AIR QUALITY

Affected Environment

The Clean Air Act (CAA) requires the United States Environmental Protection Agency (USEPA) to set, and periodically review, National Ambient Air Quality Standards (NAAQS) for six air pollutants ("criteria" air pollutants) which can be harmful to the health and welfare of the public. The six air pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2). There are currently NAAQS for two sizes of PM—particles that are 10 micrometers or less in size (PM_{10}) and particles that are 2.5 micrometers or less in size ($PM_{2.5}$).

An area with measured levels of the criteria air pollutants at or below the NAAQS is designated by the USEPA to be an "attainment" area. When measured levels of a pollutant exceed the NAAQS, an area is designated to be a "nonattainment" area. After a nonattainment area meets the standards and other requirements of the CAA, the USEPA redesignates the area to be "maintenance" for a period of 20 years. For some areas, the USEPA is not able to determine an area's status. These areas are designated to be "unclassifiable". The area where SLC is located is currently designated by the USEPA to be:

- Attainment – CO, Pb, and NO_2
- Nonattainment – O_3, SO_2, and $PM_{2.5}$
- Maintenance – PM_{10}

For some pollutants, the USEPA also classifies nonattainment areas further using descriptive identifiers that denote the severity of the nonattainment status. Based on measured levels of the pollutants, the area where SLC is located is currently designated to be a "moderate" nonattainment area for O_3 and a "serious" nonattainment area for $PM_{2.5}$. The SO_2 designation does not have a descriptive identifier.

Seasonal fluctuations in Salt Lake County play a major role in levels of O_3 and PM. In the summer, levels of O_3 can be measured above the NAAQS in areas with high concentrations of nitrogen oxides (NO_x) and volatile organic compounds (VOC)—precursors to O_3. In the winter, temperature inversions frequently trap polluted air and prevent the dispersal of PM. Fluctuations in the weather do not have role in the area's elevated SO_2 concentrations which are primarily due to industrial facilities (e.g., copper smelting).

An operational emissions inventory of aircraft and motor vehicles was prepared for existing conditions. Operational emissions were evaluated using the FAA's Aviation Environmental Design Tool (AEDT, version 3f) and USEPA's Motor Vehicle Emissions Simulator (MOVES, version 4).[1] The existing operational emissions for the year 2022 are provided in **Table 1**. For the existing condition, aircraft emissions result from those aircraft departing from Runway 35 using the existing taxiways; and motor

[1] EPA, Latest Version of MOtor Vehicle Emission Simulator (MOVES), https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves.

vehicle emissions represent those that occurred from the airport entrance to the existing employee parking lot.

Table 1. Operational Emissions Existing Condition (Tons)

Year	Source	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOC
2022	Aircraft	227	38	11	1	1	57
	Motor Vehicle	10	1	<1	<1	<1	<1
	Total	**237**	**39**	**11**	**1**	**1**	**57**
Note: Values may reflect rounding.							

Environmental Consequences

An air quality assessment of the proposed improvements at SLC was performed to comply with the requirements of the National Environmental Policy Act (NEPA). NEPA requires federal agencies to assess the environmental effects of their proposed actions as part of the decision-making process. Because the area in which SLC is located is designated by the USEPA to be nonattainment for O_3, SO_2, and $PM_{2.5}$, and maintenance for PM_{10}, the assessment also addresses the State Implementation Plan (SIP) conformity requirements of the CAA. A SIP is a state's plan for bringing an area into compliance with the NAAQS.

NEPA does not define thresholds that address the significance of changes in levels of air pollutants. Therefore, with respect to NEPA, the air quality assessment of the proposed improvements to SLC was performed for disclosure purposes. To address the SIP conformance requirements of the CAA for areas designated nonattainment or maintenance, the USEPA established *de minimis* thresholds. These thresholds are only applicable to the pollutants for which the area has either designation. If project-related emissions (i.e., the net emissions when comparing future emissions with and without proposed improvements) are below the applicable *de minimis* level, the emissions are exempt from the CAA's SIP conformance requirements. If emissions are above an applicable *de minimis* level, a formal SIP conformity determination must be performed. **Table 2** lists the *de minimis* levels for the air pollutants for which the area in which SLC is located is designated nonattainment or maintenance.

Table 2. Air Pollutant De Minimis Levels

Pollutant	Standard	Designation	*De Minimis* Level (tons)
O_3	2015 8-Hour	Moderate nonattainment	100[1]
SO_2	1971 1-Hour	Nonattainment	100
$PM_{2.5}$	2006 24-Hour	Serious nonattainment	100[2]
PM_{10}	1987 24-Hour	Maintenance	100

[1] The O_3 *de minimis* level is applicable to emissions of NO_x and VOC, precursors to the pollutant.
[2] The $PM_{2.5}$ *de minimis* level is applicable to direct emissions of $PM_{2.5}$, SO_2, NO_x, and VOC, precursors to the pollutant.
Source: Title 40 Section 93 of the Code of Federal Regulations (40 CFR §93.153(b)(1) and (b)(2)).

To evaluate the air pollutant emissions that would occur to construct the proposed improvements at SLC and the future change in emissions with the improvements, air pollutant emission inventories were prepared for CO, the O_3 and $PM_{2.5}$ precursors NO_x and VOC, PM_{10}, and $PM_{2.5}$. Because emissions rates of NO_2 and SO_2 are not available, inventories of NO_x and SO_X, respectively, were prepared. Emissions of NO_2 are one component of NO_x emissions and emissions of SO_2 are one component of SO_x emissions. Therefore, the estimates of NO_2 and SO_2 are conservative estimates. Emissions of Pb, the remaining pollutant for which there are NAAQS, were not prepared because emissions would be minimal and the only emission factors available represent emissions for complete landing-takeoff cycles (LTOs). The following summarizes the methodology and results of the air quality assessment. **Appendix A** provides detailed methodology information and documents the data used to prepare the assessment. ***Construction Emissions***

Air pollutant emissions associated with construction activities are temporary and variable depending on project location, duration and level of activity. These emissions occur predominantly in engine exhaust from operating construction equipment (scrapers, dozers, etc.), vehicles that transport material and supplies to and from the site (delivery trucks, haul trucks, etc.), and from construction worker vehicles commuting to and from the site. Additionally, fugitive dust emissions of PM_{10} and $PM_{2.5}$ result from site preparation, land clearing, material handling, equipment movement on unpaved areas; and fugitive evaporative emissions of VOCs occur during the application of asphalt from paving activities.

The construction equipment typically utilized in airport projects is comprised both of on-road vehicles (i.e., on-road-licensed) and non-road equipment (i.e., off-road). The former category of vehicles is used for the transport and delivery of supplies, material, and equipment to and from the site and includes construction worker vehicles. The latter category of equipment is operated on-site for activities such as, but not limited to, soil/material handling, site clearing and grubbing.

Project-related construction emissions were based on construction equipment types and activity levels derived from project design data using the Transportation Research Board (TRB's) Airport Construction Emissions Inventory Tool (ACEIT) and emission factors estimated using the USEPA's MOVES model.[2] Construction activities associated with the Proposed Action are anticipated to begin in 2026 and end in 2040. **Table 3** list the Proposed Action's phases and construction projects.

Table Error! No text of specified style in document.**. Proposed Action Phases and Construction Projects**

Phase No.	Construction Projects	Start (Month/Year)	End (Month/Year)
1	Canal Relocation and wetland mitigation	April-26	April-27
1b	New detention pond	April-27	October-28
	New pumpstation	April-27	October-28
2	Employee lot	April-28	October-29
	Roadway Construction	April-28	October-29
3	Employee screening and maintenance facility	April-30	April-32

[2] TRB, Airport Cooperative Research Program (ACRP) Report 102, Guidance for Estimating Airport Construction Emissions, 2014, http://www.trb.org/ACRP/Blurbs/170234.aspx.

	Sitework for Facility	April-30	April-32
4	New North Temple (Roadway)	April-32	October-33
	Relocated Salt Storage facility	April-32	October-33
5	Relocate ASOS	April-34	October-35
6	Relocate RTR	April-36	October-37
7	Construct new End-Around Taxiway	April-38	October-40
Source: HNTB 2024.			

The construction emission inventory is presented in **Table 4.** As shown, the greatest level of construction-related air pollutant emissions would occur in the year 2028.

Table 4. Construction Emission (tons)

Year	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOC
2026	3	4	<0.1	3	<1	<1
2027	4	2	<0.1	3	<1	<1
2028	6	4	<0.1	5	1	4
2029	4	4	<0.1	3	<1	4
2030	2	1	<0.1	2	<1	<1
2031	3	1	<0.1	3	<1	<1
2032	3	1	<0.1	3	<1	<1
2033	2	1	<0.1	3	<1	<1
2034	1	<1	<0.1	2	<1	<1
2035	1	<1	<0.1	3	<1	<1
2036	1	<1	<0.1	2	<1	<1
2037	1	<1	<0.1	3	<1	<1
2038	1	1	<0.1	2	<1	1
2039	1	1	<0.1	3	<1	1
2040	1	1	<0.1	3	<1	1
Note: Values may reflect rounding. Source: Crawford, Murphy & Tilly, Inc., 2024						

Operational Emissions

Over the long-term, the proposed south end-around-taxiway (SEAT) and employee south parking lot would respectively change the routes of some aircraft and some employee-related motor vehicle traffic. Project-related aircraft emissions associated with the SEAT were estimated for build out year 2040 and for the period five years after build out (2045). Project-related motor vehicle emissions associated with the employee south parking lot were estimated for opening year 2029 through build out year 2040 and (2045).

For the No Action, aircraft emissions result from those aircraft departing from Runway 35 using the existing taxiways; and motor vehicle emissions represent those that occurred from the airport entrance

to the existing employee parking lot. For the Proposed Action, aircraft emissions result from those aircraft departing from Runway 35 using the south end-around taxiway; and motor vehicle emissions represent those that occurred from the airport entrance to the proposed employee parking lot.

Because the SEAT would only change the taxi route of the aircraft departing from Runway 35, only emissions associated with the taxi mode of the aircraft using the runway were evaluated. The aircraft taxi emissions inventory was prepared using the FAA AEDT Aircraft taxi-times with and without the SEAT were derived based on runway distance, runway utilization, and an assumed aircraft taxi speed of 15 miles per hour. The change in emissions from motor vehicles was prepared using estimates of the travel distance and annual activity to/from the proposed parking lot for both employee vehicles and airport shuttles. Motor vehicle-related emission rates were obtained from USEPA's MOVES.

The operational emissions inventory for the Proposed Action and No Action Alternatives is presented in **Table 5**. As shown, because of the greater level of airport activity, the greatest level of emissions would occur in the year 2037.

Table 5. Operational Emissions (tons)

Year	Alternative	Source	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOC
2029	No Action	Motor Vehicles	7	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	26	1	2	<1	1	<1
	Project Related Emissions		**20**	**1**	**2**	**<1**	**<1**	**<1**
2030	No Action	Motor Vehicles	6	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	25	1	2	<1	1	<1
	Project Related Emissions		**18**	**1**	**1**	**<1**	**<1**	**<1**
2031	No Action	Motor Vehicles	6	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	23	1	1	<1	1	<1
	Project Related Emissions		**17**	**1**	**1**	**<1**	**<1**	**<1**
2032	No Action	Motor Vehicles	6	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	22	1	1	<1	1	<1
	Project Related Emissions		**16**	**1**	**1**	**<1**	**<1**	**<1**
2033	No Action	Motor Vehicles	5	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	20	1	1	<1	1	<1
	Project Related Emissions		**15**	**<1**	**1**	**<1**	**<1**	**<1**
2034	No Action	Motor Vehicles	5	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	19	1	1	<1	1	<1
	Project Related Emissions		**14**	**<1**	**1**	**<1**	**<1**	**<1**
2035	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	18	1	1	<1	1	<1
	Project Related Emissions		**14**	**<1**	**1**	**<1**	**<1**	**<1**
2036	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	17	1	1	<1	1	<1

Year	Alternative	Source	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOC
	Project Related Emissions		**13**	**<1**	**1**	**<1**	**<1**	**<1**
2037	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	16	1	1	<1	<1	<1
	Project Related Emissions		**12**	**<1**	**1**	**<1**	**<1**	**<1**
2038	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	15	1	1	<1	<1	<1
	Project Related Emissions		**11**	**<1**	**1**	**<1**	**<1**	**<1**
2039	No Action	Motor Vehicles	3	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	14	1	1	<1	<1	<1
	Project Related Emissions		**11**	**<1**	**1**	**<1**	**<1**	**<1**
2040	No Action	Aircraft	432	86	25	1	1	108
		Motor Vehicles	3	<1	<1	<1	<1	<1
	Proposed Action	Aircraft	598	119	34	2	2	120
		Motor Vehicles	14	1	1	<1	<1	<1
	Project Related Emissions		**177**	**34**	**10**	**<1**	**1**	**12**
2045	No Action	Aircraft	514	105	30	1	1	126
		Motor Vehicles	3	<1	<1	<1	<1	<1
	Proposed Action	Aircraft	702	144	41	2	2	139
		Motor Vehicles	12	<1	1	<1	<1	<1
	Project Related Emissions		**196**	**39**	**12**	**1**	**1**	**13**

Note: Values may reflect rounding.
Source: Crawford, Murphy & Tilly, Inc. 2024. Air Quality Report SLC Environmental Assessment. (See Appendix A).

Clean Air Act (CAA) Applicability

As previously stated, to address the SIP conformance requirements of the CAA, the USEPA established *de minimis* thresholds for the pollutants for which an area is designated nonattainment or maintenance. To determine if emissions resulting from the Proposed Action are exempt from the CAA's SIP conformance requirements, annual estimates of total project-related construction and operational emissions were compared to the *de minimis* thresholds.

As stated previously, project-related construction activities are anticipated to begin in 2026 and end in 2040. Project-related motor vehicle emissions associated with the new employee south parking lot were estimated for opening year 2029 through build out year 2040 and for the period five years after build out (2045); and aircraft emissions associated with the SEAT were estimated for build out year 2040 and 2045. These emission are presented in **Table 6**.

As shown, the estimated increase in the criteria air pollutants and pollutant precursors for which the area is designated nonattainment and maintenance are all below the thresholds. Therefore, the CAA's SIP conformance requirements are not applicable to the Proposed Action. Notably, although SLC is in an area designated to be attainment for the air pollutant CO, the greatest construction and operational

emissions estimates of this air pollutant are also below the *de minimis* level established by the CAA (i.e., 100 tons).

Table 6. Construction and Operational Emissions (tons)

Year	Alternative	Source	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOC
2026	Proposed Action	Construction	3	4	<1	3	<1	<1
	De Minimis		--	**100**	**100**	**100**	**70**	--
2027	Proposed Action	Construction	4	2	<1	3	<1	<1
	De Minimis		--	**100**	**100**	**100**	**70**	--
2028	Proposed Action	Construction	6	4	<1	5	1	4
	De Minimis		--	**100**	**100**	**100**	**70**	--
2029	No Action	Motor Vehicles	7	<1	<1	<1	<1	<1
		Total	7	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	26	1	2	<1	1	<1
		Construction	4	4	<1	3	<1	4
		Total	30	5	2	3	1	4
	Project Related Emissions		**23**	**5**	**2**	**3**	**1**	**4**
	De Minimis		--	**100**	**100**	**100**	**70**	--
2030	No Action	Motor Vehicles	6	<1	<1	<1	<1	<1
		Total	6	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	25	1	2	<1	1	<1
		Construction	2	1	<1	2	<1	<1
		Total	27	2	2	2	1	<1
	Project Related Emissions		**21**	**2**	**1**	**2**	**1**	**<1**
	De Minimis		--	**100**	**100**	**100**	**70**	--
2031	No Action	Motor Vehicles	6	<1	<1	<1	<1	<1
		Total	6	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	23	1	1	<1	1	<1
		Construction	3	1	<1	3	<1	<1
		Total	26	2	1	3	1	<1
	Project Related Emissions		**20**	**2**	**1**	**3**	**1**	**<1**
	De Minimis		--	**100**	**100**	**100**	**70**	--
2032	No Action	Motor Vehicles	6	<1	<1	<1	<1	<1
		Total	6	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	22	1	1	<1	1	<1
		Construction	3	1	<1	3	<1	<1
		Total	25	2	1	3	1	<1
	Project Related Emissions		**19**	**2**	**1**	**3**	**1**	**<1**

Year	Alternative	Source	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOC
	De Minimis		--	100	100	100	70	--
2033	No Action	Motor Vehicles	5	<1	<1	<1	<1	<1
		Total	5	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	20	1	1	<1	1	<1
		Construction	2	1	<1	3	<1	<1
		Total	23	1	1	3	1	<1
	Project Related Emissions		**17**	**1**	**1**	**3**	**1**	**<1**
	De Minimis		--	100	100	100	70	--
2034	No Action	Motor Vehicles	5	<1	<1	<1	<1	<1
		Total	5	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	19	1	1	<1	1	<1
		Construction	1	<1	<1	2	<1	<1
		Total	20	1	1	2	1	<1
	Project Related Emissions		**15**	**1**	**1**	**2**	**1**	**<1**
	De Minimis		--	100	100	100	70	--
2035	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
		Total	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	18	1	1	<1	1	<1
		Construction	1	<1	<1	3	<1	<1
		Total	19	1	1	3	1	<1
	Project Related Emissions		**14**	**<1**	**1**	**3**	**1**	**<1**
	De Minimis		--	100	100	100	70	--
2036	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
		Total	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	17	1	1	<1	1	<1
		Construction	1	<1	<1	2	<1	<1
		Total	18	1	1	2	1	<1
	Project Related Emissions		**13**	**<1**	**1**	**2**	**1**	**<1**
	De Minimis		--	100	100	100	70	--
2037	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
		Total	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	16	1	1	<1	<1	<1
		Construction	1	<1	<1	3	<1	<1
		Total	17	1	1	3	1	<1
	Project Related Emissions		**13**	**<1**	**1**	**3**	**1**	**<1**
	De Minimis		--	100	100	100	70	--

Year	Alternative	Source	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOC
2038	No Action	Motor Vehicles	4	<1	<1	<1	<1	<1
		Total	4	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	15	1	1	<1	<1	<1
		Construction	1	1	<1	2	<1	1
		Total	16	1	1	2	1	1
	Project Related Emissions		**12**	**1**	**1**	**2**	**1**	**1**
	De Minimis		**--**	**100**	**100**	**100**	**70**	**--**
2039	No Action	Motor Vehicles	3	<1	<1	<1	<1	<1
		Total	3	<1	<1	<1	<1	<1
	Proposed Action	Motor Vehicles	14	1	1	<1	<1	<1
		Construction	1	1	<1	3	<1	1
		Total	16	1	1	3	1	1
	Project Related Emissions		**12**	**1**	**1**	**3**	**1**	**1**
	De Minimis		**--**	**100**	**100**	**100**	**70**	**--**
2040	No Action	Aircraft	432	86	25	1	1	108
		Motor Vehicles	3	<1	<1	<1	<1	<1
		Total	435	86	25	1	1	108
	Proposed Action	Aircraft	598	119	34	2	2	120
		Motor Vehicles	14	1	1	<1	<1	<1
		Construction	1	1	<1	3	<1	1
		Total	613	120	35	4	2	121
	Project Related Emissions		**178**	**34**	**10**	**3**	**1**	**13**
	De Minimis		**--**	**100**	**100**	**100**	**70**	**--**
2045	No Action	Aircraft	514	105	30	1	1	126
		Motor Vehicles	3	<1	<1	<1	<1	<1
		Total	517	106	30	1	2	126
	Proposed Action	Aircraft	702	144	41	2	2	139
		Motor Vehicles	12	<1	1	<1	<1	<1
		Total	713	144	42	2	3	139
	Project Related Emissions		**196**	**39**	**12**	**1**	**1**	**13**
	De Minimis		**--**	**100**	**100**	**100**	**70**	**--**

Notes: Values may reflect rounding.
Source: Crawford, Murphy & Tilly, Inc. 2024. Air Quality Report SLC Environmental Assessment. (See Appendix A).

CLIMATE

Affected Environment

Research has shown that the increase in atmospheric greenhouse gas (GHG) emissions is significantly affecting the Earth's climate. These conclusions are based upon a scientific record that includes substantial contributions from the United States Global Change Research Program (USGCRP). Congress mandated the USGCRP in the Global Change Research Act to "assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.[3]

In 2009, based primarily on the scientific assessments of the USGCRP, as well as the National Research Council (NRC) and the Intergovernmental Panel on Climate Change (IPCC), the USEPA issued a finding that it was reasonable to assume that changes in our climate caused by elevated concentrations of GHGs in the atmosphere endanger the public health and public welfare of current and future generations.[4] In 2016, the USEPA acknowledged that scientific assessments "highlight the urgency of addressing the rising concentration of carbon dioxide (CO_2) in the atmosphere" and formally announced that GHG emissions from certain classes of aircraft engines contribute to climate change.[5]

Although there are no federal standards or significance thresholds for aviation-related GHG emissions, it is well established that GHG emissions affect climate.[6] Consistent with Executive Order 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*, the Council on Environmental Quality (CEQ) issued interim NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change for which public comment was solicitated through April 10, 2023. The FAA is currently developing procedures to comply with the CEQ guidance.

Similar to the air quality analysis, an operational emissions inventory of GHGs of aircrat and motor vehicles was prepared for existing conditions. Operational emissions were evaluated using the FAA's AEDT and USEPA's MOVES. The existing operational emissions for the year 2022 are provided in **Table 7**.

Table 7. Operational GHG Emissions Existing Condition (metric tons of CO_2e)

Year	Source	CO_2	CH_4	N_2O	Total
2022	Aircraft	24,415	4	199	24,618
	Motor Vehicle	939	3	4	946
	Total	**25,354**	**7**	**203**	**25,564**
Note: Values may reflect rounding.					

Environmental Consequences

[3] Global Change Research Act of 1990, Pub. L. 101–606, Sec. 103 (November 16, 1990), http://www.globalchange.gov.
[4] Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, 74 Federal Register. 66496 (December 15, 2009).
[5] USEPA finalized findings that GHG emissions from certain classes of engines used in aircraft contribute to the air pollution that causes climate change endangering public health and welfare under section 231(a) of the Clean Air Act.
[6] FAA, 1050.1F Desk Reference, Version 3, June 2023.

For disclosure purposes, project-related GHG emissions were estimated for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)—three of the primary atmospheric GHG. Similar to the air quality analysis, the No Action operational and the Proposed Action construction and operational emissions were estimated and are presented in **Table 8**. The estimated project-related annual GHG emissions are in metric tons of CO_2 equivalent (CO_2e) using Global Warming Potentials (GWPs) of one for CO_2, 28 for CH_4, and 265 for N_2O. GWPs are used to derive CO_2e for the purpose of comparing the relative climate effects of other GHGs. As shown, the greatest level of project-related GHG emissions would occur in the year 2028.

Table 8. Construction and Operational GHG Emissions (metric tons of CO_2e)

Year	Alternative	Source	CO_2	CH_4	N_2O	Total
2026	Proposed Action	Construction	2,736	1	19	2,755
2027	Proposed Action	Construction	1,624	<1	11	1,636
2028	Proposed Action	Construction	2,526	1	32	2,558
2029	No Action	Motor Vehicles	756	4	3	763
		Total	756	4	3	763
	Proposed Action	Motor Vehicles	3,094	37	23	3,154
		Construction	2,283	1	31	2,315
		Total	5,377	38	55	5,469
	Project Related Emissions		**4,621**	**34**	**52**	**4,706**
2030	No Action	Motor Vehicles	732	4	3	738
		Total	732	4	3	738
	Proposed Action	Motor Vehicles	3,004	36	23	3,063
		Construction	751	<1	11	762
		Total	3,755	37	34	3,825
	Project Related Emissions		**3,023**	**33**	**31**	**3,087**
2031	No Action	Motor Vehicles	709	3	3	716
		Total	709	3	3	716
	Proposed Action	Motor Vehicles	2,922	36	22	2,980
		Construction	995	<1	14	1,010
		Total	3,917	36	37	3,989
	Project Related Emissions		**3,207**	**33**	**34**	**3,274**
2032	No Action	Motor Vehicles	688	3	3	694
		Total	688	3	3	694
	Proposed Action	Motor Vehicles	2,842	35	22	2,900
		Construction	941	<1	12	953

Year	Alternative	Source	CO_2	CH_4	N_2O	Total
		Total	3,783	35	34	3,853
	Project Related Emissions		**3,095**	**32**	**31**	**3,159**
2033	No Action	Motor Vehicles	668	3	3	674
		Total	668	3	3	674
	Proposed Action	Motor Vehicles	2,769	35	22	2,825
		Construction	675	<1	8	683
		Total	3,444	35	30	3,508
	Project Related Emissions		**2,775**	**31**	**27**	**2,834**
2034	No Action	Motor Vehicles	650	3	3	656
		Total	650	3	3	656
	Proposed Action	Motor Vehicles	2,701	34	22	2,756
		Construction	98	<1	<1	99
		Total	2,799	34	22	2,855
	Project Related Emissions		**2,149**	**31**	**19**	**2,199**
2035	No Action	Motor Vehicles	634	3	3	640
		Total	634	3	3	640
	Proposed Action	Motor Vehicles	2,638	33	21	2,692
		Construction	108	<1	<1	109
		Total	2,746	33	22	2,801
	Project Related Emissions		**2,112**	**30**	**19**	**2,161**
2036	No Action	Motor Vehicles	619	3	3	625
		Total	619	3	3	625
	Proposed Action	Motor Vehicles	2,581	32	21	2,634
		Construction	97	<1	<1	97
		Total	2,677	33	21	2,731
	Project Related Emissions		**2,058**	**29**	**19**	**2,106**
2037	No Action	Motor Vehicles	605	3	3	611
		Total	605	3	3	611
	Proposed Action	Motor Vehicles	2,529	32	21	2,581
		Construction	107	<1	<1	107
		Total	2,635	32	21	2,688
	Project Related Emissions		**2,030**	**29**	**19**	**2,077**
2038	No Action	Motor Vehicles	593	3	3	598
		Total	593	3	3	598
	Proposed Action	Motor Vehicles	2,480	31	21	2,532
		Construction	580	<1	11	591

Year	Alternative	Source	CO_2	CH_4	N_2O	Total
		Total	3,060	31	31	3,123
	Project Related Emissions		**2,467**	**28**	**29**	**2,525**
2039	No Action	Motor Vehicles	583	3	3	588
		Total	583	3	3	588
	Proposed Action	Motor Vehicles	2,441	31	20	2,492
		Construction	770	<1	15	785
		Total	3,211	31	35	3,277
	Project Related Emissions		**2,629**	**28**	**32**	**2,689**
2040	No Action	Aircraft	53,121	8	433	53,562
		Motor Vehicles	575	3	3	580
		Total	53,696	11	436	54,142
	Proposed Action	Aircraft	73,608	8	601	74,216
		Motor Vehicles	2,409	30	20	2,460
		Construction	640	<1	12	652
		Total	76,656	39	633	77,328
	Project Related Emissions		**22,961**	**28**	**197**	**23,186**
2045	No Action	Aircraft	64,833	9	529	65,371
		Motor Vehicles	543	3	2	548
		Total	65,376	12	531	65,919
	Proposed Action	Aircraft	88,463	9	722	89,193
		Motor Vehicles	2,280	31	19	2,330
		Total	90,743	40	741	91,523
	Project Related Emissions		**25,367**	**28**	**210**	**25,604**

Source: Crawford, Murphy & Tilly, Inc. 2024. Air Quality Report SLC Environmental Assessment. (See Appendix A).

APPENDIX – AIR QUALITY AND CLIMATE

This appendix provides, in more detail, the input and assumptions that were used to derive the emission inventories presented in the air quality and climate sections of the Environmental Assessment (EA).

Construction Emissions

The construction-related emissions inventories were prepared using the Transportation Research Board's Airport Construction Emissions Inventory Tool (ACEIT) and emission factors estimated using the USEPA's MOtor Vehicle Emission Simulator (MOVES, Version 4) model.[7,8] ACEIT provides data

[7] TRB, Airport Cooperative Research Program (ACRP) Report 102, Guidance for Estimating Airport Construction Emissions, 2014, http://www.trb.org/ACRP/Blurbs/170234.aspx.

for the number and types of construction equipment, the horsepower (HP) of the equipment, equipment operating hours, and an estimate of the vehicle-mile travelled (VMT) for worker and material haul trips. These data are based on the type and size of a construction project(s). MOVES is a USEPA emission modeling system that estimates emission factors for mobile sources (i.e., on-road vehicles and off-road construction equipment) at the national, county, and project level for criteria air pollutants and greenhouse gases (GHGs).

ACEIT Inputs and Outputs

The proposed project's construction phase would involve air emission sources including off-road construction equipment and on-road construction vehicles. **Table A-1** presents the overall footprint, schedule, and duration of the elements of the proposed construction project that were used as input to ACEIT for each project phase.

Table A-1. ACEIT Inputs – Construction Project, Footprint, and Schedule

Project Phase	Construction Elements	Footprint	Units	Start (Month/ Year)	End (Month/ Year)	Total Months
1	Canal Relocation and wetland mitigation	23,393,412	Cubic Feet	April-26	April-27	13
1b	New detention pond	1,642,208	Cubic Feet	April-27	October-28	19
	New pumpstation	10,000	Square Feet	April-27	October-28	
2	Employee lot	3,056,824	Square Feet	April-28	October-29	19
	Roadway Construction	53,360	Square Feet	April-28	October-29	
3	Employee screening and maintenance facility	10,000	Square Feet	April-30	April-32	25
	Sitework for Facility	373,328	Square Feet	April-30	April-32	
4	New North Temple Roadway	95,040	Square Feet	April-32	October-33	19
	Relocated Salt Storage facility	10,000	Square Feet	April-32	October-33	
5	Relocate ASOS	10,000	Square Feet	April-34	October-35	19
6	Relocate RTR	10,000	Square Feet	April-36	October-37	19
7	Construct new End-Around Taxiway	1504800	Square Feet	April-38	October-40	31

Source: HNTB, 2024.

ACEIT outputs off-road construction equipment and on-road construction vehicle activity levels, and this information is represented in the analysis by hours of operation and VMT per month, respectively. **Table A-2** lists the off-road construction equipment developed for the analysis using ACEIT, the

[8] EPA, Latest Version of MOtor Vehicle Emission Simulator (MOVES), https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves.

corresponding MOVES equipment description, their activity levels in hours of operation per month, and their respective horsepower, and load factor ranges for each project phase.

Table A-2. ACEIT Outputs – Off-road Construction Equipment

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity (Hours/ Month)	HP	LF
1	Chain Saw	Concrete/Industrial Saws	30	11	0.70
	Chipper/Stump Grinder	Chippers/Stump Grinders (com)	30	100	0.43
	Concrete Truck	Off-highway Trucks	7	600	0.59
	Dozer	Crawler Tractor/Dozers	751	175	0.59
	Excavator	Excavators	573	175	0.59
	Hydroseeder	Other Lawn & Garden Eqp. (com)	11	600	0.59
	Loader	Tractors/Loaders/Backhoes	40	175	0.59
	Off-Road Truck	Off-highway Trucks	11	600	0.59
	Other General Equipment	Other General Industrial Eqp	78	175	0.43
	Pumps	Pumps	10	11	0.43
	Roller	Rollers	573	100	0.59
	Scraper	Scrapers	666	600	0.59
	Skid Steer Loader	Skid Steer Loaders	28	75	0.21
	Tractors/Loader/Backhoe	Tractors/Loaders/Backhoes	38	100	0.21
1b	40 Ton Crane	Cranes	13	300	0.43
	Backhoe	Tractors/Loaders/Backhoes	17	100	0.21
	Chain Saw	Concrete/Industrial Saws	3	11	0.70
	Chipper/Stump Grinder	Chippers/Stump Grinders (com)	3	100	0.43
	Concrete Ready Mix Trucks	Off-highway Trucks	3	600	0.59
	Concrete Truck	Off-highway Trucks	0	600	0.59
	Dozer	Crawler Tractor/Dozers	38	175	0.59
	Excavator	Excavators	27	175	0.59
	Fork Truck	Forklifts	86	100	0.59
	High Lift	Other Construction Equipment	23	100	0.59
	Hydroseeder	Other Lawn & Garden Eqp. (com)	1	600	0.59
	Loader	Tractors/Loaders/Backhoes	2	175	0.59
	Man Lift	Other Construction Equipment	63	75	0.21
	Man Lift (Fascia Construction)	Other Construction Equipment	6	75	0.21
	Off-Road Truck	Off-highway Trucks	1	600	0.59
	Other General Equipment	Other General Industrial Eqp	4	175	0.43
	Pumps	Pumps	1	11	0.43
	Roller	Rollers	27	100	0.59

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity (Hours/ Month)	HP	LF
	Scraper	Scrapers	32	600	0.59
	Skid Steer Loader	Skid Steer Loaders	1	75	0.21
	Tractors/Loader/Backhoe	Tractors/Loaders/Backhoes	2	100	0.21
2	Air Compressor	Air Compressors	61	100	0.43
	Asphalt Paver	Pavers	23	175	0.59
	Chain Saw	Concrete/Industrial Saws	46	11	0.70
	Chipper/Stump Grinder	Chippers/Stump Grinders (com)	46	100	0.43
	Concrete Saws	Concrete/Industrial Saws	61	40	0.59
	Concrete Truck	Off-highway Trucks	267	600	0.59
	Curb/Gutter Paver	Pavers	4	175	0.59
	Dozer	Crawler Tractor/Dozers	308	175	0.59
	Excavator	Excavators	65	175	0.59
	Grader	Graders	18	300	0.59
	Hydroseeder	Other Lawn & Garden Eqp. (com)	17	600	0.59
	Loader	Tractors/Loaders/Backhoes	23	175	0.59
	Off-Road Truck	Off-highway Trucks	17	600	0.59
	Other General Equipment	Other General Industrial Eqp	223	175	0.43
	Pumps	Pumps	15	11	0.43
	Roller	Rollers	190	100	0.59
	Rubber Tired Loader	Rubber Tire Loaders	61	175	0.59
	Scraper	Scrapers	76	600	0.59
	Skid Steer Loader	Skid Steer Loaders	42	75	0.21
	Slip Form Paver	Pavers	61	175	0.59
	Surfacing Equipment (Grooving)	Surfacing Equipment	90	25	0.59
	Tractors/Loader/Backhoe	Tractors/Loaders/Backhoes	49	100	0.21
	Vibratory Compactor	Plate Compactors	9	6	0.43
3	40 Ton Crane	Cranes	10	300	0.43
	Backhoe	Tractors/Loaders/Backhoes	192	100	0.21
	Bob Cat	Tractors/Loaders/Backhoes	36	75	0.21
	Bulldozer	Crawler Tractor/Dozers	60	175	0.59
	Chain Saws	Concrete/Industrial Saws	60	11	0.70
	Compacting Equipment	Plate Compactors	36	6	0.43
	Concrete Ready Mix Trucks	Off-highway Trucks	38	600	0.59
	Fork Truck	Forklifts	155	100	0.59
	Forktruck (Hoist)	Forklifts	119	100	0.59
	Front Loader	Tractors/Loaders/Backhoes	60	100	0.21

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity (Hours/ Month)	HP	LF
	Grub the site down 2'-0	Other Construction Equipment	60	40	0.59
	High Lift	Other Construction Equipment	18	100	0.59
	Log Chipper	Chippers/Stump Grinders (com)	60	100	0.43
	Man Lift	Other Construction Equipment	48	75	0.21
	Man Lift (Fascia Construction)	Other Construction Equipment	5	75	0.21
	Mulcher	Other Agricultural Equipment	60	100	0.43
	Roller	Rollers	60	100	0.59
	Small Dozer	Crawler Tractor/Dozers	36	175	0.59
	Tractor	Crawler Tractor/Dozers	119	100	0.21
4	40 Ton Crane	Cranes	13	300	0.43
	Air Compressor	Air Compressors	2	100	0.43
	Asphalt Paver	Pavers	1	175	0.59
	Backhoe	Tractors/Loaders/Backhoes	17	100	0.21
	Chain Saw	Concrete/Industrial Saws	3	11	0.70
	Chipper/Stump Grinder	Chippers/Stump Grinders (com)	3	100	0.43
	Concrete Ready Mix Trucks	Off-highway Trucks	3	600	0.59
	Concrete Saws	Concrete/Industrial Saws	2	40	0.59
	Concrete Truck	Off-highway Trucks	62	600	0.59
	Curb/Gutter Paver	Pavers	17	175	0.59
	Dozer	Crawler Tractor/Dozers	24	175	0.59
	Excavator	Excavators	15	175	0.59
	Fork Truck	Forklifts	86	100	0.59
	Grader	Graders	1	300	0.59
	High Lift	Other Construction Equipment	23	100	0.59
	Hydroseeder	Other Lawn & Garden Eqp. (com)	1	600	0.59
	Loader	Tractors/Loaders/Backhoes	32	175	0.59
	Man Lift	Other Construction Equipment	63	75	0.21
	Man Lift (Fascia Construction)	Other Construction Equipment	6	75	0.21
	Off-Road Truck	Off-highway Trucks	1	600	0.59
	Other General Equipment	Other General Industrial Eqp	84	175	0.43
	Pumps	Pumps	1	11	0.43
	Roller	Rollers	19	100	0.59
	Rubber Tired Loader	Rubber Tire Loaders	2	175	0.59
	Scraper	Scrapers	2	600	0.59
	Skid Steer Loader	Skid Steer Loaders	30	75	0.21
	Slip Form Paver	Pavers	2	175	0.59

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity (Hours/ Month)	HP	LF
	Surfacing Equipment (Grooving)	Surfacing Equipment	3	25	0.59
	Tractors/Loader/Backhoe	Tractors/Loaders/Backhoes	71	100	0.21
	Vibratory Compactor	Plate Compactors	33	6	0.43
5	Backhoe	Tractors/Loaders/Backhoes	6	100	0.21
	Bob Cat	Tractors/Loaders/Backhoes	1	75	0.21
	Bulldozer	Crawler Tractor/Dozers	2	175	0.59
	Chain Saws	Concrete/Industrial Saws	2	11	0.70
	Compacting Equipment	Plate Compactors	1	6	0.43
	Concrete Ready Mix Trucks	Off-highway Trucks	1	600	0.59
	Fork Truck	Forklifts	3	100	0.59
	Forktruck (Hoist)	Forklifts	4	100	0.59
	Front Loader	Tractors/Loaders/Backhoes	2	100	0.21
	Grub the site down 2'-0	Other Construction Equipment	2	40	0.59
	Log Chipper	Chippers/Stump Grinders (com)	2	100	0.43
	Mulcher	Other Agricultural Equipment	2	100	0.43
	Roller	Rollers	2	100	0.59
	Small Dozer	Crawler Tractor/Dozers	1	175	0.59
	Tractor	Crawler Tractor/Dozers	4	100	0.21
6	Backhoe	Tractors/Loaders/Backhoes	6	100	0.21
	Bob Cat	Tractors/Loaders/Backhoes	1	75	0.21
	Bulldozer	Crawler Tractor/Dozers	2	175	0.59
	Chain Saws	Concrete/Industrial Saws	2	11	0.70
	Compacting Equipment	Plate Compactors	1	6	0.43
	Concrete Ready Mix Trucks	Off-highway Trucks	1	600	0.59
	Fork Truck	Forklifts	3	100	0.59
	Forktruck (Hoist)	Forklifts	4	100	0.59
	Front Loader	Tractors/Loaders/Backhoes	2	100	0.21
	Grub the site down 2'-0	Other Construction Equipment	2	40	0.59
	Log Chipper	Chippers/Stump Grinders (com)	2	100	0.43
	Mulcher	Other Agricultural Equipment	2	100	0.43
	Roller	Rollers	2	100	0.59
	Small Dozer	Crawler Tractor/Dozers	1	175	0.59
	Tractor	Crawler Tractor/Dozers	4	100	0.21
7	Asphalt Paver	Pavers	7	175	0.59
	Chain Saw	Concrete/Industrial Saws	14	11	0.70
	Chipper/Stump Grinder	Chippers/Stump Grinders (com)	14	100	0.43

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity (Hours/ Month)	HP	LF
	Concrete Truck	Off-highway Trucks	4	600	0.59
	Dozer	Crawler Tractor/Dozers	101	175	0.59
	Excavator	Excavators	28	175	0.59
	Grader	Graders	6	300	0.59
	Hydroseeder	Other Lawn & Garden Eqp. (com)	5	600	0.59
	Loader	Tractors/Loaders/Backhoes	21	175	0.59
	Off-Road Truck	Off-highway Trucks	5	600	0.59
	Other General Equipment	Other General Industrial Eqp	164	175	0.43
	Pumps	Pumps	5	11	0.43
	Roller	Rollers	66	100	0.59
	Scraper	Scrapers	22	600	0.59
	Skid Steer Loader	Skid Steer Loaders	25	75	0.21
	Surfacing Equipment (Grooving)	Surfacing Equipment	9	25	0.59
	Tractors/Loader/Backhoe	Tractors/Loaders/Backhoes	29	100	0.21

Note: All off-road construction equipment are diesel-fueled. HP = horsepower and LF = Load Factor.
Source: ACRP Report 102 – Guidance for Estimating Airport Construction Emissions - Airport Construction Emissions Inventory Tool (ACEIT) and USEPA MOVES4.

Table A-3 lists the on-road construction vehicles developed for the analysis using ACEIT, along with their corresponding MOVES description, and activity levels in VMT per month by project phase.

Table A-3. ACEIT Outputs – On-road Construction Vehicles

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity Levels (VMT/ Month)
1	Cement Truck for Fencing	Single Unit Short-haul Truck	3,627
	Dump Truck	Single Unit Short-haul Truck	2,364
	Dump Truck (12 cy)	Single Unit Short-haul Truck	44,390
	Passenger Car	Passenger Car	26,606
	Pickup Truck	Passenger Truck	17,190
	Water Truck	Single Unit Short-haul Truck	5,538
1b	Cement Mixer	Single Unit Short-haul Truck	122
	Cement Truck for Fencing	Single Unit Short-haul Truck	2,482
	Dump Truck	Single Unit Short-haul Truck	134
	Dump Truck (12 cy)	Single Unit Short-haul Truck	2,132
	Dump Truck Subbase Material	Single Unit Short-haul Truck	65
	Material Deliveries	Combination Short-haul Truck	11
	Passenger Car	Passenger Car	53,213
	Pickup Truck	Passenger Truck	929
	Survey Crew Trucks	Passenger Truck	13
	Tool Truck	Passenger Truck	526
	Tractor Trailer	Combination Short-haul Truck	8
	Tractor Trailer- Material Delivery	Combination Short-haul Truck	226
	Tractor Trailer- Steel Deliveries	Combination Short-haul Truck	21
	Tractor Trailers Temp Fac.	Combination Short-haul Truck	5
	Water Truck	Single Unit Short-haul Truck	3,789
2	Asphalt 18 Wheeler	Combination Short-haul Truck	2,375
	Cement Mixer	Single Unit Short-haul Truck	37,854
	Dump Truck	Single Unit Short-haul Truck	4,033
	Dump Truck - Asphalt	Single Unit Short-haul Truck	3,365
	Dump Truck (12 cy)	Single Unit Short-haul Truck	14,300
	Dump Truck Subbase Material	Single Unit Short-haul Truck	20,189
	Flatbed Truck	Combination Short-haul Truck	181
	Passenger Car	Passenger Car	53,213
	Pickup Truck	Passenger Truck	14,674
	Water Truck	Single Unit Short-haul Truck	3,789
3	Cement Mixer	Single Unit Short-haul Truck	4,691
	Dump Truck Subbase Material	Single Unit Short-haul Truck	9,265
	Flat Bed or Dump Trucks	Combination Short-haul Truck	2,987
	Material Deliveries	Combination Short-haul Truck	8
	Passenger Car	Passenger Car	53,213
	Seed Truck Spreader	Passenger Truck	597

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity Levels (VMT/ Month)
	Survey Crew Trucks	Passenger Truck	383
	Ten Wheelers	Combination Short-haul Truck	1,493
	Tool Truck	Passenger Truck	400
	Tractor Trailer	Combination Short-haul Truck	1,250
	Tractor Trailer- Material Delivery	Combination Short-haul Truck	4,279
	Tractor Trailer- Steel Deliveries	Combination Short-haul Truck	16
	Tractor Trailer with Boom Hoist- Delivery	Combination Short-haul Truck	896
	Tractor Trailers Temp Fac.	Combination Short-haul Truck	153
4	Asphalt 18 Wheeler	Combination Short-haul Truck	73
	Cement Mixer	Single Unit Short-haul Truck	2,785
	Dump Truck	Single Unit Short-haul Truck	2,213
	Dump Truck - Asphalt	Single Unit Short-haul Truck	103
	Dump Truck (12 cy)	Single Unit Short-haul Truck	437
	Dump Truck Subbase Material	Single Unit Short-haul Truck	10,385
	Flatbed Truck	Combination Short-haul Truck	286
	Material Deliveries	Combination Short-haul Truck	11
	Passenger Car	Passenger Car	53,213
	Pickup Truck	Passenger Truck	3,289
	Survey Crew Trucks	Passenger Truck	13
	Tool Truck	Passenger Truck	526
	Tractor Trailer	Combination Short-haul Truck	73
	Tractor Trailer- Material Delivery	Combination Short-haul Truck	226
	Tractor Trailer- Steel Deliveries	Combination Short-haul Truck	21
	Tractor Trailers Temp Fac.	Combination Short-haul Truck	5
	Water Truck	Single Unit Short-haul Truck	3,789
5	Cement Mixer	Single Unit Short-haul Truck	122
	Dump Truck Subbase Material	Single Unit Short-haul Truck	65
	Flat Bed or Dump Trucks	Combination Short-haul Truck	105
	Passenger Car	Passenger Car	26,606
	Seed Truck Spreader	Passenger Truck	21
	Survey Crew Trucks	Passenger Truck	13
	Ten Wheelers	Combination Short-haul Truck	53
	Tractor Trailer	Combination Short-haul Truck	42
	Tractor Trailer- Material Delivery	Combination Short-haul Truck	145
	Tractor Trailer with Boom Hoist- Delivery	Combination Short-haul Truck	32
	Tractor Trailers Temp Fac.	Combination Short-haul Truck	5
6	Cement Mixer	Single Unit Short-haul Truck	122
	Dump Truck Subbase Material	Single Unit Short-haul Truck	65
	Flat Bed or Dump Trucks	Combination Short-haul Truck	105
	Passenger Car	Passenger Car	26,606
	Seed Truck Spreader	Passenger Truck	21

Project Phase	ACEIT Off-road Construction Equipment	MOVES Description	Activity Levels (VMT/ Month)
	Survey Crew Trucks	Passenger Truck	13
	Ten Wheelers	Combination Short-haul Truck	53
	Tractor Trailer	Combination Short-haul Truck	42
	Tractor Trailer- Material Delivery	Combination Short-haul Truck	145
	Tractor Trailer with Boom Hoist- Delivery	Combination Short-haul Truck	32
	Tractor Trailers Temp Fac.	Combination Short-haul Truck	5
7	Asphalt 18 Wheeler	Combination Short-haul Truck	704
	Cement Mixer	Single Unit Short-haul Truck	11,225
	Dump Truck	Single Unit Short-haul Truck	1,798
	Dump Truck - Asphalt	Single Unit Short-haul Truck	998
	Dump Truck (12 cy)	Single Unit Short-haul Truck	4,241
	Dump Truck Subbase Material	Single Unit Short-haul Truck	5,987
	Flatbed Truck	Combination Short-haul Truck	2,774
	Passenger Car	Passenger Car	26,606
	Pickup Truck	Passenger Truck	6,331
	Water Truck	Single Unit Short-haul Truck	2,323

Note: VMT= Vehicle-Miles-Travelled. All on-road construction vehicles are diesel-fueled, except for passenger cars which are gasoline-fueled.
Source: ACRP Report 102 – Guidance for Estimating Airport Construction Emissions - Airport Construction Emissions Inventory Tool (ACEIT) and USEPA MOVES4.

MOVES Inputs and Outputs

Emission factors for off-road construction equipment and on-road vehicles were developed using MOVES, Version 4. The model input data were developed based on specific information (e.g., vehicle/fuel mix, fuel specifications, inspection maintenance program, meteorology data) related to the proposed project. **Table A-4** summarizes the inputs to MOVES used to estimate emission rates for the emission sources associated with the proposed project.

Table A-4. MOVES Inputs – Off-road Equipment and On-road Vehicles

Parameter	Input Data
Evaluation Year(s):	2026 through 2040
Location:	Salt Lake City County
Evaluation Month(s):	January (Winter) and July (Summer)
Days:	Weekdays
Evaluation Hour(s):	7:00-8:00 AM (Hour 8) – January 3:00-4:00 PM (Hour 17) – July
Level of Analysis:	National Level MOVES Defaults for Vehicle Age Distribution, I/M Programs, etc.
Source Type:	Off-road Equipment: Commercial, Construction, Industrial Sectors, and Agricultural (Diesel Fuel) On-road Vehicles: 21 – Passenger Car (Gasoline Fuel), 31- Passenger Truck (Diesel Fuel), 52 - Single Unit Short-haul Truck (Diesel Fuel), and 61 - Combination Short-haul Truck (Diesel Fuel).
Roadway Type:	Rural Unrestricted
Temperature:	20.1 degrees (°) Fahrenheit (F) – Winter and 91.4 °F – Summer
Relative Humidity:	81.8 percent – Winter and 17.9 percent – Summer
Criteria/Precursor Pollutants:	Carbon monoxide (CO), volatile organic compounds (VOC), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM).
GHGs:	Carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4)
Source: USEPA MOVES4.	

Tables A-5 through **A-19** present the emission factors from MOVES output files, for each off-road construction equipment; and **Table A-20** presents the emission factors for on-road construction vehicle, for construction years 2026 through 2040. MOVES off-road equipment emission factors are presented in grams per horsepower-hour and on-road vehicles in grams per mile, for criteria air pollutants, pollutant precursors, and GHGs.

Table A-5. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2026

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.310	1.522	0.002	0.047	0.046	0.057	574.222	0.006
Chippers/Stump Grinders (com)	0.752	2.290	0.002	0.130	0.126	0.160	551.373	0.009
Concrete/Industrial Saws	0.485	2.087	0.002	0.063	0.061	0.089	591.917	0.010
Cranes	0.136	0.571	0.001	0.024	0.024	0.028	533.273	0.003
Crawler Tractor/Dozers	0.127	0.612	0.001	0.023	0.022	0.023	539.756	0.002
Excavators	0.072	0.372	0.001	0.014	0.014	0.016	541.897	0.001
Forklifts	0.083	1.040	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.061	0.231	0.001	0.014	0.013	0.014	537.668	0.001
Off-highway Trucks	0.069	1.394	0.001	0.019	0.018	0.027	536.752	0.002
Other Agricultural Equipment	0.840	1.791	0.002	0.154	0.149	0.158	542.563	0.003
Other Construction Equipment	0.338	0.917	0.001	0.049	0.048	0.048	537.684	0.004
Other General Industrial Eqp	0.163	0.721	0.001	0.031	0.030	0.033	546.779	0.003
Other Lawn & Garden Eqp. (com)	1.270	3.424	0.002	0.201	0.195	0.281	581.317	0.018
Pavers	0.130	0.702	0.001	0.023	0.022	0.025	550.769	0.003
Plate Compactors	2.161	4.055	0.002	0.221	0.214	0.674	588.437	0.059
Pumps	0.957	2.598	0.002	0.148	0.144	0.216	568.280	0.015
Rollers	0.218	0.931	0.002	0.035	0.034	0.039	559.625	0.004
Rubber Tire Loaders	0.199	0.785	0.001	0.034	0.033	0.033	539.942	0.003
Scrapers	0.152	0.384	0.001	0.023	0.023	0.022	536.763	0.002
Skid Steer Loaders	1.812	2.948	0.002	0.274	0.266	0.367	694.017	0.017
Surfacing Equipment	0.523	1.621	0.002	0.073	0.071	0.085	555.901	0.007
Tractors/Loaders/Backhoes	1.043	1.805	0.002	0.173	0.167	0.179	665.518	0.010

Note: The nonroad option within MOVES does not have a selection for the pollutant N_2O.
Source: USEPA MOVES4.

Table A-6. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2027

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.266	1.445	0.002	0.040	0.039	0.050	574.242	0.005
Chippers/Stump Grinders (com)	0.676	2.083	0.002	0.116	0.113	0.142	551.425	0.008
Concrete/Industrial Saws	0.414	2.011	0.002	0.052	0.050	0.082	591.938	0.009
Cranes	0.116	0.504	0.001	0.021	0.020	0.025	533.284	0.002
Crawler Tractor/Dozers	0.105	0.568	0.001	0.020	0.019	0.021	539.763	0.002
Excavators	0.063	0.349	0.001	0.013	0.012	0.015	541.900	0.001
Forklifts	0.082	1.039	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.051	0.203	0.001	0.012	0.011	0.012	537.671	0.001
Off-highway Trucks	0.062	1.383	0.001	0.018	0.017	0.026	536.755	0.002
Other Agricultural Equipment	0.744	1.627	0.002	0.134	0.130	0.139	542.619	0.003
Other Construction Equipment	0.303	0.835	0.001	0.044	0.043	0.044	537.699	0.003
Other General Industrial Eqp	0.140	0.649	0.001	0.026	0.025	0.028	546.794	0.003
Other Lawn & Garden Eqp. (com)	1.184	3.283	0.002	0.183	0.177	0.261	581.375	0.018
Pavers	0.112	0.664	0.001	0.019	0.019	0.023	550.776	0.002
Plate Compactors	2.155	4.050	0.002	0.220	0.213	0.674	588.436	0.059
Pumps	0.902	2.494	0.002	0.139	0.134	0.204	568.316	0.015
Rollers	0.185	0.877	0.002	0.029	0.028	0.036	559.634	0.004
Rubber Tire Loaders	0.166	0.711	0.001	0.029	0.028	0.029	539.954	0.003
Scrapers	0.123	0.319	0.001	0.020	0.019	0.020	536.774	0.002
Skid Steer Loaders	1.696	2.871	0.002	0.254	0.247	0.339	694.099	0.016
Surfacing Equipment	0.471	1.536	0.002	0.065	0.063	0.079	555.919	0.006
Tractors/Loaders/Backhoes	0.958	1.722	0.002	0.160	0.155	0.160	665.573	0.009

Note: The nonroad option within MOVES does not have a selection for the pollutant N_2O.
Source: USEPA MOVES4.

Table A-7. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2028

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.230	1.381	0.002	0.034	0.033	0.044	574.257	0.005
Chippers/Stump Grinders (com)	0.607	1.903	0.002	0.105	0.101	0.127	551.470	0.007
Concrete/Industrial Saws	0.375	1.965	0.002	0.046	0.045	0.078	591.948	0.009
Cranes	0.098	0.440	0.001	0.018	0.018	0.021	533.293	0.002
Crawler Tractor/Dozers	0.090	0.534	0.001	0.018	0.017	0.019	539.768	0.001
Excavators	0.056	0.334	0.001	0.012	0.011	0.015	541.902	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.044	0.180	0.001	0.011	0.010	0.011	537.674	0.001
Off-highway Trucks	0.057	1.376	0.001	0.017	0.017	0.026	536.757	0.002
Other Agricultural Equipment	0.658	1.477	0.002	0.118	0.114	0.122	542.670	0.003
Other Construction Equipment	0.273	0.770	0.001	0.041	0.039	0.039	537.711	0.003
Other General Industrial Eqp	0.115	0.593	0.001	0.021	0.021	0.024	546.805	0.002
Other Lawn & Garden Eqp. (com)	1.108	3.160	0.002	0.167	0.162	0.243	581.426	0.017
Pavers	0.098	0.633	0.001	0.017	0.016	0.021	550.780	0.002
Plate Compactors	2.150	4.047	0.002	0.219	0.213	0.674	588.436	0.059
Pumps	0.843	2.379	0.002	0.128	0.124	0.191	568.354	0.014
Rollers	0.167	0.841	0.002	0.026	0.025	0.034	559.639	0.003
Rubber Tire Loaders	0.141	0.653	0.001	0.025	0.025	0.026	539.963	0.002
Scrapers	0.102	0.276	0.001	0.017	0.017	0.017	536.779	0.001
Skid Steer Loaders	1.577	2.794	0.002	0.233	0.226	0.312	694.175	0.016
Surfacing Equipment	0.422	1.449	0.002	0.058	0.056	0.073	555.936	0.006
Tractors/Loaders/Backhoes	0.884	1.648	0.002	0.149	0.144	0.144	665.620	0.009

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-8. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2029

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.194	1.330	0.002	0.029	0.028	0.039	574.272	0.004
Chippers/Stump Grinders (com)	0.532	1.714	0.002	0.092	0.090	0.110	551.519	0.006
Concrete/Industrial Saws	0.345	1.935	0.002	0.042	0.040	0.075	591.956	0.009
Cranes	0.085	0.387	0.001	0.016	0.016	0.019	533.301	0.002
Crawler Tractor/Dozers	0.075	0.504	0.001	0.015	0.015	0.017	539.772	0.001
Excavators	0.052	0.326	0.001	0.011	0.011	0.014	541.903	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.038	0.164	0.001	0.009	0.009	0.011	537.674	0.001
Off-highway Trucks	0.054	1.372	0.001	0.017	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.581	1.342	0.002	0.104	0.101	0.107	542.712	0.003
Other Construction Equipment	0.247	0.710	0.001	0.037	0.036	0.036	537.722	0.003
Other General Industrial Eqp	0.098	0.550	0.001	0.018	0.018	0.021	546.814	0.002
Other Lawn & Garden Eqp. (com)	1.038	3.054	0.002	0.154	0.149	0.228	581.470	0.017
Pavers	0.088	0.610	0.001	0.015	0.014	0.020	550.784	0.002
Plate Compactors	2.141	4.044	0.002	0.217	0.210	0.674	588.435	0.059
Pumps	0.777	2.251	0.002	0.116	0.113	0.176	568.395	0.014
Rollers	0.151	0.810	0.002	0.023	0.023	0.032	559.645	0.003
Rubber Tire Loaders	0.117	0.593	0.001	0.022	0.021	0.023	539.971	0.002
Scrapers	0.083	0.238	0.001	0.015	0.014	0.016	536.784	0.001
Skid Steer Loaders	1.467	2.723	0.002	0.215	0.209	0.288	694.246	0.015
Surfacing Equipment	0.389	1.389	0.002	0.053	0.051	0.069	555.948	0.006
Tractors/Loaders/Backhoes	0.813	1.576	0.002	0.138	0.134	0.129	665.664	0.008

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-9. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2030

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.166	1.286	0.002	0.024	0.023	0.035	574.284	0.004
Chippers/Stump Grinders (com)	0.465	1.549	0.002	0.082	0.079	0.096	551.559	0.006
Concrete/Industrial Saws	0.316	1.906	0.002	0.037	0.036	0.072	591.963	0.009
Cranes	0.071	0.333	0.001	0.014	0.014	0.017	533.305	0.001
Crawler Tractor/Dozers	0.062	0.480	0.001	0.013	0.013	0.016	539.777	0.001
Excavators	0.049	0.320	0.001	0.010	0.010	0.014	541.905	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.034	0.153	0.001	0.009	0.008	0.010	537.676	0.001
Off-highway Trucks	0.053	1.370	0.001	0.017	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.513	1.221	0.002	0.091	0.089	0.094	542.751	0.003
Other Construction Equipment	0.218	0.646	0.001	0.033	0.032	0.032	537.732	0.003
Other General Industrial Eqp	0.087	0.523	0.001	0.016	0.016	0.019	546.820	0.002
Other Lawn & Garden Eqp. (com)	0.966	2.948	0.002	0.141	0.137	0.213	581.514	0.016
Pavers	0.080	0.591	0.001	0.013	0.013	0.019	550.787	0.002
Plate Compactors	2.131	4.043	0.002	0.214	0.208	0.674	588.437	0.059
Pumps	0.709	2.119	0.002	0.105	0.102	0.161	568.437	0.013
Rollers	0.138	0.786	0.001	0.021	0.020	0.031	559.648	0.003
Rubber Tire Loaders	0.097	0.551	0.001	0.019	0.018	0.021	539.978	0.002
Scrapers	0.065	0.204	0.001	0.012	0.012	0.014	536.788	0.001
Skid Steer Loaders	1.349	2.648	0.002	0.196	0.190	0.262	694.322	0.015
Surfacing Equipment	0.358	1.335	0.002	0.049	0.047	0.065	555.958	0.006
Tractors/Loaders/Backhoes	0.733	1.492	0.002	0.125	0.121	0.114	665.707	0.008

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-10. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2031

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.148	1.256	0.002	0.021	0.021	0.032	574.292	0.004
Chippers/Stump Grinders (com)	0.404	1.403	0.002	0.072	0.069	0.083	551.595	0.005
Concrete/Industrial Saws	0.296	1.886	0.002	0.034	0.033	0.070	591.969	0.008
Cranes	0.061	0.298	0.001	0.013	0.012	0.015	533.310	0.001
Crawler Tractor/Dozers	0.055	0.466	0.001	0.012	0.012	0.015	539.779	0.001
Excavators	0.048	0.317	0.001	0.010	0.010	0.013	541.905	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.985	0.003
Graders	0.031	0.148	0.001	0.008	0.008	0.010	537.676	0.000
Off-highway Trucks	0.052	1.368	0.001	0.017	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.450	1.107	0.002	0.080	0.078	0.082	542.786	0.002
Other Construction Equipment	0.184	0.567	0.001	0.029	0.028	0.028	537.744	0.002
Other General Industrial Eqp	0.079	0.504	0.001	0.015	0.014	0.018	546.824	0.002
Other Lawn & Garden Eqp. (com)	0.896	2.847	0.002	0.130	0.126	0.198	581.554	0.016
Pavers	0.073	0.576	0.001	0.012	0.012	0.018	550.789	0.002
Plate Compactors	2.127	4.042	0.002	0.213	0.207	0.674	588.436	0.059
Pumps	0.640	1.990	0.002	0.094	0.092	0.147	568.478	0.012
Rollers	0.129	0.768	0.001	0.019	0.019	0.030	559.651	0.003
Rubber Tire Loaders	0.085	0.522	0.001	0.017	0.016	0.019	539.982	0.002
Scrapers	0.054	0.183	0.001	0.011	0.010	0.013	536.792	0.001
Skid Steer Loaders	1.236	2.577	0.002	0.179	0.174	0.239	694.390	0.014
Surfacing Equipment	0.331	1.288	0.002	0.045	0.044	0.061	555.969	0.005
Tractors/Loaders/Backhoes	0.643	1.380	0.002	0.110	0.107	0.098	665.753	0.007

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-11. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2032

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.133	1.234	0.002	0.019	0.019	0.030	574.297	0.004
Chippers/Stump Grinders (com)	0.351	1.287	0.002	0.063	0.061	0.073	551.624	0.004
Concrete/Industrial Saws	0.282	1.872	0.002	0.032	0.031	0.069	591.973	0.008
Cranes	0.055	0.275	0.001	0.012	0.011	0.014	533.312	0.001
Crawler Tractor/Dozers	0.050	0.457	0.001	0.012	0.011	0.014	539.781	0.001
Excavators	0.046	0.314	0.001	0.010	0.010	0.013	541.906	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.983	0.003
Graders	0.030	0.145	0.001	0.008	0.008	0.010	537.678	0.000
Off-highway Trucks	0.051	1.368	0.001	0.017	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.393	1.003	0.002	0.070	0.068	0.072	542.816	0.002
Other Construction Equipment	0.159	0.501	0.001	0.025	0.025	0.025	537.753	0.002
Other General Industrial Eqp	0.073	0.489	0.001	0.013	0.013	0.017	546.826	0.002
Other Lawn & Garden Eqp. (com)	0.835	2.761	0.002	0.119	0.116	0.186	581.590	0.015
Pavers	0.068	0.565	0.001	0.011	0.011	0.017	550.790	0.002
Plate Compactors	2.127	4.042	0.002	0.213	0.207	0.675	588.435	0.059
Pumps	0.576	1.875	0.002	0.084	0.082	0.134	568.514	0.011
Rollers	0.122	0.754	0.001	0.018	0.017	0.029	559.653	0.003
Rubber Tire Loaders	0.075	0.500	0.001	0.015	0.015	0.018	539.987	0.001
Scrapers	0.046	0.168	0.001	0.010	0.009	0.012	536.793	0.001
Skid Steer Loaders	1.148	2.522	0.002	0.166	0.161	0.220	694.444	0.013
Surfacing Equipment	0.310	1.250	0.002	0.042	0.041	0.059	555.976	0.005
Tractors/Loaders/Backhoes	0.542	1.275	0.002	0.093	0.090	0.083	665.797	0.006

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-12. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2033

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.123	1.217	0.002	0.017	0.017	0.028	574.302	0.004
Chippers/Stump Grinders (com)	0.308	1.191	0.002	0.055	0.054	0.064	551.648	0.004
Concrete/Industrial Saws	0.270	1.861	0.002	0.030	0.029	0.068	591.975	0.008
Cranes	0.049	0.254	0.001	0.011	0.010	0.013	533.316	0.001
Crawler Tractor/Dozers	0.045	0.450	0.001	0.011	0.011	0.014	539.782	0.001
Excavators	0.046	0.312	0.001	0.010	0.009	0.013	541.907	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.029	0.143	0.001	0.008	0.007	0.009	537.678	0.000
Off-highway Trucks	0.051	1.368	0.001	0.017	0.016	0.025	536.759	0.002
Other Agricultural Equipment	0.341	0.905	0.001	0.061	0.059	0.062	542.845	0.002
Other Construction Equipment	0.131	0.427	0.001	0.022	0.021	0.022	537.762	0.002
Other General Industrial Eqp	0.069	0.479	0.001	0.013	0.012	0.016	546.827	0.001
Other Lawn & Garden Eqp. (com)	0.784	2.691	0.002	0.110	0.107	0.176	581.618	0.015
Pavers	0.065	0.558	0.001	0.011	0.011	0.017	550.790	0.002
Plate Compactors	2.127	4.042	0.002	0.213	0.207	0.675	588.434	0.059
Pumps	0.529	1.793	0.002	0.076	0.074	0.125	568.541	0.011
Rollers	0.117	0.742	0.001	0.017	0.016	0.029	559.655	0.003
Rubber Tire Loaders	0.065	0.480	0.001	0.014	0.013	0.017	539.990	0.001
Scrapers	0.040	0.156	0.001	0.009	0.009	0.011	536.794	0.001
Skid Steer Loaders	1.070	2.472	0.002	0.153	0.149	0.203	694.495	0.013
Surfacing Equipment	0.282	1.196	0.002	0.039	0.038	0.056	555.985	0.005
Tractors/Loaders/Backhoes	0.438	1.150	0.002	0.075	0.073	0.067	665.843	0.005

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-13. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2034

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.115	1.204	0.002	0.016	0.016	0.027	574.306	0.004
Chippers/Stump Grinders (com)	0.277	1.116	0.002	0.050	0.048	0.058	551.667	0.004
Concrete/Industrial Saws	0.260	1.851	0.002	0.029	0.028	0.067	591.978	0.008
Cranes	0.044	0.238	0.001	0.010	0.010	0.012	533.318	0.001
Crawler Tractor/Dozers	0.042	0.443	0.001	0.011	0.010	0.013	539.783	0.001
Excavators	0.045	0.310	0.001	0.010	0.009	0.013	541.906	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.028	0.141	0.001	0.008	0.007	0.009	537.678	0.000
Off-highway Trucks	0.051	1.368	0.001	0.017	0.016	0.025	536.759	0.002
Other Agricultural Equipment	0.293	0.813	0.001	0.052	0.051	0.053	542.871	0.002
Other Construction Equipment	0.107	0.375	0.001	0.019	0.018	0.019	537.769	0.002
Other General Industrial Eqp	0.066	0.471	0.001	0.012	0.012	0.016	546.829	0.001
Other Lawn & Garden Eqp. (com)	0.744	2.637	0.002	0.103	0.100	0.168	581.641	0.014
Pavers	0.063	0.555	0.001	0.010	0.010	0.017	550.791	0.002
Plate Compactors	2.126	4.042	0.002	0.213	0.207	0.675	588.434	0.059
Pumps	0.488	1.726	0.002	0.069	0.067	0.117	568.562	0.010
Rollers	0.112	0.733	0.001	0.016	0.016	0.028	559.656	0.003
Rubber Tire Loaders	0.059	0.465	0.001	0.013	0.012	0.016	539.992	0.001
Scrapers	0.035	0.145	0.001	0.008	0.008	0.011	536.798	0.001
Skid Steer Loaders	0.995	2.424	0.002	0.141	0.137	0.187	694.541	0.013
Surfacing Equipment	0.258	1.145	0.002	0.036	0.035	0.053	555.994	0.005
Tractors/Loaders/Backhoes	0.369	1.060	0.002	0.063	0.062	0.056	665.874	0.005

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-14. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2035

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.109	1.195	0.002	0.015	0.015	0.026	574.307	0.003
Chippers/Stump Grinders (com)	0.251	1.051	0.002	0.045	0.044	0.052	551.682	0.003
Concrete/Industrial Saws	0.252	1.842	0.002	0.027	0.027	0.067	591.981	0.008
Cranes	0.041	0.225	0.001	0.009	0.009	0.012	533.320	0.001
Crawler Tractor/Dozers	0.039	0.438	0.001	0.010	0.010	0.013	539.785	0.001
Excavators	0.044	0.309	0.001	0.010	0.009	0.013	541.906	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.983	0.003
Graders	0.027	0.140	0.001	0.008	0.007	0.009	537.679	0.000
Off-highway Trucks	0.051	1.368	0.001	0.017	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.241	0.702	0.001	0.043	0.042	0.044	542.897	0.002
Other Construction Equipment	0.092	0.340	0.001	0.016	0.016	0.018	537.774	0.001
Other General Industrial Eqp	0.064	0.465	0.001	0.012	0.011	0.015	546.830	0.001
Other Lawn & Garden Eqp. (com)	0.714	2.595	0.002	0.097	0.094	0.162	581.658	0.014
Pavers	0.062	0.552	0.001	0.010	0.010	0.017	550.792	0.002
Plate Compactors	2.126	4.042	0.002	0.213	0.207	0.675	588.433	0.059
Pumps	0.448	1.662	0.002	0.062	0.060	0.111	568.581	0.010
Rollers	0.110	0.728	0.001	0.016	0.015	0.028	559.657	0.003
Rubber Tire Loaders	0.053	0.453	0.001	0.012	0.012	0.015	539.994	0.001
Scrapers	0.030	0.136	0.001	0.008	0.007	0.010	536.798	0.001
Skid Steer Loaders	0.924	2.378	0.002	0.130	0.126	0.173	694.583	0.012
Surfacing Equipment	0.233	1.093	0.002	0.032	0.031	0.050	556.003	0.005
Tractors/Loaders/Backhoes	0.310	1.001	0.002	0.053	0.052	0.047	665.899	0.004

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-15. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2036

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.104	1.188	0.002	0.014	0.014	0.026	574.308	0.003
Chippers/Stump Grinders (com)	0.226	0.990	0.002	0.041	0.040	0.047	551.696	0.003
Concrete/Industrial Saws	0.245	1.835	0.002	0.026	0.025	0.066	591.981	0.008
Cranes	0.038	0.216	0.001	0.009	0.009	0.011	533.322	0.001
Crawler Tractor/Dozers	0.037	0.434	0.001	0.010	0.010	0.013	539.785	0.001
Excavators	0.044	0.309	0.001	0.010	0.009	0.013	541.907	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.986	0.003
Graders	0.027	0.139	0.001	0.007	0.007	0.009	537.680	0.000
Off-highway Trucks	0.051	1.368	0.001	0.016	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.197	0.618	0.001	0.035	0.034	0.037	542.920	0.002
Other Construction Equipment	0.079	0.310	0.001	0.015	0.014	0.016	537.778	0.001
Other General Industrial Eqp	0.062	0.460	0.001	0.011	0.011	0.015	546.831	0.001
Other Lawn & Garden Eqp. (com)	0.690	2.560	0.002	0.093	0.090	0.157	581.673	0.014
Pavers	0.061	0.551	0.001	0.010	0.010	0.017	550.792	0.002
Plate Compactors	2.125	4.042	0.002	0.213	0.207	0.675	588.433	0.059
Pumps	0.418	1.610	0.002	0.057	0.055	0.105	568.597	0.009
Rollers	0.108	0.725	0.001	0.015	0.015	0.028	559.657	0.003
Rubber Tire Loaders	0.049	0.444	0.001	0.011	0.011	0.015	539.995	0.001
Scrapers	0.027	0.128	0.001	0.007	0.007	0.010	536.799	0.000
Skid Steer Loaders	0.854	2.330	0.002	0.118	0.115	0.159	694.622	0.012
Surfacing Equipment	0.214	1.058	0.002	0.030	0.029	0.048	556.008	0.004
Tractors/Loaders/Backhoes	0.256	0.949	0.002	0.044	0.042	0.039	665.921	0.004

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-16. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2037

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.101	1.183	0.002	0.014	0.013	0.026	574.308	0.003
Chippers/Stump Grinders (com)	0.202	0.929	0.002	0.037	0.036	0.043	551.710	0.003
Concrete/Industrial Saws	0.239	1.828	0.002	0.025	0.025	0.065	591.982	0.008
Cranes	0.036	0.208	0.001	0.009	0.008	0.011	533.323	0.001
Crawler Tractor/Dozers	0.035	0.430	0.001	0.010	0.009	0.013	539.786	0.001
Excavators	0.044	0.309	0.001	0.009	0.009	0.013	541.907	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.027	0.138	0.001	0.007	0.007	0.009	537.679	0.000
Off-highway Trucks	0.051	1.368	0.001	0.016	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.164	0.552	0.001	0.029	0.028	0.031	542.934	0.002
Other Construction Equipment	0.069	0.287	0.001	0.013	0.013	0.015	537.782	0.001
Other General Industrial Eqp	0.061	0.457	0.001	0.011	0.011	0.015	546.832	0.001
Other Lawn & Garden Eqp. (com)	0.667	2.525	0.002	0.088	0.086	0.152	581.686	0.014
Pavers	0.061	0.550	0.001	0.010	0.010	0.017	550.793	0.002
Plate Compactors	2.125	4.042	0.002	0.213	0.207	0.675	588.434	0.059
Pumps	0.397	1.571	0.002	0.053	0.051	0.101	568.608	0.009
Rollers	0.107	0.723	0.001	0.015	0.015	0.028	559.658	0.003
Rubber Tire Loaders	0.046	0.438	0.001	0.011	0.011	0.014	539.997	0.001
Scrapers	0.024	0.121	0.001	0.007	0.007	0.010	536.801	0.000
Skid Steer Loaders	0.772	2.276	0.002	0.105	0.102	0.145	694.664	0.011
Surfacing Equipment	0.201	1.033	0.002	0.028	0.027	0.046	556.013	0.004
Tractors/Loaders/Backhoes	0.225	0.916	0.002	0.038	0.037	0.035	665.935	0.003

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-17. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2038

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.099	1.179	0.002	0.013	0.013	0.025	574.310	0.003
Chippers/Stump Grinders (com)	0.181	0.870	0.002	0.033	0.032	0.039	551.721	0.003
Concrete/Industrial Saws	0.234	1.823	0.002	0.025	0.024	0.065	591.984	0.008
Cranes	0.034	0.202	0.001	0.008	0.008	0.011	533.324	0.001
Crawler Tractor/Dozers	0.034	0.428	0.001	0.010	0.009	0.013	539.786	0.001
Excavators	0.044	0.309	0.001	0.009	0.009	0.013	541.906	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.027	0.138	0.001	0.007	0.007	0.009	537.680	0.000
Off-highway Trucks	0.051	1.368	0.001	0.016	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.139	0.498	0.001	0.024	0.023	0.027	542.947	0.001
Other Construction Equipment	0.061	0.269	0.001	0.012	0.012	0.014	537.783	0.001
Other General Industrial Eqp	0.060	0.454	0.001	0.011	0.011	0.015	546.832	0.001
Other Lawn & Garden Eqp. (com)	0.642	2.489	0.002	0.084	0.081	0.147	581.700	0.013
Pavers	0.060	0.549	0.001	0.010	0.010	0.016	550.792	0.002
Plate Compactors	2.125	4.042	0.002	0.213	0.207	0.675	588.434	0.059
Pumps	0.379	1.537	0.002	0.050	0.048	0.098	568.618	0.009
Rollers	0.106	0.722	0.001	0.015	0.015	0.028	559.658	0.003
Rubber Tire Loaders	0.043	0.433	0.001	0.010	0.010	0.014	539.998	0.001
Scrapers	0.022	0.117	0.001	0.007	0.006	0.010	536.800	0.000
Skid Steer Loaders	0.666	2.210	0.002	0.090	0.087	0.128	694.712	0.011
Surfacing Equipment	0.188	1.010	0.002	0.026	0.025	0.045	556.017	0.004
Tractors/Loaders/Backhoes	0.201	0.889	0.002	0.034	0.033	0.031	665.945	0.003

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-18. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2039

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.098	1.176	0.002	0.013	0.013	0.025	574.312	0.003
Chippers/Stump Grinders (com)	0.160	0.821	0.001	0.029	0.028	0.035	551.732	0.002
Concrete/Industrial Saws	0.231	1.819	0.002	0.024	0.023	0.065	591.985	0.008
Cranes	0.033	0.198	0.001	0.008	0.008	0.011	533.324	0.001
Crawler Tractor/Dozers	0.034	0.427	0.001	0.010	0.009	0.013	539.786	0.001
Excavators	0.044	0.308	0.001	0.009	0.009	0.013	541.907	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.027	0.138	0.001	0.007	0.007	0.009	537.679	0.000
Off-highway Trucks	0.051	1.368	0.001	0.017	0.016	0.025	536.758	0.002
Other Agricultural Equipment	0.121	0.456	0.001	0.021	0.020	0.024	542.956	0.001
Other Construction Equipment	0.056	0.256	0.001	0.011	0.011	0.014	537.785	0.001
Other General Industrial Eqp	0.060	0.453	0.001	0.011	0.011	0.015	546.832	0.001
Other Lawn & Garden Eqp. (com)	0.619	2.452	0.002	0.080	0.077	0.143	581.713	0.013
Pavers	0.060	0.549	0.001	0.010	0.010	0.016	550.792	0.002
Plate Compactors	2.126	4.042	0.002	0.213	0.207	0.675	588.433	0.059
Pumps	0.362	1.504	0.002	0.047	0.045	0.095	568.627	0.009
Rollers	0.106	0.721	0.001	0.015	0.015	0.028	559.658	0.003
Rubber Tire Loaders	0.041	0.428	0.001	0.010	0.010	0.014	539.998	0.001
Scrapers	0.021	0.114	0.001	0.006	0.006	0.010	536.801	0.000
Skid Steer Loaders	0.574	2.151	0.002	0.077	0.075	0.113	694.754	0.010
Surfacing Equipment	0.179	0.992	0.002	0.025	0.024	0.044	556.020	0.004
Tractors/Loaders/Backhoes	0.182	0.869	0.002	0.031	0.030	0.028	665.953	0.003

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-19. MOVES Outputs – Off-road Construction Equipment Emission Factors (grams per horsepower-hour) - 2040

Equipment	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4
Air Compressors	0.097	1.173	0.002	0.013	0.013	0.025	574.311	0.003
Chippers/Stump Grinders (com)	0.142	0.779	0.001	0.026	0.025	0.031	551.743	0.002
Concrete/Industrial Saws	0.228	1.816	0.002	0.024	0.023	0.064	591.986	0.008
Cranes	0.032	0.195	0.001	0.008	0.008	0.010	533.326	0.001
Crawler Tractor/Dozers	0.033	0.427	0.001	0.009	0.009	0.012	539.786	0.001
Excavators	0.044	0.308	0.001	0.009	0.009	0.013	541.907	0.001
Forklifts	0.082	1.038	0.002	0.012	0.012	0.020	573.984	0.003
Graders	0.027	0.138	0.001	0.007	0.007	0.009	537.679	0.000
Off-highway Trucks	0.051	1.368	0.001	0.017	0.016	0.025	536.759	0.002
Other Agricultural Equipment	0.105	0.423	0.001	0.018	0.018	0.021	542.964	0.001
Other Construction Equipment	0.052	0.246	0.001	0.011	0.010	0.013	537.786	0.001
Other General Industrial Eqp	0.059	0.452	0.001	0.011	0.011	0.014	546.832	0.001
Other Lawn & Garden Eqp. (com)	0.599	2.423	0.002	0.076	0.074	0.139	581.724	0.013
Pavers	0.060	0.548	0.001	0.010	0.010	0.016	550.793	0.002
Plate Compactors	2.127	4.042	0.002	0.214	0.207	0.675	588.432	0.059
Pumps	0.346	1.474	0.002	0.044	0.043	0.092	568.636	0.009
Rollers	0.106	0.720	0.001	0.015	0.015	0.028	559.658	0.003
Rubber Tire Loaders	0.040	0.424	0.001	0.010	0.010	0.013	539.998	0.001
Scrapers	0.020	0.113	0.001	0.006	0.006	0.010	536.802	0.000
Skid Steer Loaders	0.513	2.112	0.002	0.068	0.066	0.103	694.783	0.009
Surfacing Equipment	0.173	0.980	0.002	0.024	0.023	0.043	556.021	0.004
Tractors/Loaders/Backhoes	0.166	0.851	0.002	0.028	0.028	0.026	665.960	0.003

Note: The nonroad option within MOVES does not have a selection for the pollutant N2O.
Source: USEPA MOVES4.

Table A-20. MOVES Output – On-road Construction Vehicle Emission Factors (grams per miles)

Vehicles	Fuel	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O
2026										

Vehicles	Fuel	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O
Passenger Car	Gasoline	4.271	0.093	0.002	0.056	0.009	0.059	373	0.009	0.002
Passenger Truck	Diesel	2.476	1.842	0.002	0.067	0.062	0.230	648	0.014	0.056
Single Unit Short-haul Truck	Diesel	1.159	1.667	0.003	0.035	0.032	0.114	900	0.015	0.117
Combination Short-haul Truck	Diesel	2.174	3.891	0.006	0.044	0.041	0.146	1,673	0.020	0.229
2027										
Passenger Car	Gasoline	4.139	0.085	0.002	0.056	0.009	0.056	366	0.009	0.002
Passenger Truck	Diesel	2.332	1.664	0.002	0.058	0.054	0.202	636	0.013	0.057
Single Unit Short-haul Truck	Diesel	1.119	1.503	0.003	0.030	0.027	0.100	881	0.015	0.118
Combination Short-haul Truck	Diesel	2.116	3.541	0.005	0.038	0.035	0.134	1,641	0.020	0.229
2028										
Passenger Car	Gasoline	3.990	0.071	0.002	0.056	0.009	0.050	361	0.008	0.002
Passenger Truck	Diesel	1.968	1.401	0.002	0.040	0.037	0.165	622	0.013	0.059
Single Unit Short-haul Truck	Diesel	1.087	1.369	0.003	0.023	0.021	0.089	865	0.014	0.118
Combination Short-haul Truck	Diesel	2.063	3.204	0.005	0.031	0.028	0.123	1,613	0.019	0.230
2029										
Passenger Car	Gasoline	3.786	0.062	0.002	0.056	0.009	0.045	358	0.008	0.002
Passenger Truck	Diesel	1.980	1.405	0.002	0.041	0.037	0.169	614	0.013	0.059
Single Unit Short-haul Truck	Diesel	1.056	1.220	0.003	0.019	0.017	0.078	849	0.014	0.119
Combination Short-haul Truck	Diesel	2.020	2.882	0.005	0.026	0.024	0.114	1,587	0.019	0.230
2030										
Passenger Car	Gasoline	3.602	0.049	0.002	0.056	0.009	0.042	355	0.008	0.002
Passenger Truck	Diesel	1.855	1.229	0.002	0.034	0.031	0.141	604	0.013	0.060
Single Unit Short-haul Truck	Diesel	1.037	1.125	0.003	0.016	0.015	0.073	836	0.013	0.119
Combination Short-haul Truck	Diesel	1.985	2.613	0.005	0.022	0.020	0.107	1,565	0.019	0.231
2031										
Passenger Car	Gasoline	3.394	0.030	0.002	0.056	0.009	0.039	352	0.007	0.002
Passenger Truck	Diesel	1.821	1.174	0.002	0.032	0.029	0.134	601	0.012	0.061
Single Unit Short-haul Truck	Diesel	1.010	1.010	0.003	0.014	0.013	0.065	824	0.013	0.119
Combination Short-haul Truck	Diesel	1.941	2.325	0.005	0.019	0.018	0.100	1,546	0.018	0.231
2032										
Passenger Car	Gasoline	3.212	0.028	0.002	0.056	0.009	0.038	350	0.007	0.002
Passenger Truck	Diesel	1.706	1.026	0.002	0.026	0.024	0.111	590	0.012	0.062
Single Unit Short-haul Truck	Diesel	0.988	0.912	0.003	0.012	0.011	0.059	813	0.013	0.120
Combination Short-haul Truck	Diesel	1.905	2.074	0.005	0.017	0.015	0.095	1,529	0.018	0.231
2033										

Vehicles	Fuel	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O
Passenger Car	Gasoline	3.010	0.024	0.002	0.056	0.009	0.037	346	0.007	0.002
Passenger Truck	Diesel	1.569	0.843	0.002	0.021	0.020	0.086	582	0.012	0.062
Single Unit Short-haul Truck	Diesel	0.959	0.812	0.003	0.010	0.009	0.051	803	0.012	0.120
Combination Short-haul Truck	Diesel	1.876	1.872	0.005	0.015	0.014	0.090	1,515	0.018	0.232
2034										
Passenger Car	Gasoline	2.818	0.020	0.002	0.056	0.009	0.036	342	0.007	0.002
Passenger Truck	Diesel	1.509	0.773	0.002	0.018	0.017	0.076	574	0.012	0.063
Single Unit Short-haul Truck	Diesel	0.945	0.743	0.003	0.009	0.008	0.048	794	0.012	0.120
Combination Short-haul Truck	Diesel	1.864	1.724	0.005	0.013	0.012	0.087	1,503	0.018	0.232
2035										
Passenger Car	Gasoline	2.629	0.017	0.002	0.056	0.009	0.035	338	0.006	0.002
Passenger Truck	Diesel	1.443	0.691	0.002	0.014	0.013	0.063	565	0.012	0.064
Single Unit Short-haul Truck	Diesel	0.935	0.690	0.003	0.008	0.007	0.045	786	0.012	0.120
Combination Short-haul Truck	Diesel	1.854	1.600	0.005	0.012	0.011	0.084	1,492	0.017	0.232
2036										
Passenger Car	Gasoline	2.453	0.015	0.002	0.056	0.009	0.034	336	0.006	0.002
Passenger Truck	Diesel	1.414	0.664	0.002	0.013	0.012	0.061	561	0.011	0.064
Single Unit Short-haul Truck	Diesel	0.926	0.640	0.003	0.007	0.006	0.043	779	0.012	0.120
Combination Short-haul Truck	Diesel	1.845	1.487	0.005	0.011	0.011	0.081	1,483	0.017	0.232
2037										
Passenger Car	Gasoline	2.294	0.013	0.002	0.056	0.008	0.033	333	0.006	0.002
Passenger Truck	Diesel	1.240	0.524	0.002	0.002	0.002	0.027	550	0.013	0.065
Single Unit Short-haul Truck	Diesel	0.902	0.594	0.003	0.004	0.004	0.036	773	0.012	0.119
Combination Short-haul Truck	Diesel	1.825	1.375	0.005	0.008	0.007	0.076	1,476	0.018	0.232
2038										
Passenger Car	Gasoline	2.151	0.011	0.002	0.056	0.008	0.032	331	0.006	0.002
Passenger Truck	Diesel	1.223	0.501	0.002	0.002	0.002	0.026	546	0.012	0.065
Single Unit Short-haul Truck	Diesel	0.898	0.561	0.003	0.004	0.003	0.035	767	0.012	0.119
Combination Short-haul Truck	Diesel	1.817	1.296	0.005	0.008	0.007	0.074	1,470	0.018	0.232
2039										
Passenger Car	Gasoline	2.030	0.010	0.002	0.056	0.008	0.031	329	0.006	0.002
Passenger Truck	Diesel	1.212	0.452	0.002	0.002	0.002	0.025	538	0.011	0.066
Single Unit Short-haul Truck	Diesel	0.895	0.541	0.003	0.004	0.003	0.035	763	0.012	0.119
Combination Short-haul Truck	Diesel	1.810	1.227	0.005	0.007	0.007	0.073	1,465	0.017	0.232
2040										

Vehicles	Fuel	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O
Passenger Car	Gasoline	1.930	0.009	0.002	0.055	0.008	0.031	328	0.006	0.002
Passenger Truck	Diesel	1.197	0.415	0.002	0.002	0.002	0.025	532	0.010	0.066
Single Unit Short-haul Truck	Diesel	0.895	0.512	0.003	0.004	0.003	0.035	758	0.011	0.119
Combination Short-haul Truck	Diesel	1.813	1.165	0.005	0.007	0.007	0.073	1,462	0.017	0.233

Source: USEPA MOVES4.

Operational Emissions

Aircraft

Aircraft fleet mix and operations were obtained from a Master Plan prepared for Salt Lake City International Airport[9]. Over the long-term, the proposed south end-around-taxiway (SEAT) and employee parking lot would respectively change the routes of some aircraft and some employee-related motor vehicle traffic. Because the goal of the air quality assessment is to disclose changes in air pollutants and pollutant precursors, the operational emission inventories were only prepared for these two sources.

Table A-21 presents the forecast annual aircraft fleet mix and operations departing from Runway 35 for existing year 2022 and future analysis years 2040 and 2045.

Table A-21. Annual Aircraft Operations Departing Runway 35

Airframe	Engine	2022	2040	2045
Airbus A220-300	PW1521G	1,307	17,474	21,736
Airbus A319-100 Series	CFM56-5A5	4,442	0	0
Airbus A320-100 Series	CFM56-5-A1	6,271	0	0
Airbus A320-NEO	LEAP-1A26/26E1	2,352	32,429	39,871
Airbus A321-200 Series	CFM56-5B3/3	6,271	8,484	8,583
Airbus A321-NEO	PW1133G-JM	1,829	13,494	16,641
Airbus A330-200 Series	Trent 772	261	328	328
Airbus A330-900N Series (Neo)	Trent7000-72	1,307	2,833	3,128
Boeing 717-200 Series	BR700-715A1-30	4,703	5,901	5,901
Boeing 737-300 Series	CFM56-3-B1	8,623	3,987	2,216
Boeing 737-800 Series	CFM56-7B26E	15,940	2,918	0
Boeing 737-900 Series	CFM56-7B26	8,100	0	0
Boeing 737-7	LEAP-1B25	0	5,481	7,350
Boeing 737-8	LEAP-1B28/28B1/28B2/28B3	1,045	52,946	66,879
Bombardier CRJ-200	CF34-3B/-3B1	1,045	1,600	1,698
Bombardier CRJ-700	CF34-8C5B1	17,768	0	0
Bombardier CRJ-900	CF34-8C5	6,533	34,429	40,150
Embraer ERJ170	CF34-8E5	261	328	328
Embraer ERJ175	CF34-8E5	16,462	23,328	24,017
Embraer ERJ190	CF34-10E6	523	1,561	1,757
Boeing MD-90	V2525-D5	2,874	0	0
Airbus A300F4-600 Series	CF6-80C2A1	1,344	845	761
Airbus A330-300 Series	Trent 768	0	550	689
Boeing 777 Freighter	GE90-115B	137	498	610
Boeing 767-300 ER Freighter	CF6-80C2B7F	1,455	4,327	5,254

[9] SLC International Master Plan, 2022. SLC International Master Plan Documents and Resources | Salt Lake City International Airport (slcairport.com)

Airframe	Engine	2022	2040	2045
Boeing 757-200 Series Freighter	RB211-535E4	92	0	0
Boeing 737-400 Series Freighter	CFM56-3-B1	422	689	736
Boeing MD-11 Freighter	CF6-80C2D1F	74	0	0
Boeing DC-9-10 Series Freighter	JT8D-9 series	119	0	0
ATR 72-600 Freighter	PW127	220	796	962
ATR 42-300	PW120	217	518	591
Embraer EMB120 Brasilia	PW118A	178	0	0
Fairchild Metro IVC	TPE331-12UHR	344	0	0
Raytheon Beech 99	PT6A-27	1,514	2,780	3,038
Raytheon Beech 1900-C	PT6A-65B	1,413	2,596	2,836
Cessna 402	TIO-540-J2B2	285	817	947
Cessna 208 Caravan	PT6A-114	1,231	1,590	1,654
Cessna 172 Skyhawk	IO-360-B	1,743	2,812	2,598
Cirrus SR22 (FAS)	TIO-540-J2B2	358	352	320
Cessna 182	IO-360-B	272	267	243
Cessna 206	TIO-540-J2B2	124	122	111
Cessna 185 Skywagon	IO-360-B	121	119	108
Piper PA-28 Cherokee Series	IO-320-D1AD	119	118	107
Diamond DA40	IO-360-B	104	102	93
Cessna 340	TIO-540-J2B2	125	145	140
Piper PA44 (FAS)	IO-320-D1AD	108	125	120
Pilatus PC-12	PT6A-67	1,864	1,919	1,766
Piper PA46 (Piston)	TIO-540-J2B2	122	140	139
Raytheon Super King Air 200	PT6A-40	1,620	2,613	2,761
Cessna 750 Citation X	AE3007C	2,856	5,435	5,879
Gulfstream IV-SP	TAY Mk611-8	709	1,348	1,458
Raytheon Hawker 800	TFE731-3	395	751	812
Hawker HS-125 Series 400	TFE731-3	158	323	358
Bombardier Challenger 300	AE3007A1	641	1,264	1,392
Bombardier Challenger 350	AS907-2-1A (HTF7350)	163	322	354
Bombardier Challenger 650	CF34-3B/-3B1	360	709	780
Dassault Falcon 900	TFE731-3	170	335	369
Dassault Falcon 2000	PW308C BS 1289	215	424	467
Bombardier Learjet 35	TFE731-3	225	443	488
Bombardier Learjet 45	TFE731-2-2B	120	236	260
Bombardier Learjet 60	PW306A	197	388	427
Embraer Phenom 300 (EMB-505)	PW530	1,365	2,690	2,961
	Total	**131,219**	**247,030**	**283,171**

Source: HNTB 2024.

AEDT uses taxi times to estimate emissions from the aircraft taxi mode. For the existing and No Action scenarios a taxi distance of 1.15 miles was assumed; and for the Proposed Action a distance of 1.98 miles was derived and a nominal taxi speed of 15 miles an hour (mph) was assumed. Delays of 2.7, 4.0 and 4.5 minutes were assumed for 2022, 2040, and 2045, respectively.

AEDT provides estimates of aircraft-related greenhouse gas (GHG) emissions based on the amount of Jet A and aviation gasoline (Avgas) usage and the emission factors in **Table A-22**.

Table A-22. Aircraft GHG Emission Factors

Operation	Fuel Type	kg /gallon	g/gallon	g/gallon
		CO_2	CH_4	N_2O
Taxi	Jet-A	9.75	0	0.30
	Av-Gas	8.31	7.06	0.11
Source: USEPA GHG Emission Factors Hub, 2024.				

Table A-23 presents the Jet A and Avgas fuel usage for all alternatives.

Table A-23. Aircraft Fuel Usage

Operation	Alternative	Fuel Type	Usage (gallons)
2022	Existing	Jet-A	2,503,055
		Av-Gas	1,262
2040	No Action	Jet-A	5,446,223
		Av-Gas	2,452
	Proposed Action	Jet-A	7,546,614
		Av-Gas	3,397
2045	No Action	Jet-A	6,647,243
		Av-Gas	2,674
	Proposed Action	Jet-A	9,069,978
		Av-Gas	3,649
Source: USEPA AEDT, 2024.			

Motor Vehicles

For the existing and No Action conditions, emissions associated with employee vehicles were estimated based on the travel distance (1.56 miles) from the airport property boundary to the existing employee parking lot. For the Proposed Action the travel distance was from the airport property boundary to the proposed south employee parking lot (2.1 miles). Daily employee vehicle counts were obtained from the Master Plan.

The shuttle buses vehicle-miles travelled (VMT) for the existing, No Action and Proposed Action were also obtained and derived from SLC's Master Plan.

For the analysis, the employee motor vehicle fleet was assumed to be 50 percent passenger cars and 50 percent passenger trucks. The shuttle buses were assumed to be transit buses.

The "National" default in MOVES 4 was assumed to obtain summer and winter on-road motor vehicle emission factors for 2022, 2029 through 2040 and 2045. The emission factors represent worst-case emissions as maximum summer and minimum winter temperatures were assumed. MOVES Passenger Cars (21) and Passenger Trucks (31) with composite fuel emission factors were assumed to represent employee vehicles. Transit Buses (42) with composite fuel emission factors were assumed to represent the airport shuttle buses. **Table A-24** presents the MOVES inputs; and **Table A-25** presents the MOVES emission factors (i.e., output).

Table A-24. MOVES Inputs – On-road Motor Vehicles

Parameter	Input Data
Evaluation Year(s):	2029 and 240 and 2045
Location:	Salt Lake City County
Evaluation Month(s):	January (Winter) and July (Summer)
Days:	Weekdays
Evaluation Hour(s):	7:00-8:00 AM (Hour 8) – January
	3:00-4:00 PM (Hour 16) – July
Level of Analysis:	National Level MOVES Defaults for Vehicle Age Distribution, I/M Programs, etc.
Source Type:	On-road Vehicles:
	21 – Passenger Car (Composite Fuel), 31- Passenger Truck (Composite Fuel), and 42 - Transit Bus (Composite Fuel),
Roadway Type:	Urban Unrestricted
Temperature:	20.1 ˚F – Winter and 91.4 ˚F – Summer
Relative Humidity:	81.8 percent – Winter and 17.9 percent – Summer
Criteria/Precursor Pollutants:	CO, VOC, NO_x, SO_2, and PM
GHGs:	CO_2, N_2O, and CH_4
Source: USEPA MOVES4.	

Table A-25. MOVES On-road Motor Vehicle Emission Factors (grams/mile)

Source	Alternative	Source	Vehicle Type	CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
2022	Exiting	Employee Vehicles	Passenger Car	4.796	0.125	0.186	0.002	0.057	0.010	394	0.014	0.003
			Passenger Truck	4.673	0.161	0.336	0.002	0.065	0.014	506	0.016	0.005
		Buses/Shuttles	Transit Bus	8.448	0.541	3.084	0.007	0.204	0.050	1,815	2.060	0.148
2029	No Action	Employee Vehicles	Passenger Car	3.300	0.074	0.054	0.001	0.056	0.009	311	0.007	0.002
			Passenger Truck	2.729	0.082	0.095	0.002	0.062	0.010	402	0.007	0.003
		Buses/Shuttles	Transit Bus	9.837	0.494	2.506	0.006	0.191	0.038	1,713	2.636	0.149
	Proposed Action	Employee Vehicles	Passenger Car	3.300	0.074	0.054	0.001	0.056	0.009	311	0.007	0.002
			Passenger Truck	2.729	0.082	0.095	0.002	0.062	0.010	402	0.007	0.003
		Buses/Shuttles	Transit Bus	9.837	0.494	2.506	0.006	0.191	0.038	1,713	2.636	0.149
2030	No Action	Employee Vehicles	Passenger Car	3.048	0.069	0.042	0.001	0.056	0.009	300	0.006	0.001
			Passenger Truck	2.546	0.076	0.079	0.002	0.061	0.010	389	0.007	0.003
		Buses/Shuttles	Transit Bus	9.733	0.473	2.386	0.006	0.189	0.037	1,689	2.603	0.148
	Proposed Action	Employee Vehicles	Passenger Car	3.048	0.069	0.042	0.001	0.056	0.009	300	0.006	0.001
			Passenger Truck	2.546	0.076	0.079	0.002	0.061	0.010	389	0.007	0.003
		Buses/Shuttles	Transit Bus	9.733	0.473	2.386	0.006	0.189	0.037	1,689	2.603	0.148
2031	No Action	Employee Vehicles	Passenger Car	2.787	0.065	0.025	0.001	0.056	0.009	289	0.006	0.001
			Passenger Truck	2.388	0.070	0.057	0.002	0.061	0.010	377	0.006	0.003
		Buses/Shuttles	Transit Bus	9.625	0.453	2.261	0.006	0.188	0.036	1,665	2.565	0.146
	Proposed Action	Employee Vehicles	Passenger Car	2.787	0.065	0.025	0.001	0.056	0.009	289	0.006	0.001
			Passenger Truck	2.388	0.070	0.057	0.002	0.061	0.010	377	0.006	0.003
		Buses/Shuttles	Transit Bus	9.625	0.453	2.261	0.006	0.188	0.036	1,665	2.565	0.146
2032	No Action	Employee Vehicles	Passenger Car	2.561	0.063	0.022	0.001	0.056	0.008	279	0.006	0.001
			Passenger Truck	2.237	0.065	0.049	0.002	0.061	0.010	366	0.006	0.003
		Buses/Shuttles	Transit Bus	9.516	0.434	2.139	0.006	0.187	0.035	1,642	2.527	0.145
	Proposed Action	Employee Vehicles	Passenger Car	2.561	0.063	0.022	0.001	0.056	0.008	279	0.006	0.001
			Passenger Truck	2.237	0.065	0.049	0.002	0.061	0.010	366	0.006	0.003
		Buses/Shuttles	Transit Bus	9.516	0.434	2.139	0.006	0.187	0.035	1,642	2.527	0.145

Source	Alternative	Source	Vehicle Type	CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
2033	No Action	Employee Vehicles	Passenger Car	2.348	0.060	0.019	0.001	0.056	0.008	269	0.005	0.001
			Passenger Truck	2.086	0.062	0.040	0.002	0.061	0.009	356	0.006	0.003
		Buses/Shuttles	Transit Bus	9.255	0.412	2.001	0.006	0.185	0.034	1,618	2.485	0.144
	Proposed Action	Employee Vehicles	Passenger Car	2.348	0.060	0.019	0.001	0.056	0.008	269	0.005	0.001
			Passenger Truck	2.086	0.062	0.040	0.002	0.061	0.009	356	0.006	0.003
		Buses/Shuttles	Transit Bus	9.255	0.412	2.001	0.006	0.185	0.034	1,618	2.485	0.144
2034	No Action	Employee Vehicles	Passenger Car	2.158	0.058	0.015	0.001	0.055	0.008	261	0.005	0.001
			Passenger Truck	1.947	0.060	0.034	0.002	0.060	0.009	346	0.005	0.003
		Buses/Shuttles	Transit Bus	9.005	0.393	1.885	0.006	0.184	0.034	1,594	2.441	0.142
	Proposed Action	Employee Vehicles	Passenger Car	2.158	0.058	0.015	0.001	0.055	0.008	261	0.005	0.001
			Passenger Truck	1.947	0.060	0.034	0.002	0.060	0.009	346	0.005	0.003
		Buses/Shuttles	Transit Bus	9.005	0.393	1.885	0.006	0.184	0.034	1,594	2.441	0.142
2035	No Action	Employee Vehicles	Passenger Car	1.974	0.055	0.013	0.001	0.055	0.008	254	0.005	0.001
			Passenger Truck	1.836	0.059	0.029	0.002	0.060	0.009	338	0.005	0.003
		Buses/Shuttles	Transit Bus	8.752	0.374	1.766	0.006	0.183	0.033	1,570	2.396	0.141
	Proposed Action	Employee Vehicles	Passenger Car	1.974	0.055	0.013	0.001	0.055	0.008	254	0.005	0.001
			Passenger Truck	1.836	0.059	0.029	0.002	0.060	0.009	338	0.005	0.003
		Buses/Shuttles	Transit Bus	8.752	0.374	1.766	0.006	0.183	0.033	1,570	2.396	0.141
2036	No Action	Employee Vehicles	Passenger Car	1.809	0.053	0.011	0.001	0.055	0.008	247	0.004	0.001
			Passenger Truck	1.736	0.058	0.026	0.002	0.060	0.009	330	0.005	0.003
		Buses/Shuttles	Transit Bus	8.507	0.357	1.655	0.006	0.183	0.032	1,547	2.345	0.139
	Proposed Action	Employee Vehicles	Passenger Car	1.809	0.053	0.011	0.001	0.055	0.008	247	0.004	0.001
			Passenger Truck	1.736	0.058	0.026	0.002	0.060	0.009	330	0.005	0.003
		Buses/Shuttles	Transit Bus	8.507	0.357	1.655	0.006	0.183	0.032	1,547	2.345	0.139
2037	No Action	Employee Vehicles	Passenger Car	1.661	0.050	0.009	0.001	0.055	0.008	241	0.004	0.001
			Passenger Truck	1.641	0.056	0.022	0.002	0.060	0.009	323	0.005	0.003
		Buses/Shuttles	Transit Bus	8.255	0.335	1.566	0.006	0.179	0.029	1,526	2.298	0.137
	Proposed Action	Employee Vehicles	Passenger Car	1.661	0.050	0.009	0.001	0.055	0.008	241	0.004	0.001
			Passenger Truck	1.641	0.056	0.022	0.002	0.060	0.009	323	0.005	0.003

Source	Alternative	Source	Vehicle Type	CO	VOC	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
		Buses/Shuttles	Transit Bus	8.255	0.335	1.566	0.006	0.179	0.029	1,526	2.298	0.137
2038	No Action	Employee Vehicles	Passenger Car	1.533	0.048	0.008	0.001	0.055	0.008	236	0.004	0.001
			Passenger Truck	1.546	0.055	0.020	0.001	0.060	0.009	316	0.005	0.003
		Buses/Shuttles	Transit Bus	8.051	0.321	1.508	0.006	0.179	0.029	1,506	2.260	0.136
	Proposed Action	Employee Vehicles	Passenger Car	1.533	0.048	0.008	0.001	0.055	0.008	236	0.004	0.001
			Passenger Truck	1.546	0.055	0.020	0.001	0.060	0.009	316	0.005	0.003
		Buses/Shuttles	Transit Bus	8.051	0.321	1.508	0.006	0.179	0.029	1,506	2.260	0.136
2039	No Action	Employee Vehicles	Passenger Car	1.429	0.046	0.007	0.001	0.055	0.008	232	0.004	0.001
			Passenger Truck	1.478	0.054	0.017	0.001	0.060	0.009	310	0.005	0.003
		Buses/Shuttles	Transit Bus	7.846	0.307	1.457	0.006	0.178	0.029	1,488	2.223	0.134
	Proposed Action	Employee Vehicles	Passenger Car	1.429	0.046	0.007	0.001	0.055	0.008	232	0.004	0.001
			Passenger Truck	1.478	0.054	0.017	0.001	0.060	0.009	310	0.005	0.003
		Buses/Shuttles	Transit Bus	7.846	0.307	1.457	0.006	0.178	0.029	1,488	2.223	0.134
2040	No Action	Employee Vehicles	Passenger Car	1.343	0.044	0.006	0.001	0.055	0.008	228	0.004	0.001
			Passenger Truck	1.409	0.054	0.015	0.001	0.060	0.009	306	0.005	0.003
		Buses/Shuttles	Transit Bus	7.733	0.297	1.396	0.006	0.177	0.028	1,474	2.203	0.135
	Proposed Action	Employee Vehicles	Passenger Car	1.343	0.044	0.006	0.001	0.055	0.008	228	0.004	0.001
			Passenger Truck	1.409	0.054	0.015	0.001	0.060	0.009	306	0.005	0.003
		Buses/Shuttles	Transit Bus	7.733	0.297	1.396	0.006	0.177	0.028	1,474	2.203	0.135
2045	No Action	Employee Vehicles	Passenger Car	1.105	0.038	0.004	0.001	0.055	0.008	217	0.004	0.001
			Passenger Truck	1.153	0.050	0.012	0.001	0.059	0.009	287	0.004	0.002
		Buses/Shuttles	Transit Bus	7.215	0.252	1.189	0.005	0.175	0.027	1,404	2.230	0.126
	Proposed Action	Employee Vehicles	Passenger Car	1.105	0.038	0.004	0.001	0.055	0.008	217	0.004	0.001
			Passenger Truck	1.153	0.050	0.012	0.001	0.059	0.009	287	0.004	0.002
		Buses/Shuttles	Transit Bus	7.215	0.252	1.189	0.005	0.175	0.027	1,404	2.230	0.126
Source: USEPA MOVES4.												