18	4.24	0.01	0.29	0.08	0.10
2027							
Passenger Car	Gasoline	4.08	0.08	<0.01	0.02	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	1.12	1.59	<0.01	0.03	0.03	0.08
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		2.37	1.47	<0.01	0.06	0.06	0.19
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		2.12	3.87	0.01	0.28	0.07	0.09
2028							
Passenger Car	Gasoline	3.93	0.07	<0.01	0.02	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	1.09	1.45	<0.01	0.03	0.02	0.07
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		1.99	1.24	<0.01	0.04	0.04	0.15
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		2.07	3.51	0.01	0.27	0.06	0.08
2029							
Passenger Car	Gasoline	3.73	0.06	<0.01	0.02	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	1.06	1.29	<0.01	0.02	0.02	0.06
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		2.01	1.24	<0.01	0.04	0.04	0.16
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		2.02	3.17	0.01	0.27	0.06	0.07
2030							
Passenger Car	Gasoline	3.55	0.05	<0.01	0.02	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	1.04	1.19	<0.01	0.02	0.02	0.05
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		1.88	1.09	<0.01	0.03	0.03	0.13
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		1.98	2.88	0.01	0.26	0.05	0.06
2032							
Passenger Car	Gasoline	3.16	0.02	<0.01	0.01	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	0.99	0.98	<0.01	0.01	0.01	0.04
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		1.73	0.91	<0.01	0.03	0.02	0.10
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		1.90	2.33	0.01	0.25	0.05	0.05
2033							

Table 5. On-Road Vehicle Emission Factors (g/mile)

On-Road Vehicle Type	Fuel Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Passenger Car	Gasoline	2.96	0.02	<0.01	0.01	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	0.96	0.88	<0.01	0.01	0.01	0.03
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		1.59	0.75	<0.01	0.02	0.02	0.08
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		1.87	2.14	0.01	0.25	0.05	0.04
2034							
Passenger Car	Gasoline	2.77	0.02	<0.01	0.01	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	0.94	0.81	<0.01	0.01	0.01	0.03
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		1.53	0.68	<0.01	0.02	0.02	0.07
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		1.86	2.01	0.01	0.25	0.04	0.04
2035							
Passenger Car	Gasoline	2.59	0.02	<0.01	0.01	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	0.93	0.76	<0.01	0.01	0.01	0.03
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		1.46	0.61	<0.01	0.01	0.01	0.05
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		1.86	2.01	0.01	0.25	0.04	0.04
2036							
Passenger Car	Gasoline	2.42	0.01	<0.01	0.01	0.05	0.01
Dump Truck/Water Truck/Cement Mixer	Diesel	0.92	0.71	<0.01	0.01	0.01	0.03
Pickup Truck/Tool and Survey Crew Trucks/Line Painting and Sprayer Trucks		1.43	0.59	<0.01	0.01	0.01	0.05
Flatbed Truck/Distributing Tanker/Tractor Trailers/10 and 18 Wheelers		1.84	1.80	<0.01	0.24	0.04	0.04
Notes: CO = carbon monoxide, NO _x = nitrogen oxide, SO ₂ = sulfur dioxide, VOC = volatile organic compounds, PM ₁₀ = particulate matter with a diameter of 10 microns or smaller, and PM _{2.5} = particulate matter with a diameter of 2.5 microns or smaller. No construction anticipated in 2031 (see Table 2 - Construction Projects, Footprint, and Schedule), therefore no emission factors presented in table for this year. Source: U.S. EPA MOVES4, 2024.							

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
2026						
40 Ton Rough Terrain Crane	0.14	0.61	<0.01	0.03	0.03	0.03
Air Compressor	0.33	1.54	<0.01	0.06	0.05	0.05
Asphalt Paver	0.12	0.66	<0.01	0.02	0.02	0.02
Auger Drill	1.07	3.93	<0.01	0.27	0.19	0.18
Backhoe	1.84	2.46	<0.01	0.40	0.29	0.28
Bob Cat	1.84	2.46	<0.01	0.40	0.29	0.28
Bulldozer	0.12	0.60	<0.01	0.02	0.02	0.02
Caisson Drilling Rig	1.07	3.93	<0.01	0.27	0.19	0.18
Chain Saw	0.45	2.02	<0.01	0.09	0.05	0.05
Chipper/Stump Grinder	0.82	2.57	<0.01	0.18	0.15	0.14
Cold Planer	0.57	1.40	<0.01	0.08	0.08	0.08
Compacting Equipment	2.21	4.08	<0.01	0.68	0.23	0.23
Concrete Boom Pump	0.93	2.55	<0.01	0.22	0.16	0.15
Concrete Pump	0.93	2.55	<0.01	0.22	0.16	0.15
Concrete Ready-Mix Trucks	0.08	1.40	<0.01	0.03	0.02	0.02
Concrete Saws	0.45	2.02	<0.01	0.09	0.05	0.05
Concrete Truck	0.08	1.40	<0.01	0.03	0.02	0.02
Crack Cleaner	0.57	1.40	<0.01	0.08	0.08	0.08
Crack Filler	0.57	1.40	<0.01	0.08	0.08	0.08
Cranes	0.14	0.61	<0.01	0.03	0.03	0.03
Curb/Gutter Paver	0.12	0.66	<0.01	0.02	0.02	0.02
Dozer	0.12	0.60	<0.01	0.02	0.02	0.02
Excavator	0.07	0.37	<0.01	0.02	0.02	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	1.84	2.46	<0.01	0.40	0.29	0.28
Generator	0.91	2.60	<0.01	0.22	0.15	0.14
Grader	0.06	0.22	<0.01	0.01	0.01	0.01
High Lift	0.57	1.40	<0.01	0.08	0.08	0.08
Hydraulic Hammer	0.57	1.40	<0.01	0.08	0.08	0.08
Hydroseeder	0.78	1.80	<0.01	0.15	0.14	0.14
Loader	1.84	2.46	<0.01	0.40	0.29	0.28
Log Chipper	0.82	2.57	<0.01	0.18	0.15	0.14
Man Lift	0.57	1.40	<0.01	0.08	0.08	0.08
Mulcher	0.78	1.80	<0.01	0.15	0.14	0.14
Off-Road Truck	0.08	1.40	<0.01	0.03	0.02	0.02
Other General Equipment	0.17	0.73	<0.01	0.03	0.03	0.03
Paving Machine	0.12	0.66	<0.01	0.02	0.02	0.02
Pumps	0.93	2.55	<0.01	0.22	0.16	0.15
Roller	0.22	0.88	<0.01	0.04	0.03	0.03

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Rubber Tired Loader	0.20	0.80	<0.01	0.04	0.04	0.03
Scraper	0.14	0.36	<0.01	0.02	0.02	0.02
Skid Steer Loader	4.93	4.87	<0.01	0.95	0.70	0.68
Slip Form Paver	0.12	0.66	<0.01	0.02	0.02	0.02
Small Dozer	0.12	0.60	<0.01	0.02	0.02	0.02
Surfacing Equip. (Grooving)	0.86	2.34	<0.01	0.13	0.11	0.11
Sweepers	0.57	1.40	<0.01	0.08	0.08	0.08
Tractor	0.12	0.60	<0.01	0.02	0.02	0.02
Tractors/Loader/Backhoe	1.84	2.46	<0.01	0.40	0.29	0.28
Trencher	0.41	1.88	<0.01	0.08	0.05	0.05
Trowel Machine	0.86	2.34	<0.01	0.13	0.11	0.11
Truck for Topsoil & Seed Del&Spread	0.78	1.80	<0.01	0.15	0.14	0.14
2027						
40 Ton Rough Terrain Crane	0.12	0.52	<0.01	0.03	0.02	0.02
Air Compressor	0.28	1.46	<0.01	0.05	0.04	0.04
Asphalt Paver	0.11	0.63	<0.01	0.02	0.02	0.02
Auger Drill	0.96	3.56	<0.01	0.24	0.17	0.16
Backhoe	1.57	2.20	<0.01	0.34	0.25	0.24
Bob Cat	1.57	2.20	<0.01	0.34	0.25	0.24
Bulldozer	0.10	0.55	<0.01	0.02	0.02	0.02
Caisson Drilling Rig	0.96	3.56	<0.01	0.24	0.17	0.16
Chain Saw	0.40	1.97	<0.01	0.09	0.05	0.04
Chipper/Stump Grinder	0.74	2.35	<0.01	0.16	0.13	0.13
Cold Planer	0.48	1.21	<0.01	0.07	0.07	0.06
Compacting Equipment	2.20	4.06	<0.01	0.68	0.23	0.22
Concrete Boom Pump	0.86	2.42	<0.01	0.20	0.14	0.14
Concrete Pump	0.86	2.42	<0.01	0.20	0.14	0.14
Concrete Ready-Mix Trucks	0.07	1.39	<0.01	0.03	0.02	0.02
Concrete Saws	0.40	1.97	<0.01	0.09	0.05	0.04
Concrete Truck	0.07	1.39	<0.01	0.03	0.02	0.02
Crack Cleaner	0.48	1.21	<0.01	0.07	0.07	0.06
Crack Filler	0.48	1.21	<0.01	0.07	0.07	0.06
Cranes	0.12	0.52	<0.01	0.03	0.02	0.02
Curb/Gutter Paver	0.11	0.63	<0.01	0.02	0.02	0.02
Dozer	0.10	0.55	<0.01	0.02	0.02	0.02
Excavator	0.06	0.34	<0.01	0.02	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	1.57	2.20	<0.01	0.34	0.25	0.24
Generator	0.84	2.47	<0.01	0.20	0.13	0.13
Grader	0.05	0.20	<0.01	0.01	0.01	0.01

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
High Lift	0.48	1.21	<0.01	0.07	0.07	0.06
Hydraulic Hammer	0.48	1.21	<0.01	0.07	0.07	0.06
Hydroseeder	0.68	1.61	<0.01	0.13	0.12	0.12
Loader	1.57	2.20	<0.01	0.34	0.25	0.24
Log Chipper	0.74	2.35	<0.01	0.16	0.13	0.13
Man Lift	0.48	1.21	<0.01	0.07	0.07	0.06
Mulcher	0.68	1.61	<0.01	0.13	0.12	0.12
Off-Road Truck	0.07	1.39	<0.01	0.03	0.02	0.02
Other General Equipment	0.14	0.66	<0.01	0.03	0.03	0.03
Paving Machine	0.11	0.63	<0.01	0.02	0.02	0.02
Pumps	0.86	2.42	<0.01	0.20	0.14	0.14
Roller	0.17	0.82	<0.01	0.03	0.03	0.03
Rubber Tired Loader	0.16	0.71	<0.01	0.03	0.03	0.03
Scraper	0.11	0.30	<0.01	0.02	0.02	0.02
Skid Steer Loader	4.53	4.60	<0.01	0.86	0.64	0.62
Slip Form Paver	0.11	0.63	<0.01	0.02	0.02	0.02
Small Dozer	0.10	0.55	<0.01	0.02	0.02	0.02
Surfacing Equip. (Grooving)	0.71	2.04	<0.01	0.11	0.10	0.09
Sweepers	0.48	1.21	<0.01	0.07	0.07	0.06
Tractor	0.10	0.55	<0.01	0.02	0.02	0.02
Tractors/Loader/Backhoe	1.57	2.20	<0.01	0.34	0.25	0.24
Trencher	0.35	1.79	<0.01	0.07	0.04	0.04
Trowel Machine	0.71	2.04	<0.01	0.11	0.10	0.09
Truck for Topsoil & Seed Del&Spread	0.68	1.61	<0.01	0.13	0.12	0.12
2028						
40 Ton Rough Terrain Crane	0.10	0.45	<0.01	0.02	0.02	0.02
Air Compressor	0.24	1.39	<0.01	0.04	0.04	0.04
Asphalt Paver	0.10	0.61	<0.01	0.02	0.02	0.02
Auger Drill	0.84	3.15	<0.01	0.21	0.14	0.14
Backhoe	1.37	2.01	<0.01	0.30	0.22	0.21
Bob Cat	1.37	2.01	<0.01	0.30	0.22	0.21
Bulldozer	0.08	0.52	<0.01	0.02	0.02	0.02
Caisson Drilling Rig	0.84	3.15	<0.01	0.21	0.14	0.14
Chain Saw	0.35	1.93	<0.01	0.08	0.04	0.04
Chipper/Stump Grinder	0.65	2.12	<0.01	0.14	0.12	0.11
Cold Planer	0.41	1.07	<0.01	0.06	0.06	0.06
Compacting Equipment	2.19	4.05	<0.01	0.68	0.23	0.22
Concrete Boom Pump	0.81	2.32	<0.01	0.19	0.13	0.13
Concrete Pump	0.81	2.32	<0.01	0.19	0.13	0.13
Concrete Ready-Mix Trucks	0.06	1.38	<0.01	0.03	0.02	0.02
Concrete Saws	0.35	1.93	<0.01	0.08	0.04	0.04

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Concrete Truck	0.06	1.38	<0.01	0.03	0.02	0.02
Crack Cleaner	0.41	1.07	<0.01	0.06	0.06	0.06
Crack Filler	0.41	1.07	<0.01	0.06	0.06	0.06
Cranes	0.10	0.45	<0.01	0.02	0.02	0.02
Curb/Gutter Paver	0.10	0.61	<0.01	0.02	0.02	0.02
Dozer	0.08	0.52	<0.01	0.02	0.02	0.02
Excavator	0.05	0.32	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	1.37	2.01	<0.01	0.30	0.22	0.21
Generator	0.78	2.37	<0.01	0.19	0.12	0.12
Grader	0.05	0.18	<0.01	0.01	0.01	0.01
High Lift	0.41	1.07	<0.01	0.06	0.06	0.06
Hydraulic Hammer	0.41	1.07	<0.01	0.06	0.06	0.06
Hydroseeder	0.60	1.47	<0.01	0.11	0.11	0.10
Loader	1.37	2.01	<0.01	0.30	0.22	0.21
Log Chipper	0.65	2.12	<0.01	0.14	0.12	0.11
Man Lift	0.41	1.07	<0.01	0.06	0.06	0.06
Mulcher	0.60	1.47	<0.01	0.11	0.11	0.10
Off-Road Truck	0.06	1.38	<0.01	0.03	0.02	0.02
Other General Equipment	0.12	0.60	<0.01	0.02	0.02	0.02
Paving Machine	0.10	0.61	<0.01	0.02	0.02	0.02
Pumps	0.81	2.32	<0.01	0.19	0.13	0.13
Roller	0.15	0.80	<0.01	0.03	0.02	0.02
Rubber Tired Loader	0.14	0.66	<0.01	0.03	0.02	0.02
Scraper	0.09	0.24	<0.01	0.02	0.02	0.01
Skid Steer Loader	4.08	4.30	<0.01	0.77	0.57	0.55
Slip Form Paver	0.10	0.61	<0.01	0.02	0.02	0.02
Small Dozer	0.08	0.52	<0.01	0.02	0.02	0.02
Surfacing Equip. (Grooving)	0.59	1.82	<0.01	0.10	0.08	0.08
Sweepers	0.41	1.07	<0.01	0.06	0.06	0.06
Tractor	0.08	0.52	<0.01	0.02	0.02	0.02
Tractors/Loader/Backhoe	1.37	2.01	<0.01	0.30	0.22	0.21
Trencher	0.30	1.73	<0.01	0.06	0.04	0.03
Trowel Machine	0.59	1.82	<0.01	0.10	0.08	0.08
Truck for Topsoil & Seed Del&Spread	0.60	1.47	<0.01	0.11	0.11	0.10
2029						
40 Ton Rough Terrain Crane	0.09	0.40	<0.01	0.02	0.02	0.02
Air Compressor	0.20	1.34	<0.01	0.04	0.03	0.03
Asphalt Paver	0.09	0.60	<0.01	0.02	0.02	0.01
Auger Drill	0.71	2.71	<0.01	0.18	0.12	0.12

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Backhoe	1.20	1.85	<0.01	0.26	0.19	0.19
Bob Cat	1.20	1.85	<0.01	0.26	0.19	0.19
Bulldozer	0.07	0.48	<0.01	0.02	0.01	0.01
Caisson Drilling Rig	0.71	2.71	<0.01	0.18	0.12	0.12
Chain Saw	0.32	1.89	<0.01	0.08	0.03	0.03
Chipper/Stump Grinder	0.57	1.91	<0.01	0.13	0.10	0.10
Cold Planer	0.36	0.95	<0.01	0.05	0.05	0.05
Compacting Equipment	2.17	4.05	<0.01	0.68	0.22	0.22
Concrete Boom Pump	0.75	2.20	<0.01	0.18	0.12	0.12
Concrete Pump	0.75	2.20	<0.01	0.18	0.12	0.12
Concrete Ready-Mix Trucks	0.05	1.37	<0.01	0.03	0.02	0.02
Concrete Saws	0.32	1.89	<0.01	0.08	0.03	0.03
Concrete Truck	0.05	1.37	<0.01	0.03	0.02	0.02
Crack Cleaner	0.36	0.95	<0.01	0.05	0.05	0.05
Crack Filler	0.36	0.95	<0.01	0.05	0.05	0.05
Cranes	0.09	0.40	<0.01	0.02	0.02	0.02
Curb/Gutter Paver	0.09	0.60	<0.01	0.02	0.02	0.01
Dozer	0.07	0.48	<0.01	0.02	0.01	0.01
Excavator	0.05	0.31	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	1.20	1.85	<0.01	0.26	0.19	0.19
Generator	0.72	2.26	<0.01	0.17	0.11	0.11
Grader	0.04	0.16	<0.01	0.01	0.01	0.01
High Lift	0.36	0.95	<0.01	0.05	0.05	0.05
Hydraulic Hammer	0.36	0.95	<0.01	0.05	0.05	0.05
Hydroseeder	0.54	1.35	<0.01	0.10	0.09	0.09
Loader	1.20	1.85	<0.01	0.26	0.19	0.19
Log Chipper	0.57	1.91	<0.01	0.13	0.10	0.10
Man Lift	0.36	0.95	<0.01	0.05	0.05	0.05
Mulcher	0.54	1.35	<0.01	0.10	0.09	0.09
Off-Road Truck	0.05	1.37	<0.01	0.03	0.02	0.02
Other General Equipment	0.10	0.56	<0.01	0.02	0.02	0.02
Paving Machine	0.09	0.60	<0.01	0.02	0.02	0.01
Pumps	0.75	2.20	<0.01	0.18	0.12	0.12
Roller	0.14	0.78	<0.01	0.03	0.02	0.02
Rubber Tired Loader	0.12	0.61	<0.01	0.02	0.02	0.02
Scraper	0.07	0.20	<0.01	0.01	0.01	0.01
Skid Steer Loader	3.56	3.96	<0.01	0.67	0.49	0.47
Slip Form Paver	0.09	0.60	<0.01	0.02	0.02	0.01
Small Dozer	0.07	0.48	<0.01	0.02	0.01	0.01

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Surfacing Equip. (Grooving)	0.52	1.69	<0.01	0.09	0.07	0.07
Sweepers	0.36	0.95	<0.01	0.05	0.05	0.05
Tractor	0.07	0.48	<0.01	0.02	0.01	0.01
Tractors/Loader/Backhoe	1.20	1.85	<0.01	0.26	0.19	0.19
Trencher	0.26	1.68	<0.01	0.05	0.03	0.03
Trowel Machine	0.52	1.69	<0.01	0.09	0.07	0.07
Truck for Topsoil & Seed Del&Spread	0.54	1.35	<0.01	0.10	0.09	0.09
2030						
40 Ton Rough Terrain Crane	0.07	0.36	<0.01	0.02	0.01	0.01
Air Compressor	0.17	1.30	<0.01	0.04	0.03	0.03
Asphalt Paver	0.08	0.58	<0.01	0.02	0.01	0.01
Auger Drill	0.58	2.29	<0.01	0.15	0.10	0.10
Backhoe	1.04	1.69	<0.01	0.23	0.17	0.16
Bob Cat	1.04	1.69	<0.01	0.23	0.17	0.16
Bulldozer	0.05	0.45	<0.01	0.01	0.01	0.01
Caisson Drilling Rig	0.58	2.29	<0.01	0.15	0.10	0.10
Chain Saw	0.28	1.86	<0.01	0.07	0.03	0.03
Chipper/Stump Grinder	0.51	1.74	<0.01	0.11	0.09	0.09
Cold Planer	0.31	0.84	<0.01	0.04	0.04	0.04
Compacting Equipment	2.14	4.04	<0.01	0.68	0.22	0.21
Concrete Boom Pump	0.68	2.08	<0.01	0.16	0.11	0.11
Concrete Pump	0.68	2.08	<0.01	0.16	0.11	0.11
Concrete Ready-Mix Trucks	0.05	1.37	<0.01	0.03	0.02	0.02
Concrete Saws	0.28	1.86	<0.01	0.07	0.03	0.03
Concrete Truck	0.05	1.37	<0.01	0.03	0.02	0.02
Crack Cleaner	0.31	0.84	<0.01	0.04	0.04	0.04
Crack Filler	0.31	0.84	<0.01	0.04	0.04	0.04
Cranes	0.07	0.36	<0.01	0.02	0.01	0.01
Curb/Gutter Paver	0.08	0.58	<0.01	0.02	0.01	0.01
Dozer	0.05	0.45	<0.01	0.01	0.01	0.01
Excavator	0.05	0.31	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	1.04	1.69	<0.01	0.23	0.17	0.16
Generator	0.66	2.15	<0.01	0.16	0.10	0.10
Grader	0.03	0.15	<0.01	0.01	0.01	0.01
High Lift	0.31	0.84	<0.01	0.04	0.04	0.04
Hydraulic Hammer	0.31	0.84	<0.01	0.04	0.04	0.04
Hydroseeder	0.48	1.23	<0.01	0.09	0.08	0.08
Loader	1.04	1.69	<0.01	0.23	0.17	0.16
Log Chipper	0.51	1.74	<0.01	0.11	0.09	0.09

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Man Lift	0.31	0.84	<0.01	0.04	0.04	0.04
Mulcher	0.48	1.23	<0.01	0.09	0.08	0.08
Off-Road Truck	0.05	1.37	<0.01	0.03	0.02	0.02
Other General Equipment	0.09	0.53	<0.01	0.02	0.02	0.02
Paving Machine	0.08	0.58	<0.01	0.02	0.01	0.01
Pumps	0.68	2.08	<0.01	0.16	0.11	0.11
Roller	0.14	0.77	<0.01	0.03	0.02	0.02
Rubber Tired Loader	0.10	0.57	<0.01	0.02	0.02	0.02
Scraper	0.05	0.16	<0.01	0.01	0.01	0.01
Skid Steer Loader	2.95	3.59	<0.01	0.56	0.41	0.40
Slip Form Paver	0.08	0.58	<0.01	0.02	0.01	0.01
Small Dozer	0.05	0.45	<0.01	0.01	0.01	0.01
Surfacing Equip. (Grooving)	0.46	1.58	<0.01	0.08	0.06	0.06
Sweepers	0.31	0.84	<0.01	0.04	0.04	0.04
Tractor	0.05	0.45	<0.01	0.01	0.01	0.01
Tractors/Loader/Backhoe	1.04	1.69	<0.01	0.23	0.17	0.16
Trencher	0.22	1.64	<0.01	0.05	0.03	0.02
Trowel Machine	0.46	1.58	<0.01	0.08	0.06	0.06
Truck for Topsoil & Seed Del&Spread	0.48	1.23	<0.01	0.09	0.08	0.08
2032						
40 Ton Rough Terrain Crane	0.06	0.30	<0.01	0.02	0.01	0.01
Air Compressor	0.14	1.24	<0.01	0.03	0.02	0.02
Asphalt Paver	0.07	0.56	<0.01	0.02	0.01	0.01
Auger Drill	0.43	1.83	<0.01	0.11	0.08	0.08
Backhoe	0.80	1.46	<0.01	0.17	0.13	0.12
Bob Cat	0.80	1.46	<0.01	0.17	0.13	0.12
Bulldozer	0.04	0.43	<0.01	0.01	0.01	0.01
Caisson Drilling Rig	0.43	1.83	<0.01	0.11	0.08	0.08
Chain Saw	0.24	1.82	<0.01	0.07	0.02	0.02
Chipper/Stump Grinder	0.41	1.48	<0.01	0.09	0.07	0.07
Cold Planer	0.23	0.67	<0.01	0.03	0.03	0.03
Compacting Equipment	2.12	4.04	<0.01	0.67	0.21	0.20
Concrete Boom Pump	0.58	1.89	<0.01	0.14	0.09	0.09
Concrete Pump	0.58	1.89	<0.01	0.14	0.09	0.09
Concrete Ready-Mix Trucks	0.05	1.37	<0.01	0.02	0.02	0.02
Concrete Saws	0.24	1.82	<0.01	0.07	0.02	0.02
Concrete Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Crack Cleaner	0.23	0.67	<0.01	0.03	0.03	0.03
Crack Filler	0.23	0.67	<0.01	0.03	0.03	0.03
Cranes	0.06	0.30	<0.01	0.02	0.01	0.01
Curb/Gutter Paver	0.07	0.56	<0.01	0.02	0.01	0.01

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Dozer	0.04	0.43	<0.01	0.01	0.01	0.01
Excavator	0.05	0.31	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	0.80	1.46	<0.01	0.17	0.13	0.12
Generator	0.56	1.97	<0.01	0.14	0.08	0.08
Grader	0.03	0.14	<0.01	0.01	0.01	0.01
High Lift	0.23	0.67	<0.01	0.03	0.03	0.03
Hydraulic Hammer	0.23	0.67	<0.01	0.03	0.03	0.03
Hydroseeder	0.37	1.02	<0.01	0.07	0.07	0.06
Loader	0.80	1.46	<0.01	0.17	0.13	0.12
Log Chipper	0.41	1.48	<0.01	0.09	0.07	0.07
Man Lift	0.23	0.67	<0.01	0.03	0.03	0.03
Mulcher	0.37	1.02	<0.01	0.07	0.07	0.06
Off-Road Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Other General Equipment	0.08	0.50	<0.01	0.02	0.01	0.01
Paving Machine	0.07	0.56	<0.01	0.02	0.01	0.01
Pumps	0.58	1.89	<0.01	0.14	0.09	0.09
Roller	0.12	0.75	<0.01	0.03	0.02	0.02
Rubber Tired Loader	0.07	0.50	<0.01	0.02	0.02	0.01
Scraper	0.02	0.12	<0.01	0.01	0.01	0.01
Skid Steer Loader	2.05	3.06	<0.01	0.40	0.30	0.29
Slip Form Paver	0.07	0.56	<0.01	0.02	0.01	0.01
Small Dozer	0.04	0.43	<0.01	0.01	0.01	0.01
Surfacing Equip. (Grooving)	0.38	1.42	<0.01	0.07	0.05	0.05
Sweepers	0.23	0.67	<0.01	0.03	0.03	0.03
Tractor	0.04	0.43	<0.01	0.01	0.01	0.01
Tractors/Loader/Backhoe	0.80	1.46	<0.01	0.17	0.13	0.12
Trencher	0.17	1.57	<0.01	0.04	0.02	0.02
Trowel Machine	0.38	1.42	<0.01	0.07	0.05	0.05
Truck for Topsoil & Seed Del&Spread	0.37	1.02	<0.01	0.07	0.07	0.06
2033						
40 Ton Rough Terrain Crane	0.05	0.27	<0.01	0.01	0.01	0.01
Air Compressor	0.13	1.23	<0.01	0.03	0.02	0.02
Asphalt Paver	0.07	0.56	<0.01	0.02	0.01	0.01
Auger Drill	0.39	1.68	<0.01	0.10	0.07	0.07
Backhoe	0.70	1.36	<0.01	0.15	0.11	0.11
Bob Cat	0.70	1.36	<0.01	0.15	0.11	0.11
Bulldozer	0.04	0.43	<0.01	0.01	0.01	0.01
Caisson Drilling Rig	0.39	1.68	<0.01	0.10	0.07	0.07
Chain Saw	0.23	1.81	<0.01	0.06	0.02	0.02

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Chipper/Stump Grinder	0.37	1.39	<0.01	0.08	0.07	0.07
Cold Planer	0.20	0.60	<0.01	0.03	0.03	0.03
Compacting Equipment	2.11	4.04	<0.01	0.67	0.21	0.20
Concrete Boom Pump	0.54	1.83	<0.01	0.13	0.08	0.08
Concrete Pump	0.54	1.83	<0.01	0.13	0.08	0.08
Concrete Ready-Mix Trucks	0.05	1.37	<0.01	0.02	0.02	0.02
Concrete Saws	0.23	1.81	<0.01	0.06	0.02	0.02
Concrete Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Crack Cleaner	0.20	0.60	<0.01	0.03	0.03	0.03
Crack Filler	0.20	0.60	<0.01	0.03	0.03	0.03
Cranes	0.05	0.27	<0.01	0.01	0.01	0.01
Curb/Gutter Paver	0.07	0.56	<0.01	0.02	0.01	0.01
Dozer	0.04	0.43	<0.01	0.01	0.01	0.01
Excavator	0.05	0.31	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	0.70	1.36	<0.01	0.15	0.11	0.11
Generator	0.53	1.91	<0.01	0.13	0.08	0.07
Grader	0.03	0.14	<0.01	0.01	0.01	0.01
High Lift	0.20	0.60	<0.01	0.03	0.03	0.03
Hydraulic Hammer	0.20	0.60	<0.01	0.03	0.03	0.03
Hydroseeder	0.33	0.93	<0.01	0.06	0.06	0.06
Loader	0.70	1.36	<0.01	0.15	0.11	0.11
Log Chipper	0.37	1.39	<0.01	0.08	0.07	0.07
Man Lift	0.20	0.60	<0.01	0.03	0.03	0.03
Mulcher	0.33	0.93	<0.01	0.06	0.06	0.06
Off-Road Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Other General Equipment	0.07	0.48	<0.01	0.02	0.01	0.01
Paving Machine	0.07	0.56	<0.01	0.02	0.01	0.01
Pumps	0.54	1.83	<0.01	0.13	0.08	0.08
Roller	0.12	0.74	<0.01	0.03	0.02	0.02
Rubber Tired Loader	0.06	0.47	<0.01	0.02	0.01	0.01
Scraper	0.02	0.12	<0.01	0.01	0.01	0.01
Skid Steer Loader	1.83	2.92	<0.01	0.36	0.26	0.26
Slip Form Paver	0.07	0.56	<0.01	0.02	0.01	0.01
Small Dozer	0.04	0.43	<0.01	0.01	0.01	0.01
Surfacing Equip. (Grooving)	0.34	1.35	<0.01	0.06	0.05	0.04
Sweepers	0.20	0.60	<0.01	0.03	0.03	0.03
Tractor	0.04	0.43	<0.01	0.01	0.01	0.01
Tractors/Loader/Backhoe	0.70	1.36	<0.01	0.15	0.11	0.11
Trencher	0.16	1.56	<0.01	0.04	0.02	0.02
Trowel Machine	0.34	1.35	<0.01	0.06	0.05	0.04

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Truck for Topsoil & Seed Del&Spread	0.33	0.93	<0.01	0.06	0.06	0.06
2034						
40 Ton Rough Terrain Crane	0.05	0.25	<0.01	0.01	0.01	0.01
Air Compressor	0.12	1.21	<0.01	0.03	0.02	0.02
Asphalt Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Auger Drill	0.35	1.55	<0.01	0.09	0.06	0.06
Backhoe	0.60	1.26	<0.01	0.13	0.09	0.09
Bob Cat	0.60	1.26	<0.01	0.13	0.09	0.09
Bulldozer	0.03	0.43	<0.01	0.01	0.01	0.01
Caisson Drilling Rig	0.35	1.55	<0.01	0.09	0.06	0.06
Chain Saw	0.22	1.81	<0.01	0.06	0.02	0.02
Chipper/Stump Grinder	0.34	1.31	<0.01	0.07	0.06	0.06
Cold Planer	0.17	0.53	<0.01	0.03	0.03	0.03
Compacting Equipment	2.11	4.04	<0.01	0.67	0.21	0.20
Concrete Boom Pump	0.51	1.77	<0.01	0.12	0.08	0.07
Concrete Pump	0.51	1.77	<0.01	0.12	0.08	0.07
Concrete Ready-Mix Trucks	0.05	1.37	<0.01	0.02	0.02	0.02
Concrete Saws	0.22	1.81	<0.01	0.06	0.02	0.02
Concrete Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Crack Cleaner	0.17	0.53	<0.01	0.03	0.03	0.03
Crack Filler	0.17	0.53	<0.01	0.03	0.03	0.03
Cranes	0.05	0.25	<0.01	0.01	0.01	0.01
Curb/Gutter Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Dozer	0.03	0.43	<0.01	0.01	0.01	0.01
Excavator	0.04	0.31	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	0.60	1.26	<0.01	0.13	0.09	0.09
Generator	0.50	1.85	<0.01	0.12	0.07	0.07
Grader	0.03	0.14	<0.01	0.01	0.01	0.01
High Lift	0.17	0.53	<0.01	0.03	0.03	0.03
Hydraulic Hammer	0.17	0.53	<0.01	0.03	0.03	0.03
Hydroseeder	0.28	0.82	<0.01	0.05	0.05	0.05
Loader	0.60	1.26	<0.01	0.13	0.09	0.09
Log Chipper	0.34	1.31	<0.01	0.07	0.06	0.06
Man Lift	0.17	0.53	<0.01	0.03	0.03	0.03
Mulcher	0.28	0.82	<0.01	0.05	0.05	0.05
Off-Road Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Other General Equipment	0.07	0.47	<0.01	0.02	0.01	0.01
Paving Machine	0.06	0.55	<0.01	0.02	0.01	0.01
Pumps	0.51	1.77	<0.01	0.12	0.08	0.07
Roller	0.11	0.73	<0.01	0.03	0.02	0.02

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Rubber Tired Loader	0.05	0.45	<0.01	0.02	0.01	0.01
Scraper	0.02	0.12	<0.01	0.01	0.01	0.01
Skid Steer Loader	1.64	2.81	<0.01	0.32	0.23	0.23
Slip Form Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Small Dozer	0.03	0.43	<0.01	0.01	0.01	0.01
Surfacing Equip. (Grooving)	0.31	1.29	<0.01	0.06	0.04	0.04
Sweepers	0.17	0.53	<0.01	0.03	0.03	0.03
Tractor	0.03	0.43	<0.01	0.01	0.01	0.01
Tractors/Loader/Backhoe	0.60	1.26	<0.01	0.13	0.09	0.09
Trencher	0.15	1.55	<0.01	0.04	0.02	0.02
Trowel Machine	0.31	1.29	<0.01	0.06	0.04	0.04
Truck for Topsoil & Seed Del&Spread	0.28	0.82	<0.01	0.05	0.05	0.05
2035						
40 Ton Rough Terrain Crane	0.04	0.23	<0.01	0.01	0.01	0.01
Air Compressor	0.11	1.20	<0.01	0.03	0.02	0.02
Asphalt Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Auger Drill	0.31	1.43	<0.01	0.08	0.06	0.05
Backhoe	0.51	1.18	<0.01	0.11	0.08	0.08
Bob Cat	0.51	1.18	<0.01	0.11	0.08	0.08
Bulldozer	0.03	0.43	<0.01	0.01	0.01	0.01
Caisson Drilling Rig	0.31	1.43	<0.01	0.08	0.06	0.05
Chain Saw	0.22	1.81	<0.01	0.06	0.02	0.02
Chipper/Stump Grinder	0.31	1.23	<0.01	0.07	0.06	0.05
Cold Planer	0.15	0.47	<0.01	0.02	0.02	0.02
Compacting Equipment	2.11	4.04	<0.01	0.67	0.21	0.20
Concrete Boom Pump	0.47	1.70	<0.01	0.12	0.07	0.07
Concrete Pump	0.47	1.70	<0.01	0.12	0.07	0.07
Concrete Ready-Mix Trucks	0.05	1.37	<0.01	0.02	0.02	0.02
Concrete Saws	0.22	1.81	<0.01	0.06	0.02	0.02
Concrete Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Crack Cleaner	0.15	0.47	<0.01	0.02	0.02	0.02
Crack Filler	0.15	0.47	<0.01	0.02	0.02	0.02
Cranes	0.04	0.23	<0.01	0.01	0.01	0.01
Curb/Gutter Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Dozer	0.03	0.43	<0.01	0.01	0.01	0.01
Excavator	0.04	0.31	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	0.51	1.18	<0.01	0.11	0.08	0.08
Generator	0.46	1.79	<0.01	0.12	0.06	0.06
Grader	0.03	0.14	<0.01	0.01	0.01	0.01
High Lift	0.15	0.47	<0.01	0.02	0.02	0.02

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Hydraulic Hammer	0.15	0.47	<0.01	0.02	0.02	0.02
Hydroseeder	0.24	0.73	<0.01	0.04	0.04	0.04
Loader	0.51	1.18	<0.01	0.11	0.08	0.08
Log Chipper	0.31	1.23	<0.01	0.07	0.06	0.05
Man Lift	0.15	0.47	<0.01	0.02	0.02	0.02
Mulcher	0.24	0.73	<0.01	0.04	0.04	0.04
Off-Road Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Other General Equipment	0.06	0.47	<0.01	0.02	0.01	0.01
Paving Machine	0.06	0.55	<0.01	0.02	0.01	0.01
Pumps	0.47	1.70	<0.01	0.12	0.07	0.07
Roller	0.11	0.73	<0.01	0.03	0.02	0.02
Rubber Tired Loader	0.04	0.43	<0.01	0.01	0.01	0.01
Scraper	0.02	0.12	<0.01	0.01	0.01	0.01
Skid Steer Loader	1.48	2.71	<0.01	0.29	0.21	0.20
Slip Form Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Small Dozer	0.03	0.43	<0.01	0.01	0.01	0.01
Surfacing Equip. (Grooving)	0.29	1.24	<0.01	0.06	0.04	0.04
Sweepers	0.15	0.47	<0.01	0.02	0.02	0.02
Tractor	0.03	0.43	<0.01	0.01	0.01	0.01
Tractors/Loader/Backhoe	0.51	1.18	<0.01	0.11	0.08	0.08
Trencher	0.15	1.54	<0.01	0.04	0.02	0.02
Trowel Machine	0.29	1.24	<0.01	0.06	0.04	0.04
Truck for Topsoil & Seed Del&Spread	0.24	0.73	<0.01	0.04	0.04	0.04
2036						
40 Ton Rough Terrain Crane	0.04	0.21	<0.01	0.01	0.01	0.01
Air Compressor	0.11	1.19	<0.01	0.03	0.01	0.01
Asphalt Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Auger Drill	0.28	1.33	<0.01	0.07	0.05	0.05
Backhoe	0.44	1.10	<0.01	0.09	0.07	0.07
Bob Cat	0.44	1.10	<0.01	0.09	0.07	0.07
Bulldozer	0.03	0.43	<0.01	0.01	0.01	0.01
Caisson Drilling Rig	0.28	1.33	<0.01	0.07	0.05	0.05
Chain Saw	0.22	1.81	<0.01	0.06	0.02	0.02
Chipper/Stump Grinder	0.27	1.15	<0.01	0.06	0.05	0.05
Cold Planer	0.13	0.43	<0.01	0.02	0.02	0.02
Compacting Equipment	2.12	4.04	<0.01	0.67	0.21	0.20
Concrete Boom Pump	0.43	1.64	<0.01	0.11	0.06	0.06
Concrete Pump	0.43	1.64	<0.01	0.11	0.06	0.06
Concrete Ready-Mix Trucks	0.05	1.37	<0.01	0.02	0.02	0.02
Concrete Saws	0.22	1.81	<0.01	0.06	0.02	0.02
Concrete Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Crack Cleaner	0.13	0.43	<0.01	0.02	0.02	0.02

Table 6. Off-Road Construction Equipment Emission Factors (g/hp-hr)

Off-Road Equipment Type	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
Crack Filler	0.13	0.43	<0.01	0.02	0.02	0.02
Cranes	0.04	0.21	<0.01	0.01	0.01	0.01
Curb/Gutter Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Dozer	0.03	0.43	<0.01	0.01	0.01	0.01
Excavator	0.04	0.31	<0.01	0.01	0.01	0.01
Fork Truck	0.08	1.04	<0.01	0.02	0.01	0.01
Forklift	0.08	1.04	<0.01	0.02	0.01	0.01
Front Loader	0.44	1.10	<0.01	0.09	0.07	0.07
Generator	0.43	1.74	<0.01	0.11	0.06	0.06
Grader	0.03	0.14	<0.01	0.01	0.01	0.01
High Lift	0.13	0.43	<0.01	0.02	0.02	0.02
Hydraulic Hammer	0.13	0.43	<0.01	0.02	0.02	0.02
Hydroseeder	0.21	0.66	<0.01	0.04	0.04	0.03
Loader	0.44	1.10	<0.01	0.09	0.07	0.07
Log Chipper	0.27	1.15	<0.01	0.06	0.05	0.05
Man Lift	0.13	0.43	<0.01	0.02	0.02	0.02
Mulcher	0.21	0.66	<0.01	0.04	0.04	0.03
Off-Road Truck	0.05	1.37	<0.01	0.02	0.02	0.02
Other General Equipment	0.06	0.46	<0.01	0.01	0.01	0.01
Paving Machine	0.06	0.55	<0.01	0.02	0.01	0.01
Pumps	0.43	1.64	<0.01	0.11	0.06	0.06
Roller	0.11	0.72	<0.01	0.03	0.02	0.01
Rubber Tired Loader	0.04	0.42	<0.01	0.01	0.01	0.01
Scraper	0.02	0.12	<0.01	0.01	0.01	0.01
Skid Steer Loader	1.34	2.62	<0.01	0.27	0.19	0.18
Slip Form Paver	0.06	0.55	<0.01	0.02	0.01	0.01
Small Dozer	0.03	0.43	<0.01	0.01	0.01	0.01
Surfacing Equip. (Grooving)	0.26	1.19	<0.01	0.05	0.04	0.03
Sweepers	0.13	0.43	<0.01	0.02	0.02	0.02
Tractor	0.03	0.43	<0.01	0.01	0.01	0.01
Tractors/Loader/Backhoe	0.44	1.10	<0.01	0.09	0.07	0.07
Trencher	0.15	1.53	<0.01	0.04	0.02	0.02
Trowel Machine	0.26	1.19	<0.01	0.05	0.04	0.03
Truck for Topsoil & Seed Del&Spread	0.21	0.66	<0.01	0.04	0.04	0.03

Notes: g/hp-hr = grams per horsepower-hour. CO = carbon monoxide, NO_x = nitrogen oxide, SO₂ = sulfur dioxide, VOC = volatile organic compounds, PM₁₀ = particulate matter with a diameter of 10 microns or smaller, and PM_{2.5} = particulate matter with a diameter of 2.5 microns or smaller.

All off-road construction equipment is assumed to be operating on diesel fuel.

No construction anticipated in 2031 (see *Table 2 - Construction Projects, Footprint, and Schedule*), therefore no emission factors presented in table for this year.

Source: U.S. EPA MOVES4, 2024.

Emissions Calculations

On-road construction vehicle emissions were computed by applying the emission factors of each on-road vehicle type to the anticipated VMT of expected vehicle use, using the following formula:

$$\text{On-road Construction Vehicle Emissions (tons/year)} = \text{emission factor (grams/mile)} \times \text{vehicle-miles-travelled (VMT/year)} \times (1 \text{ pound}/453.6 \text{ grams}) \times (1 \text{ ton}/2,000 \text{ pounds})$$

Off-road construction equipment emissions were estimated by applying the emission factors of each off-road equipment type to the equipment's size (in horsepower), load factor, and to the anticipated activity levels (in hours) of expected equipment use. The emission estimates were computed using the following formula:

$$\text{Off-road Construction Equipment Emissions (tons/year)} = \text{emission factor (grams/hp-hour)} \times \text{size (horsepower)} \times \text{load factor} \times \text{hours per year} \times (1 \text{ pound}/453.6 \text{ grams}) \times (1 \text{ ton}/2,000 \text{ pounds})$$

Fugitives

Fugitive dust (PM₁₀/PM_{2.5}) and evaporative (VOCs) emissions result from non-combustive activities including, but not limited to, earthmoving, demolition, asphalt paving and concrete batching. Emissions of PM₁₀/PM_{2.5} associated with the construction and demolition activities of Alternatives #1 and #2 were calculated using emission factors from the EPA's AP-42 documentation, VOC emissions from asphalt paving activities were estimated using EPA guidance specific to asphalt paving. All fugitive emissions were included in the total construction emissions inventory.

3.2. Operational Emissions Inventory

Aircraft Operations

Operational emissions inventories were developed only for Alternative #2 for aircraft, APUs, and GSE. The aircraft operations associated with Alternative #2 reflects the anticipated introduction of commercial airline activity at HEF beginning in 2026. The current general aviation aircraft operations are not expected to increase as a result of this alternative.

Emissions inventories for aircraft, APUs and GSE were developed for the years 2026 through 2036 and for the future build-out year 2041. These inventories include criteria air pollutants and their precursors. The analysis utilized the latest available version of the FAA's Aviation Environmental Design Tool (AEDT, Version 3f)⁹ at the start of study. Default AEDT data for APUs and GSE were applied in the modeling analysis.

It is assumed that the aircraft fleet mix will remain consistent throughout the analysis years. The aircraft fleet mix, number of operations, engine assignments, runway use, stage length, and other modeling parameters used to develop the emissions inventories were aligned with the noise analysis presented in *Appendix L - Noise Technical Report* of the EA. As detailed in the *Noise Technical Report*, the aircraft fleet mix and operational data were derived from the RS&H forecast developed as part of the HEF Master Plan and the AvPorts commercial airline forecast. The projected additions of commercial aircraft operations (arrivals and departures) for all analysis years are summarized in **Table 7**.

⁹ U.S. Department of Transportation (DOT), Federal Aviation Administration, "Aviation Environmental Design Tool (AEDT)," <https://aedt.faa.gov/>. At the time of the preparation of this analysis, AEDT Version 3f was the latest version of AEDT.

Year	Operations
2026	7,955
2027	11,153
2028	12,266
2029	14,284
2030	16,337
2031	17,888
2032	18,353
2033	18,722
2034	19,145
2035	19,337
2036	19,032
2041	21,304

Note: Operations include arrivals and departures.
Source: HEF, 2025.

Motor Vehicle Operations

This analysis evaluated operational emissions from motor vehicles traveling on airport roadways. Emissions of criteria air pollutants and their precursors were computed using emissions factors from the MOVES model and project-related annual VMT data obtained from *Appendix M – Traffic Impact Analysis Report* of the EA. The vehicle fleet mix was assumed to consist of 50% gasoline-fueled passenger cars and 50% gasoline-fueled passenger trucks. MOVES emission factors for passenger cars/trucks for criteria air/precursor pollutants are presented in **Table 8**.

Year	CO	NO _x	SO ₂	VOC	PM ₁₀	PM _{2.5}
2026	4.13	0.13	<0.01	0.04	0.01	0.06
2027	3.90	0.10	<0.01	0.03	0.01	0.06
2028	3.74	0.09	<0.01	0.02	0.01	0.06
2029	3.57	0.08	<0.01	0.02	0.01	0.06
2030	3.37	0.06	<0.01	0.02	0.01	0.06
2031	3.22	0.05	<0.01	0.02	0.01	0.06
2032	3.06	0.03	<0.01	0.02	0.01	0.06
2033	2.91	0.03	<0.01	0.02	0.01	0.06
2034	2.75	0.02	<0.01	0.01	0.01	0.06
2035	2.59	0.02	<0.01	0.01	0.01	0.06
2036	1.90	0.02	<0.01	0.05	0.01	0.06
2041	1.37	0.01	<0.01	0.05	0.01	0.06

Notes: CO = carbon monoxide, NO_x = nitrogen oxide, SO₂ = sulfur dioxide, VOC = volatile organic compounds, PM₁₀ = particulate matter with a diameter of 10 microns or smaller, PM_{2.5} = particulate matter with a diameter of 2.5 microns or smaller. Source: U.S. EPA MOVES4, 2024.

The traffic impact analysis analyzed VMT for 2027, 2036 and 2041. The 2036 VMT were conservatively applied to each analysis year, because they represent the year with the highest VMT during the analysis period of 2026 through 2036. The VMT for 2036 is 6,772,648 miles and the VMT for the build-out year 2041 is 7,579,955 miles. Motor vehicle emissions are calculated using the same methodology applied to on-road construction vehicles.

4. Emissions Inventory Results

4.1. Criteria Air/Precursor Pollutants Emissions Inventory Results

The results of the construction and operational emissions inventories are provided in **Table 9** and **Table 10** for Alternatives #1 and #2, respectively. Notably, operational emissions inventories were developed only for Alternative #2.

For disclosure purposes, under NEPA, emission results are presented for the criteria air pollutants and pollutant precursors CO, NO_x, SO₂, VOC, PM₁₀ and PM_{2.5}. The results of NO_x and VOCs are further compared to their applicable CAA General Conformity *de minimis* thresholds of 100 and 50 tons per year, respectively.

Year	Category	CO	NO _x	SO ₂	PM ₁₀	PM _{2.5}	VOC
2027	Construction	3.4	0.51	<0.01	0.39	0.05	0.15
	<i>CAA de minimis thresholds</i>	--	100	--	--	--	50
	Exceeds CAA de minimis thresholds?	--	No	--	--	--	No
2028	Construction	3.2	0.47	<0.01	0.39	0.05	0.15
	<i>CAA de minimis thresholds</i>	--	100	--	--	--	50
	Exceeds CAA de minimis thresholds?	--	No	--	--	--	No
2032	Construction	1.9	0.05	<0.01	0.07	0.01	0.02
	<i>CAA de minimis thresholds</i>	--	100	--	--	--	50
	Exceeds CAA de minimis thresholds?	--	No	--	--	--	No
2033	Construction	1.7	0.04	<0.01	0.07	0.01	0.02
	<i>CAA de minimis thresholds</i>	--	100	--	--	--	50
	Exceeds CAA de minimis thresholds?	--	No	--	--	--	No
2034	Construction	1.6	0.04	<0.01	0.07	0.01	0.02
	<i>CAA de minimis thresholds</i>	--	100	--	--	--	50
	Exceeds CAA de minimis thresholds?	--	No	--	--	--	No

Notes:
 Criteria air pollutants and their precursors include carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO₂), volatile organic compounds (VOCs), and particulate matter with diameters of 10 and 2.5 microns (PM₁₀ and PM_{2.5}).
 The City of Manassas is attainment for the pollutants CO, SO₂, PM_{2.5} and PM₁₀, thus the *CAA de minimis* levels do not apply to these pollutants.
 Results may reflect rounding.
 Construction emissions include emissions associated with on-road construction vehicles, off-road construction equipment and fugitives (dust and evaporative).
 Source: CMT, 2025.

Year	Category	Source	CO	NO _x	SO ₂	PM ₁₀	PM _{2.5}	VOC
2026	Construction		12.7	8.9	0.02	8.9	1.2	1.9
	Operational ¹	Motor Vehicles	30.8	1.0	0.02	0.4	0.1	0.3
		Aircraft	28.1	34.0	3.22	0.3	0.3	3.5
	Total		71.6	43.9	3.26	9.6	1.5	5.7
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2027	Construction		14.4	3.5	0.01	4.6	0.6	1.4
	Operational ¹	Motor Vehicles	29.1	0.8	0.02	0.4	0.1	0.2
		Aircraft	39.4	47.7	4.52	0.4	0.4	4.9
	Total		83.0	52.0	4.55	5.4	1.1	6.5

Table 10. Alternative #2 Criteria Air/Precursor Pollutants Emissions Inventory (Short Tons)

Year	Category	Source	CO	NO _x	SO ₂	PM ₁₀	PM _{2.5}	VOC
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
	Exceeds CAA de minimis thresholds?		--	No	--	--	--	No
2028	Construction		11.3	2.1	0.01	3.2	0.4	1.0
	Operational ¹	Motor Vehicles	27.9	0.7	0.02	0.4	0.1	0.2
		Aircraft	43.3	52.3	4.96	0.5	0.5	5.4
	Total		82.5	55.1	4.98	4.1	0.9	6.6
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2029	Construction		7.2	2.3	<0.01	3.0	0.4	1.1
	Operational ¹	Motor Vehicles	26.6	0.6	0.01	0.4	0.1	0.2
		Aircraft	50.5	61.1	5.79	0.5	0.5	6.3
	Total		84.3	63.9	5.81	3.9	1.0	7.6
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2030	Construction		2.6	1.3	<0.01	1.8	0.2	0.7
	Operational ¹	Motor Vehicles	25.2	0.5	0.01	0.4	0.1	0.1
		Aircraft	57.8	69.8	6.62	0.6	0.6	7.2
	Total		85.6	71.6	6.64	2.8	0.9	8.0
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2031	Operational ¹	Motor Vehicles	24.0	0.4	0.01	0.4	0.1	0.1
		Aircraft ¹	63.3	76.5	7.25	0.7	0.7	7.9
	Total		87.3	76.9	7.27	1.1	0.7	8.1
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2032	Construction		1.9	<0.01	<0.01	0.1	<0.01	<0.01
	Operational ¹	Motor Vehicles	22.8	0.2	0.01	0.4	0.1	0.1
		Aircraft	64.7	78.3	7.42	0.7	0.7	8.1
	Total		89.4	78.5	7.43	1.2	0.8	8.2
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2033	Construction		8.5	1.0	<0.01	1.7	0.2	0.6
	Operational ¹	Motor Vehicles	21.8	0.2	0.01	0.4	0.1	0.1
		Aircraft	66.2	80.0	7.59	0.7	0.7	8.3
	Total		96.5	81.2	7.61	2.8	1.0	9.0
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2034	Construction		6.3	0.1	<0.01	0.5	0.1	0.2
	Operational ¹	Motor Vehicles	20.5	0.2	0.01	0.4	0.1	0.1
		Aircraft	67.7	81.9	7.76	0.7	0.7	8.5
	Total		94.5	82.1	7.78	1.7	0.8	8.8
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2035	Construction		2.0	0.4	<0.01	0.2	0.1	0.1
	Operational ¹	Motor Vehicles	19.3	0.1	0.01	0.4	0.1	0.1
		Aircraft	68.4	82.7	7.84	0.7	0.7	8.6
	Total		89.7	83.2	7.85	1.3	0.8	8.7
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	

Table 10. Alternative #2 Criteria Air/Precursor Pollutants Emissions Inventory (Short Tons)								
Year	Category	Source	CO	NO _x	SO ₂	PM ₁₀	PM _{2.5}	VOC
2036	Construction		1.8	0.03	<0.01	0.2	0.1	0.05
	Operational ¹	Motor Vehicles	14.2	0.1	0.01	0.4	0.1	0.4
		Aircraft	67.1	81.2	7.69	0.7	0.7	8.4
	Total		83.1	81.3	7.70	1.3	0.8	8.9
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
Exceeds CAA de minimis thresholds?		--	No	--	--	--	No	
2041	Operational ¹	Motor Vehicles	11.4	0.1	0.01	0.5	0.1	0.4
		Aircraft	77.0	92.3	8.72	0.9	0.8	8.8
	Total		88.4	92.4	8.73	1.3	0.9	9.2
	<i>CAA de minimis thresholds</i>		--	100	--	--	--	50
	Exceeds CAA de minimis thresholds?		--	No	--	--	--	No

Notes:
¹ Operational emissions represent the difference between Alternative #2 and the No Action.
 Criteria air pollutants and their precursors include carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO₂), volatile organic compounds (VOCs), and particulate matter with diameters of 10 and 2.5 microns (PM₁₀ and PM_{2.5}).
 The City of Manassas is attainment for the pollutants CO, SO₂, PM_{2.5} and PM₁₀, thus the CAA *de minimis* levels do not apply to these pollutants. Results may reflect rounding.
 Construction emissions include emissions associated with on-road construction vehicles, off-road construction equipment and fugitives (dust and evaporative).
 Motor vehicles emissions represent passenger cars/trucks traveling on airport roadways.
 Aircraft emissions include emissions associated with aircraft engines, APUs, and GSE.
 Source: CMT, 2025.

As previously stated, under the CAA General Conformity Rule, federal agencies are prohibited from supporting, permitting, or approving any action that does not conform to an approved SIP. The most direct approach to meeting the General Conformity requirement is demonstrating that the Alternatives’ emissions are below applicable *de minimis* levels. As presented in **Table 9** and **Table 10**, project-related emissions of criteria air/precursor pollutant for both Alternatives #1 and #2 are below *de minimis* levels for NO_x and VOCs. Therefore, both Alternatives #1 and #2 comply with the requirements of the CAA General Conformity Rule, and a formal Conformity Determination is not required. No further analysis is necessary.

5. Summary

Compliance with NEPA was achieved by disclosing the impacts associated with the construction and operational activities for Alternatives #1 and #2 . Furthermore, emissions results for both alternatives are below the CAA *de minimis* thresholds of 100 tons per year for NO_x and 50 tons per year for VOCs. Consequently, the Alternatives #1 and #2 are considered to conform to the applicable EPA-approved SIP, and no additional analysis under the CAA General Conformity Rule is required.