CHAPTER 5

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

5.1 INTRODUCTION

The purpose of this chapter is two-fold: to describe the character of the environment in which the Proposed Action would occur—the affected environment—and to identify the potential impacts of the proposed projects associated with the No Action Alternative and the Proposed Action Alternative—the environmental consequences.

Each section in this chapter starts with a description of the affected environment, focusing on the characteristics of the surrounding area to familiarize the reader with the geography, land use, demographics, and existing environmental conditions.

Then, in accordance with the Federal Aviation Administration's (FAA's) environmental orders 5050.4B, Airport Environmental Handbook, and 1050.1F, Environmental Impacts: Policies and Procedures, each chapter includes a discussion of the environmental consequences for the No Action and Proposed Action Alternatives.

As discussed in the **Section 1.1.2**, the analyses presented in **Chapter 5** cover three separate conditions (i.e., specific years):

- The 2018 Existing Condition—representing the conditions present during calendar year 2018 and before the start of the Environmental Assessment (EA) process.
- The 2025 Interim Condition—representing the conditions three years after the proposed start of project construction for the No Action and Proposed Action Alternatives.
- The 2032 Build Out Condition—representing the conditions ten years after the start of the project and the planned timeframe for completion of project construction for the No Action and Proposed Action Alternatives.

For brevity in this document when presenting environmental consequences, the combination of the evaluated condition year and alternative are referred to in the following shortened form:

- **Interim No Action** for the 2025 Interim Condition of the No Action Alternative,
- **Interim Proposed Action** for the 2025 Interim Condition of the Proposed Action Alternative,
- **Build Out No Action** for the 2032 Build Out Condition of the No Action Alternative, and
- **Build Out Proposed Action** for the 2032 Build Out Condition of the Proposed Action Alternative.

Section 5.2 discusses the environmental resource categories that are dismissed from or retained for further analysis in this EA.

Potential impacts to the environmental resource categories retained for analysis have been evaluated in the following sections of Chapter 5:

- 5.3 Air Quality
- 5.4 Climate
- 5.5 Noise and Noise-Compatible Land Use
- 5.6 Historical, Architectural, Archeological, and Cultural Resources
- 5.7 Department of Transportation Act, Section 4(f)
- 5.8 Biological Resources
- 5.9 Light Emissions and Visual Impacts
- 5.10 Hazardous Materials, Solid Waste, and Pollution Prevention
- 5.11 Natural Resources and Energy Supply
- 5.12 Surface Transportation and Parking
- 5.13 Water Resources
- 5.14 Socioeconomic Impacts, Environmental Justice, and Children's Health and Safety Risks
- 5.15 Irreversible and Irretrievable Commitment of Resources
- 5.16 Cumulative Impacts

5.2 RESOURCE CATEGORIES DISMISSED FROM OR RETAINED FOR FURTHER ANALYSIS

Council on Environmental Quality (CEQ) and agency guidance[1] encourages agencies to focus on impact categories where there is potential for significant impacts or uncertainty about impacts caused by a Proposed Action. The discussion of environmental impacts must focus on substantive issues and provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) (see 40 Code of Federal Regulations [CFR] Section 1508.9(a)(1), CEQ Regulations). This section must include analysis necessary to address the significance factors in Paragraph 4-3 and 40 CFR Section 1508.27, CEQ Regulations. The focus of this analysis is on resources that would be directly, indirectly, and cumulatively affected.[2] In preparing this EA, the FAA determined that certain environmental resources do not require detailed analysis either in whole or in part. Activities associated with either the Interim Proposed Action or the Build Out Proposed Action would not have the potential to adversely or beneficially impact the affected environment associated with such resources. For this reason, this EA does not examine the effects on the following three environmental impact categories:

- Coastal Resources
- Farmlands
- Land Use

[1] FAA Order 1050.1E, Change 1 Guidance Memo #2, Guidance on Preparing Focused, Concise, and Timely Environmental Assessments, January 10, 2011

[2] FAA Order 1050.1F, 2015

- o With respect to noise from aircraft operations, compatibility of existing and future off-airport land-use patterns is assessed as part of the analyses undertaken for the noise environmental impact category (see **Section 5.5**).
- o Analyses otherwise contemplated for this category consider potential conflicts between the Proposed Action and the objectives of federal, tribal, state, regional, and local land use plans, policies, and controls for the area concerned. Because land use at O'Hare International Airport (O'Hare or the airport) is already recognized in federal, state, regional, and local land use plans, and given that the Proposed Action primarily consists of construction projects well removed from the boundary of O'Hare and thus removed from adjacent, potentially conflicting land uses, dismissal of this aspect of the category is warranted.

These resources are either not present where the activities associated with the Proposed Action would occur; there is no potential for the activities associated with the Proposed Action to create effects on these resources that would rise to a level of significance, as identified in FAA Order 1050.1F; or the resource is addressed in another environmental impact category.

Additionally, certain other environmental impact categories identified in FAA Order 1050.1F have sub-categories for which detailed analysis is similarly not warranted. In these instances, the FAA has made a similar determination, but at the sub-category level. Therefore, these resources are partially dismissed and partially retained for detailed impact analysis. The following explains which sub-categories are retained and which ones are dismissed, along with the rationale:

- Visual Resources (Light Emissions; Visual Resources and Visual Character) (dismissed in part and retained in part)
  - o Light Emissions Effects (retained): This sub-category is retained for detailed analyses and is presented in **Section 5.9**.
  - o Visual Resources and Visual Character (dismissed): The nature of the Proposed Action is such that construction activities are confined to a large-scale airport campus setting. Therefore, a detailed viewshed analysis with respect to off-airport areas is not warranted. As indicated in FAA Order 1050.1F, to the extent that visual character and viewsheds are important attributes of on- or off-airport historic resources, parks, refuges, or wildlife preserves for which detailed impact analyses are conducted, discussion of those effects is integrated into analyses presented in **Section 5.6** and **Section 5.7**.
- Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks (dismissed in part and retained in part)
  - o Socioeconomic Impacts (dismissed except for surface transportation): Using definitions found in FAA 1050.1F, the Proposed Action would generally not affect this sub-category. No land acquisition or displacement of persons or businesses is proposed, nor would there be meaningful potential for loss to a community's tax base or changes to the fabric of the community as a result. Therefore, detailed modeling and analysis of socioeconomic effects (e.g., effects on employment, multiplier effects from construction expenditures, etc.,) are not presented. Nonetheless, it is anticipated that construction and implementation of the Proposed Action would have beneficial effects on local employment and lead to economic multiplier effects.

    However, in the same manner that visual character is integrated into other analyses when warranted, but not otherwise separately discussed, one element of the socioeconomic impacts analyses identified in FAA 1050.1F is the effect of the Proposed Action on "local surface roadway traffic patterns." The analysis of the Proposed Action's effects on the surface transportation network, primarily undertaken for the purpose of informing detailed analyses of other environmental impact categories (i.e., induced or secondary effects on air quality) is presented in **Section 5.12**.

- Environmental Justice (retained): Detailed analysis for this sub-category is presented in **Section 5.14**.
- Children's Environmental Health and Safety Risks (dismissed): The Proposed Action would not affect this sub-category. Construction and implementation of the Build Out Proposed Action would not involve products or substances with which a child is likely to be exposed, come into contact with, ingest, or use, since construction sites are secured, limited-access facilities. Furthermore, the Proposed Action would not result in a concentrated, localized increase in emissions that could affect children's health. Accordingly, there would be no increase in environmental health and safety risks that could disproportionately affect children. Therefore, this sub-category was not carried forward for in-depth analysis.

- Water Resources (Wetlands, Floodplains, Groundwater, Surface Waters, Water Quality, and Wild and Scenic Rivers) (dismissed in part and retained in part)
  - Wetlands, Floodplains, Surface Waters, and Water Quality (retained): Detailed analyses for these sub-categories are presented in **Section 5.13**.
  - Groundwater (dismissed): As explained in Appendix K of the O'Hare Modernization Program (OMP) EIS, "The City of Chicago and municipalities surrounding the airport have ordinances prohibiting the use of groundwater wells as potable water resources." Therefore, the Safe Drinking Water Act is not applicable to the Proposed Action, and groundwater is not considered further in this EA. Per- and Polyfluoroalkyl Substances (PFAS) are discussed in **Section 5.10**.
  - Wild and Scenic Rivers (dismissed): No resources designated as such exist in the Primary or Secondary Study Area.

Table 5.2-1 summarizes the environmental impact categories and sub-categories retained for detailed analysis or dismissed from further analysis in this EA.

TABLE 5.2-1 FAA ORDER 1050.1F ENVIRONMENTAL IMPACT CATEGORIES AND RECOMMENDED ANALYSES

Environmental Impact Category	Detailed Analysis Presented in EA?
Coastal Resources	No
Farmlands	No
Land Use	No; for land use compatibility analyses associated with aircraft noise, see **Section 5.5**
Air Quality	Yes, see **Section 5.3**
Climate	Yes, see **Section 5.4**

Environmental Impact Category	Detailed Analysis Presented in EA?
Noise and Noise-Compatible Land Use	Yes, see Section 5.5
Historical, Architectural, Archeological, and Cultural Resources	Yes, see Section 5.6
Department of Transportation Act, Section 4(f)	Yes, see Section 5.7
Biological Resources	Yes, see Section 5.8
Visual Effects	Yes (partial), see Section 5.9
Hazardous Materials, Solid Waste, and Pollution Prevention	Yes, see Section 5.10
Natural Resources and Energy Supply	Yes, see Section 5.11
Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks	Yes (partial), see Section 5.12 for Surface Transportation and Parking and Section 5.14 for Environmental Justice
Water Resources	Yes (partial), see Section 5.13
Recommended Analyses	**Detailed Analysis Presented in EA?**
Irreversible and Irretrievable Commitment of Resources	Yes, see Section 5.15
Cumulative Impacts	Yes, see Section 5.16
Source: FAA Order 1050.1F Desk Reference, 2020	

5.3 AIR QUALITY

This section describes existing air quality conditions and the potential consequences to air quality that would result from project implementation. Additional documentation describing the analysis methodology, assumptions, supporting data, and detailed results is provided in **Appendix E**.

5.3.1 Definition of Resource

The United States Environmental Protection Agency (USEPA) promulgates National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (CAA) to protect human health and public welfare for what are known as "criteria" air pollutants. The current federal primary and secondary NAAQS (the human health and welfare standards, respectively) adopted by the State of Illinois are listed in **Table 5.3-1**.

TABLE 5.3-1
NATIONAL AMBIENT AIR QUALITY STANDARDS

		Primary Standards (Human Health-Based)		Secondary Standards (Public Welfare-Based)	
Pollutant	Averaging Time	µg/m³	ppm	µg/ms³	ppm
CO	1-Hour (see note 1)	40,000	35	-	-
	8-Hour (see note 1)	10,000	9	-	-
O_3 (see note 10)	8-Hour (see note 2)	137	0.070	137	0.070
SO_2	1-Hour (see note 3)	196	0.075	-	-

Pollutant	Averaging Time	Primary Standards (Human Health-Based)		Secondary Standards (Public Welfare-Based)	
		μg/m³	ppm	μg/ms³	ppm
	3-Hour (see note 1)	-	-	1,300	0.5
NO_2	1-Hour (see note 4)	188	0.100	-	-
	Annual (see note 5)	100	0.053	100	0.053
PM_{10}	24-Hour (see note 6)	150	-	150	-
$PM_{2.5}$	24-Hour (see note 7)	35	-	35	-
	Annual (see note 8)	12.0	-	15.0	-
Pb	Quarterly Mean (see note 9)	0.15	-	0.15	-

Notes: "-" = not applicable
μg/m³ = micrograms per cubic meter
ppm = parts per million
1. Not to be exceeded more than once per year
2. Attained when the average of the annual fourth highest daily maximum 8-hour average is less than or equal to 0.070 ppm
3. Attained when the three-year average of the annual 99th percentile of the 1-hour daily maximum is less than or equal to 0.075 ppm
4. Attained when the three-year average of the annual 98th percentile of the 1-hour daily maximum is less than or equal to 0.10 ppm
5. Attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 0.053 ppm, rounded to three decimal places
6. Attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μgm³ is equal to or less than one
7. Attained when the 98th percentile 24-hour concentration average over three years is less than or equal to 35 μgm³
8. Attained when the annual arithmetic mean concentration is less than or equal to 12.0 μg/m³ (revised on December 14, 2012) but the secondary standard retained the annual arithmetic mean concentration is less than or equal to 15.0 μg/m³
9. Maximum arithmetic mean averaged over a rolling three-month period
10. Year 2015 standard

Source: 40 CFR Part 50, National Primary and Secondary Ambient Air Quality Standards, https://www.epa.gov/criteria-air-pollutants/naaqs-table

The following criteria air pollutants are addressed in this EA: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), and particulate matter (PM). For comparison to the NAAQS, two sizes of PM are also evaluated: PM less than or equal to 10 micrometers in diameter (coarse or PM_{10}) and PM less than or equal to 2.5 micrometers in diameter (fine or $PM_{2.5}$). When volatile organic compounds (VOC) and nitrogen oxide (NO_x) accumulate in the atmosphere and are exposed to the ultraviolet component of sunlight, the pollutant O_3 forms. As such, the assessment of this pollutant was performed using estimates of VOC and NO_x, known as pollutant precursors. Estimates of lead (Pb) were not prepared because less than one percent of the total aircraft operations at O'Hare include piston aircraft (approximately 1,300 operations per year), which use aviation fuel containing Pb (i.e., Avgas/100LL). This Avgas use would result in less than 0.1 tons per year of Pb emissions, which is well below the USEPA's ambient monitoring threshold of one ton.

The sources of airport-related air pollutant emissions are construction activities, aircraft, auxiliary power units (APU), ground support equipment (GSE), stationary sources, and motor vehicles (employee and passenger). The following describes each source:

- **Construction** – Combustion exhaust occurs from equipment such as cranes, excavators, and loaders, as well as haul trucks and employee trips. The impact of the combustion emissions depends on the size of the equipment and hours of operation. Fugitive dust (i.e., small particles suspended in the air) and emissions from combustion sources occur at airports during construction and land-clearing activities. The impact of a fugitive dust source depends on the quantity and drift potential of the particles injected into the atmosphere. Erosion control measures (e.g., watering, chemical stabilization) are typically used to minimize fugitive dust emissions.

- **Aircraft** – Exhaust gases from aircraft engines are predominantly comprised of nitrogen, oxygen, and water vapor, compounds not normally considered air pollutants. Aircraft also emit CO, VOC, NO_x, sulfur oxide (SO_x), PM_{10}, and $PM_{2.5}$. The amount of pollutant emitted depends on factors such as engine type, aircraft type, and operational mode (i.e., taxi/idle, approach, climb-out, or takeoff).
- **APU** – APU are small turbine engines on an aircraft that are used to start the main engines; provide electrical power to aircraft radios, lights, and other equipment; and power the onboard air conditioning (heating and cooling) system.
- **GSE** – GSE is the equipment used to service aircraft between flights (e.g., baggage tugs, tow tugs, belt loaders). GSE emissions depend on the level of fuel consumption and distance traveled/operating time.
- **Stationary sources** – Airports have a variety of stationary sources, including heating and refrigeration plants, boilers, generators, aircraft engine testing, and fuel storage/transfer facilities. Emission levels from some stationary sources are regulated through permits.
- **Motor vehicles** – On-airport motor vehicle activity includes passenger, employee, and cargo carrying vehicles, buses transporting employees, and employees using airport roadways and parking lots. On the regional roadway network, these vehicles are indistinguishable from non-airport motor vehicle traffic.

In addition to criteria air pollutants, hazardous air pollutants (HAP) are also evaluated. HAP are gaseous organic and inorganic chemicals and PM that the USEPA has identified to have known or suspected potential to cause cancer or other serious health effects. HAP are emitted by a wide range of airport and non-airport sources, including aircraft, GSE, motor vehicles, dry cleaning, and industrial facilities. The CAA mandates that the USEPA regulate HAP emissions. While there are currently no ambient (i.e., outdoor) standards for HAP emission levels, standards do exist for the level of HAP emissions emitted by stationary sources.

The air quality study area has the same limits as the surface transportation study area, except for aircraft. Generally, the study area is bounded by Mannheim Road to the east, Touhy Avenue/Higgins Road to the north, Irving Park Road to the south, and York Road to the west. On the west side of the airport, the study area also includes Busse Road between Thorndale Avenue and Irving Park Road, Thorndale Avenue from York Road to Wood Dale Road, and Irving Park Road from York Road to Busse Road.

The aircraft activities comprising a landing/take-off cycle produce ground-based emissions (i.e., emissions in aircraft taxi/idle mode) and emissions that occur above ground level (i.e., during aircraft modes of approach, climb-out, and takeoff). While the taxi/idle mode and portions of the approach and climb-out modes occur within the study limits described, the air quality study area—for the purpose of estimating the level of emissions that could impact air pollutants—extends beyond the area described up to the atmospheric mixing height (i.e., the height above ground in which a pollutant disperses). In the Chicago area, the atmospheric mixing height is 2,510 feet above ground level. To be at this altitude, aircraft arriving at O'Hare would be approximately six miles from the airport (i.e., the evaluation includes all aircraft activity occurring approximately six miles from the end of any of the airport's runways).

5.3.2 Regulatory Context

The National Environmental Policy Act (NEPA) requires disclosure of impacts to air quality due to federal actions. The primary guidance documents by which an air quality assessment is performed to comply with NEPA are FAA Order 1050.1F[3] and its accompanying 1050.1F Desk Reference[4] and the Aviation Emissions and Air Quality Handbook.[5]

The CAA regulates air pollutants from stationary and mobile sources. An area with air pollutant concentrations below the NAAQS is designated by the USEPA as an "attainment" area. An area in violation of the NAAQS is designated a "nonattainment" area. States with a nonattainment area must develop a State Implementation Plan (SIP) that demonstrates how the area will attain the NAAQS. If a state reduces air pollutant levels in a nonattainment area such that no violations of the NAAQS occur over a specific time, the USEPA re-designates the area to be "maintenance." Portions of O'Hare lie in both Cook County and DuPage County. These counties, along with three other counties and areas in Illinois, two counties in Indiana, and part of a county in Wisconsin, are designated as a "serious nonattainment" area for an O_3 standard promulgated by the USEPA in 2008 and a "marginal nonattainment" area for an O_3 standard promulgated in 2015.[6, 7]

The CAA requires that federal agencies ensure that non-highway and transit-related actions proposed in a maintenance or nonattainment area conform to a SIP. This process is referred to as General Conformity. Part 93 of Title 40 of the Code of Federal Regulations (40 CFR Part 93) outlines the requirements for determining whether a proposed federal action conforms to a state's SIP. The General Conformity Rule, 40 CFR Part 93 Subpart B, implements the CAA's mandate that a proposed action must comply with a SIP's purpose: eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of the standards [42 United States Code (U.S.C.) Section 7506(c)(1)(A)]. A General Conformity Determination is required if an action's emissions exceed *de minimis* levels. Comparing project-related emissions to the *de minimis* levels is referred to as an Applicability Test, which is only conducted for the air pollutants for which an area is classified as maintenance or nonattainment. Because O'Hare is in an area designated by the USEPA as nonattainment/serious with respect to the 2008 O_3 NAAQS, the *de minimis* level for the Proposed Action is 50 tons per year of VOC or NO_x, which are the precursors to O_3 formation.[8]

5.3.3 Affected Environment

The Illinois Environmental Protection Agency (IEPA) maintains a network of air quality monitors to assess compliance with the NAAQS and to evaluate the effect of air pollution control strategies. The maximum IEPA-measured pollutant concentrations from 2016 through 2018 in Cook and DuPage Counties are presented in **Table 5.3-2**. As shown, eight-hour measured O_3 concentrations exceeded the NAAQS, which is consistent with the area's nonattainment status. Although the maximum IEPA-measured 24-hour $PM_{2.5}$ concentrations in 2017 and 2018 were above the NAAQS, these levels are not

[3] 1050.1F - Environmental Impacts: Policies and Procedures – Document Information (faa.gov)
[4] 1050.1F Desk Reference | Federal Aviation Administration (faa.gov)
[5] Federal Aviation Administration, Aviation Emissions and Air Quality Handbook, Version 3, Update 1. January 2015, Aviation Emissions and Air Quality Handbook, Version 3, Update 1 (faa.gov)
[6] United States Environmental Protection Agency, Nonattainment Areas for Criteria Pollutants, https://www.epa.gov/green-book
[7] In the March 10, 2022, Federal Register, the EPA is proposing to approve the redesignation of the Illinois portion of the Chicago-Naperville, IL-IN-WI area (Chicago area) from serious nonattainment to attainment of the 2008 O3 NAAQS in accordance with a request from Illinois submitted on January 25, 2022. The EPA is accepting public comments until April 11, 2022. Not withstanding a proposed change, the analysis and conclusions provided in this EA would remain as provided for the Proposed Action.
[8] United States Environmental Protection Agency, General Conformity *De Minimis* Tables, https://www.epa.gov/general-conformity/de-minimis-tables

considered a violation because the standard for this pollutant is based on a 98th percentile concentration of the ranked 24-hour measurements averaged over a three-year period, which is below the NAAQS and reflects the region's attainment status for $PM_{2.5}$.

TABLE 5.3-2
IEPA AIR POLLUTANT MONITORING DATA

Pollutant	Averaging Time	NAAQS		Highest Measured Level (see notes 1 and 2)		
		Value	Units	2016	2017	2018
CO	1-Hour	35	ppm	1.22	1.41	1.32
	8-Hour	9	ppm	0.78	0.70	1.10
O_3	8-Hour	0.070	ppm	0.086	0.092	0.096
SO_2	1-Hour	0.75	ppm	0.19	0.33	0.14
	3-Hour	0.50	ppm	0.14	0.19	0.11
NO_2	1-Hour	0.100	ppm	0.92	0.87	0.85
	Annual	0.053	ppm	0.017	0.016	0.018
PM_{10}	24-Hour	150	μg/m³	119	145	93
$PM_{2.5}$	24-Hour	35	μg/m³	26.4	35.9	35.7
	24-Hour (98%)	35	μg/m³			22.5
	Annual	12.0	μg/m³	9.4	10.3	11.4
Pb	Quarterly Mean	0.15	μg/m³	0.027	0.027	0.019

Notes: 1. Data from all monitors in Cook and DuPage counties
2. The concentrations are the highest measured levels within the defined area. As such, the levels may/may not be directly comparable to the number of NAAQS exceedances because of the methodologies used to determine whether an exceedance has occurred.

Source: United States Environmental Protection Agency, Office of Air Quality Planning and Standards, AIR Data – Monitor Values Reports, Air Data: Air Quality Data Collected at Outdoor Monitors Across the US | US EPA and Illinois Environmental Protection Agency, Annual Air Quality Reports, Air Quality - Air Quality Reports (illinois.gov)

Meteorological conditions play an important role in the diffusion, dilution, and accumulation of air pollutants. In general, conditions in Illinois can be described as "continental," or dry near the surface, which is typical of the interior of a large landmass. The area experiences cold winters, warm summers, and frequent short fluctuations in temperature, humidity, cloudiness, and wind direction. Lake Michigan influences the climate of northeastern Illinois and especially Chicago. The large mass of the lake tends to reduce temperatures, resulting in slightly cooler summers and warmer winters than areas located farther inland. Temperature inversions that typically occur in the winter (when cold air sinks and gets trapped under a layer of warmer air) can exacerbate the deterioration of air quality in the nonattainment area. The higher levels of sunshine during July and August—combined with temperature inversions caused when cooler air from Lake Michigan is prevented from dispersing from under the upper warm air—are favorable for the formation of O_3.

5.3.3.1 Methodology

Two types of air quality analysis were performed for the Existing Condition: emission inventories and dispersion modeling. Emission inventories estimate the amount of air pollutants emitted by airport sources, while dispersion modeling uses these estimates, along with meteorological and other data, to derive predicted pollutant concentrations that can be directly compared with the NAAQS. Because no ambient (i.e., outdoor) standards exist for concentrations of HAP, only emissions inventories are prepared to disclose changes in emissions levels of these pollutants resulting from a proposed project.

For the Existing Condition, the FAA's Aviation Environmental Design Tool (AEDT, Version 2d Service Pack 2) was used to prepare airport operational emission estimates for aircraft, APU, GSE, and stationary sources.[9] Data from Total Airspace and Airport Modeling (TAAM) (see **Appendix D)** was used to develop aircraft fleet mix and other pertinent information used in the emissions inventory and dispersion modeling. To estimate motor vehicle emissions associated with passenger trips, emission factors were obtained from USEPA's Motor Vehicle Emissions Simulator (MOVES, Version 2014b)[10] model (see **Section 5.14** for detailed motor vehicle data in the study area). **Appendix E** provides the O'Hare-specific data used to prepare the air pollutant emission estimates.

The dispersion analysis performed for the Existing Condition provides modeled concentrations of the evaluated criteria air pollutants on and in the vicinity of O'Hare. This analysis was performed using AEDT and a version of USEPA's American Meterological Society/USEPA Regulatory Model (AERMOD) dispersion model that would facilitate the analysis (Version 19191).[11,12,13] AEDT uses information such as the location of emission sources and operational profiles[14] to estimate hourly emissions by source and develops an input file for AERMOD. AERMOD then determines the estimated air concentrations at nearby receptors for comparison to the NAAQS. **Exhibit 5.3-1** provides the location of the receptors (i.e., representative locations for which air pollutant concentrations were estimated). **Appendix E** provides further details related to the modeled receptors.

5.3.3.2 Existing Condition

Criteria Air Pollutants/Pollutant Precursors

Emissions Inventory

An airport operational emissions inventory was prepared for the Existing Condition. The inventory was prepared for CO, NO_x (as a surrogate for NO_2), SO_x (as a surrogate for SO_2), PM_{10}, and $PM_{2.5}$.[15] An inventory of VOC emissions was also prepared because, as previously stated, when VOC and NO_x accumulate in the atmosphere and are exposed to the ultraviolet component of sunlight, the pollutant O_3 is formed. Estimates of Pb were not prepared because less than one percent of the total aircraft operations at O'Hare involve piston aircraft, the aircraft that use aviation fuel that contains Pb (i.e., Avgas/100LL).

9 Federal Aviation Administration, Aviation Environmental Design Tool (AEDT) Users Guide, September 2017, https://aedt.faa.gov/; AEDT 2d, Service Pack 2 was released September 5, 2019

10 United States Environmental Protection Agency, Motor Vehicle Emissions Simulator (MOVES) User Guide for MOVES2014b, December 2018, https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

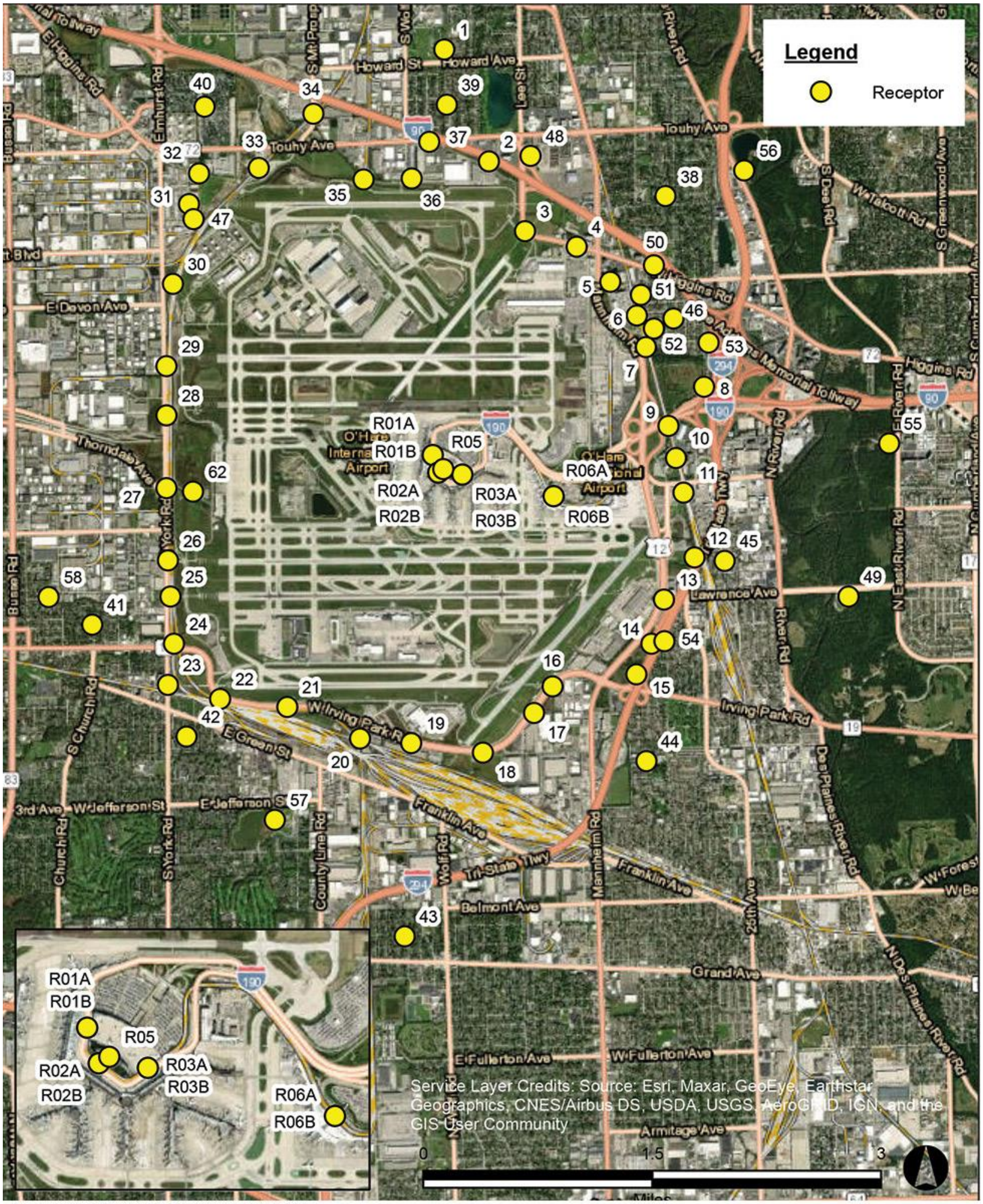
11 United States Environmental Protection Agency, Preferred/Recommended Models, *AERMOD Modeling System*, https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models

12 Title 40 CFR Part 51, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule, http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf

13 A different version of AERMOD than the version incorporated in AEDT Version 2d, Service Pack 2 was used because the more recent version allowed for use of the urban source dispersion coefficient and additional methods for predicting concentrations of NO_2.

14 Temporal factors are used to describe the relationship of one period to another (i.e., the relationship of activity during one hour to activity in a 24-hour period).

15 The inventories of NO_x and SO_x are conservative surrogates for inventories of NO_2 and SO_2 because NO_2 and SO_2 are components of NO_x and SO_x.



Source: Crawford, Murphy & Tilly, Inc./RCH Group, August 2019

Chicago O'Hare International Airport

Terminal Area Plan and Air Traffic Procedures Environmental Assessment

Dispersion Modeling Receptor Locations

Exhibit 5.3-1

The Existing Condition emission inventory for the study area is provided in **Table 5.3-3.** As shown for airport-related sources, the level of emissions varies from 58 to 6,970 tons, depending on the pollutant. Regardless of pollutant, the source of the greatest emissions is aircraft. Estimates of non-airport related motor vehicle activity in the study area are also provided in **Table 5.3-3**. As shown, the level of emissions from non-airport vehicles ranges from one to 1,062 tons depending on the pollutant.

TABLE 5.3-3
EMISSIONS INVENTORY – CRITERIA AIR POLLUTANTS: EXISTING CONDITION

Source Category			Tons in Existing Condition Year					
			CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Airport	Aircraft		5,756	696	3,934	433	33	33
	APU		44	4	35	5	6	6
	GSE		596	22	68	5	5	5
	Training Fires		2	2	--	--	8	8
	Stationary Sources		36	8	77	<1	5	4
	Airport Motor Vehicles	Off-Airport Roadways	224	5	28	<1	4	1
		On-Airport Roadways	189	5	23	<1	4	1
		Parking Lots	27	1	4	<1	1	<1
		Terminal Curbsides	59	3	10	<1	2	1
		Employee Busing from Parking Lots to Terminals	4	1	8	<1	1	<1
		Employee Airfield to Parking Lots	34	2	9	<1	1	<1
	Subtotal		**6,970**	**749**	**4,195**	**444**	**72**	**58**
Non/Off-Airport Motor Vehicles			1,062	30	211	1	21	9
Total			**8,032**	**779**	**4,405**	**445**	**91**	**67**

Notes: Table values are rounded for reporting, and as such, may not sum to the presented totals.
-- designates pollutants for which AEDT does not provide emissions data.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling

For the Existing Condition, air pollutant concentrations were derived for the following pollutants: CO, SO_2, NO_2, PM_{10}, and $PM_{2.5}$. Concentrations of O_3 were not estimated because the computer models used to perform dispersion modeling for this pollutant require input from all sources in a nonattainment area and provide only an indication of the change in regional emissions rather than concentrations at a specific location.

Table 5.3-4 provides the dispersion analysis results for the Existing Condition. As shown, the pollutant concentrations are below the NAAQS. For the Existing Condition, concentrations of CO, SO_2, PM_{10}, and

$PM_{2.5}$ are predicted to be greatest adjacent to the terminal curbside. The sources that contribute most of the emissions in this area are motor vehicles, GSE, and aircraft in the taxi mode. When considering the annual standard, concentrations of NO_2 are also greatest at the terminal curbsides, but maximum one-hour average concentrations are predicted to occur at the ends of the airport's runways.

TABLE 5.3-4
DISPERSION MODELING RESULTS: EXISTING CONDITION

	Maximum Predicted Pollutant Concentrations (µg/m³)								
	CO		NO_2		SO_2		PM_{10}	$PM_{2.5}$	
Criteria	**1-Hour**	**8-Hour**	**1-Hour**	**Annual**	**1-Hour**	**3-Hour**	**24-Hour**	**24-Hour**	**Annual**
Predicted Concentration	2,480	1,246	163	32	85	81	15	5	2
Background Concentration	1,606	1,222	16	5	9	12	53	21	8
Total Concentration	4,085	2,468	178	37	94	93	68	26	11
Receptor ID	R01A	R01A	12	R01A	R06A	R06A	R01A	R03A	R01A
NAAQS	40,000	10,000	188	100	196	1,300	150	35	12
Percent of NAAQS	10	25	95	37	48	7	45	74	92
Exceeds NAAQS?	No	No	No	No	No	No	No	No	No

Notes: Values have been rounded to whole numbers for reporting.
Additional information regarding background concentrations is provided in **Appendix E**.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

It is notable that the predicted concentrations for CO, SO_2, and PM_{10} are well below the NAAQS (i.e., less than 50 percent of the standards). And, while predicted concentrations of 24-hour and annual $PM_{2.5}$ are 74 and 92 percent of the standards, respectively, most of the total predicted concentration is from non-airport-related sources (referred to as background sources) outside the study area. While the concentration of annual NO_2 is also well below the NAAQS (37 percent of the standard), the predicted concentration for one-hour NO_2 is 95 percent of the standard with a minimal contribution from background sources (16 µg/m³ of the total 178 µg/m³ predicted concentration).

Although the predicted NO_2 contribution from the modeled sources is elevated, it is widely recognized that AEDT/AERMOD overpredicts concentrations of one-hour NO_2 from airport sources. This fact is readily demonstrated by comparing the modeled concentration to a concentration measured by the IEPA at an air monitoring station located approximately 4,200 feet east of O'Hare's Runway 28C, one of two frequently used departure runways in the area. The maximum measured one-hour NO_2 concentration at the air monitoring station for the same year as the Existing Condition is 115 µg/m³, 35 percent less than the total modeled concentration of 178 µg/m³. Currently, the USEPA is evaluating AERMOD's performance and techniques that can be used to improve predicted concentrations of NO_2 in airport environments. **Appendix E** provides additional documentation regarding AEDT/AERMOD's performance in predicting concentrations of one-hour NO_2.

Hazardous Air Pollutants

The FAA's Aviation Emissions and Air Quality Handbook, Chapter 6,[16] lists potential HAP to be included in an airport emissions inventory. The HAP emission inventory for the Existing Condition is provided in **Table 5.3-5**. As shown, formaldehyde is emitted in the greatest amount, followed by acetaldehyde, acrolein, benzene, methyl alcohol, and 1,3-butadiene. As also shown, most HAP emissions come from aircraft, followed by motor vehicles and GSE. For the Existing Condition, airport-related sources of HAP contribute 169 tons, while non-airport motor vehicle traffic contributes the remaining eight tons.

5.3.4 Environmental Consequences

This section presents the results of an analysis performed to evaluate the change in air pollutants emissions and concentrations for the Proposed Action Alternative and the potential for the Proposed Action Alternative to impact air quality conditions in the study area. Operational emission estimates and dispersion analysis results for the No Action Alternative and the Proposed Action Alternative are presented, as well as construction emission estimates for the Proposed Action Alternative.

5.3.4.1 Methodology

As stated above, in addition to preparing emission inventories for airport operational sources, estimates of air pollutant were prepared for the construction activities that would be required for the Proposed Action. Emission factors for construction equipment were obtained from USEPA's NONROAD,[17] and factors for construction-related on-road motor vehicles were obtained from USEPA's MOVES.[18] The Chicago Department of Aviation (CDA) provided the construction equipment schedule used to prepare the emission inventories. **Appendix E** includes detailed information provided by the CDA and the Proposed Action-specific data/emission factors used to prepare the construction-related emissions inventory.

Two scales of dispersion analysis—macroscale and microscale—were performed. The macroscale analysis provides concentrations of CO, SO_2, NO_2, PM_{10}, and $PM_{2.5}$ at various locations in the study area, while the microscale dispersion analysis provides concentrations of motor vehicle-related CO and $PM_{2.5}$ at roadway intersections/interchanges. The macro- and microscale dispersion analyses for this EA were performed for the Interim Condition (2025) and the Build Out Condition (2032).

The macroscale analysis was performed using AEDT and the AERMOD dispersion model. The microscale analysis was performed using the USEPA's CAL3QHC roadway intersection model (to estimate pollutant concentrations of CO) and AERMOD (to estimate concentrations of $PM_{2.5}$).[19,20] The receptors modeled for roadway intersections represent the worst-case locations along each intersection approach/departure.

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16 Federal Aviation Administration, Aviation Emissions and Air Quality Handbook, January 2015, Aviation Emissions and Air Quality Handbook (faa.gov)

17 United States Environmental Protection Agency, NONROAD Model, https://19january2017snapshot.epa.gov/moves/nonroad-model-nonroad-engines-equipment-and-vehicles_.html and USEPA, Non-Road Model Worksheet, December 2008

18 United States Environmental Protection Agency, Motor Vehicle Emissions Simulator (MOVES) User Guide for MOVES2014b, December 2018, https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

19 United States Environmental Protection Agency, User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections, November 1992, http://www.epa.gov/ttn/scram/userg/regmod/cal3qhcug.pdf

20 USEPA requires the use of AERMOD for $PM_{2.5}$ hot-spot analysis initiated after January 20, 2020 Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter, January 17, 2017, https://www.epa.gov/sites/production/files/2020-09/documents/appw_17.pdf.

TABLE 5.3-5
EMISSIONS INVENTORY – HAZARDOUS AIR POLLUTANTS: EXISTING CONDITION

Pollutant	Tons in Existing Condition Year												
						On-Airport Motor Vehicles					Off-Airport Motor Vehicles		
						Passenger-Related			Employee				
	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	On-Airport Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
1,1,1-trichloroethane	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
1,3-butadiene	9.25	<0.01	--	--	0.07	<0.01	0.01	0.01	<0.01	0.01	0.01	0.08	9.45
2,2,4-trimethylpentane	--	--	0.27	--	--	0.03	0.06	0.09	<0.01	0.11	0.11	0.49	1.16
2-methylnaphthalene	1.13	<0.01	--	--	--	--	--	--	--	--	--	--	1.13
Acetaldehyde	23.43	<0.01	0.17	--	--	0.01	0.04	0.06	0.02	0.09	0.07	0.50	24.40
Acetone	2.02	<0.01	--	--	0.04	--	--	--	--	--	--	--	2.06
Acrolein	13.43	<0.01	--	--	--	<0.01	0.01	0.01	<0.01	0.01	0.01	0.07	13.54
Benzaldehyde	2.58	<0.01	0.03	--	--	--	--	--	--	--	--	--	2.61
Benzene	9.22	<0.01	0.31	0.94	0.40	0.03	0.05	0.11	0.01	0.09	0.13	0.73	12.03
Butyl cellosolve	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Chlorobenzene	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Cyclohexane	--	--	--	--	0.05	--	--	--	--	--	--	--	0.05
Ethyl acetate	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Ethylbenzene	0.95	<0.01	0.12	--	0.02	0.02	0.04	0.08	<0.01	0.07	0.09	0.43	1.82
Ethylene glycol	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Formaldehyde	67.52	<0.01	0.50	--	0.40	0.02	0.09	0.11	0.05	0.18	0.12	1.02	70.02
Isomers of xylene	--	--	--	--	0.04	--	--	--	--	--	--	--	0.04
Isopropylbenzene	0.02	<0.01	--	--	<0.01	--	--	--	--	--	--	--	0.02
M & P-xylene	1.55	<0.01	--	--	0.07	--	--	--	--	--	--	--	1.62

Pollutant	Tons in Existing Condition Year												
						On-Airport Motor Vehicles					Off-Airport Motor Vehicles		
						Passenger-Related			Employee				
	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	On-Airport Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
Methyl alcohol	9.90	<0.01	--	--	--	--	--	--	--	--	--	--	9.90
Methyl ethyl ketone	--	--	--	--	0.03	--	--	--	--	--	--	--	0.03
M-xylene	--	--	0.33	--	--	--	--	--	--	--	--	--	0.33
Naphthalene	2.97	<0.01	--	--	<0.01	--	--	--	--	--	--	--	2.97
N-heptane	0.35	<0.01	0.13	--	0.10	--	--	--	--	--	--	--	0.58
N-hexane	--		0.27	--	0.22	0.03	0.05	0.08	<0.01	0.10	0.10	0.50	1.37
O-xylene	0.91	<0.01	0.16	--	0.03	--	--	--	--	--	--	--	1.10
Phenol	3.98	<0.01	--	--	--	--	--	--	--	--	--	--	3.98
Propionaldehyde	3.99	<0.01	0.10	--	--	<0.01	<0.01	0.01	<0.01	0.01	0.01	0.05	4.17
Styrene	1.69	<0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	1.74
Toluene	3.52	<0.01	0.53	--	0.30	0.14	0.25	0.42	0.01	0.47	0.48	2.23	8.35
Xylene	--	--	--	--	--	0.08	0.16	0.28	0.01	0.29	0.32	1.54	2.67
Total	**158.41**	**<0.01**	**2.94**	**0.94**	**1.84**	**0.38**	**0.76**	**1.25**	**0.11**	**1.45**	**1.44**	**7.65**	**177.20**

Note: -- designates pollutants for which AEDT does not provide emissions.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.3.4.2 Interim No Action

Criteria Air Pollutant/Pollutant Precursors

Emissions Inventory

The emissions inventory for the Interim No Action is provided in **Table 5.3-6**. As shown, estimates range from 52 to 6,031 tons for airport-related sources depending on pollutant. Estimates for the airport sources and the non-airport motor vehicles range from 58 to 6,895 tons. Regardless of pollutant, the source of the greatest emissions is aircraft.

TABLE 5.3-6
EMISSIONS INVENTORY – CRITERIA AIR POLLUTANTS/OPERATIONAL: INTERIM NO ACTION

Source Category			Tons in Interim Condition Year					
			CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Airport	Aircraft		5,098	568	4,649	444	30	30
	APU		29	2	29	4	4	4
	GSE		465	17	43	5	3	3
	Training Fires		2	2	--	--	8	8
	Stationary Sources		43	10	168	2	9	6
	Airport Motor Vehicles	Off-Airport Roadways	172	3	14	<1	4	1
		On-Airport Roadways	137	3	11	<1	4	1
		Parking Lots	19	1	2	<1	1	<1
		Terminal Curbsides	36	1	1	<1	2	<1
		Employee Busing from Parking Lots to Terminals	2	<1	5	<1	<1	<1
		Employee Airfield to Parking Lots	28	1	6	<1	1	<1
	Subtotal		**6,031**	**610**	**4,927**	**455**	**66**	**52**
Non/Off-Airport Motor Vehicles			864	22	120	2	18	6
Total			**6,895**	**632**	**5,048**	**457**	**84**	**58**

Notes: Table values are rounded for reporting, and as such, may not sum to the presented totals.
-- designates pollutants for which AEDT does not provide emissions data.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Macroscale

Table 5.3-7 compares the maximum predicted pollutant concentrations for the Interim No Action to the NAAQS. As shown, the concentrations are below the standards. The maximum one-hour NO_2 predicted concentration occurs at a receptor west of Runway 9R. All other maximum pollutant concentrations occur in the main terminal area, primarily due to motor vehicles, GSE, and aircraft taxiing in the area.

TABLE 5.3-7
DISPERSION MODELING RESULTS – MACROSCALE: INTERIM NO ACTION

Criteria	Maximum Predicted Pollutant Concentrations (µg/m3)								
	CO		NO_2		SO_2		PM_{10}	$PM_{2.5}$	
	1-Hour	8-Hour	1-Hour	Annual	1-Hour	3-Hour	24-Hour	24-Hour	Annual
Predicted Concentration	2,095	938	163	25	75	79	13	4	2
Background Concentration	1,606	1,222	22	5	9	12	53	21	8
Total Concentration	**3,701**	**2,160**	**185**	**30**	**84**	**91**	**66**	**24**	**10**
Receptor ID	R03A	R02A	28	R01A	R06A	R06A	R03A	R03A	R03A
NAAQS	40,000	10,000	188	100	196	1,300	150	35	12
Percent of NAAQS	9	22	98	30	43	6	44	69	83
Exceeds NAAQS?	No	No	No	No	No	No	No	No	No

Notes: Table values are rounded for reporting, and as such, may not sum to the presented totals.
Background concentrations are found in **Appendix E**.
Appendix E provides the maximum predicted concentration for all pollutants at each modeled receptor.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Microscale

Microscale analysis provides concentrations of CO and $PM_{2.5}$ immediately adjacent to roadway intersections/interchanges. For CO, five intersections in the vicinity of the airport were selected for analysis based on the forecast level of service and the volume of motor vehicle traffic approaching and departing each location. The forecast change in the level of service for the Proposed Action Alternative, compared with the No Action Alternative, was also a consideration. Of the five intersections evaluated for CO, the one with the greatest forecast number of trucks was evaluated for $PM_{2.5}$. Because evaluations of $PM_{2.5}$ focus on diesel-fueled vehicles and to be conservative, it was assumed that all trucks forecast to approach/depart each intersection/interchange would be diesel-fueled.

Table 5.3-8 presents the maximum CO and $PM_{2.5}$ concentration at each evaluated location. As shown, analysis indicates that the ambient levels of both pollutants would either fall below or meet—but not exceed—the NAAQS. Notably, the background level of $PM_{2.5}$ (i.e., emitted by sources not included in the computer model) represents more than 55 percent of both the 24-hour and annual predicted $PM_{2.5}$ levels.

TABLE 5.3-8
DISPERSION MODELING RESULTS – MICROSCALE: INTERIM NO ACTION

Intersections	CO (ppm)		$PM_{2.5}$ (µg/m3)	
	1-Hour	8-Hour	24-Hour	Annual
York Road and Irving Park Road	3	2	--	--
Mannheim Road and Irving Park Road	2	1	32	12
Mannheim Road and Higgins Road, Mannheim Road and Zemke Boulevard (see note)	2	1	--	--

Intersections	CO (ppm)		$PM_{2.5}$ (µg/m3)	
	1-Hour	8-Hour	24-Hour	Annual
Higgins Road and Lee Street, I-90 Eastbound Ramp (see note)	2	1	--	--
NAAQS	35	9	35	12
Note: These intersections are near one another and were evaluated together. Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021				

Hazardous Air Pollutants

The HAP emissions inventory for the Interim No Action is given in **Table 5.3-9.** Formaldehyde occurs in the greatest amounts, followed by acetaldehyde, acrolein, benzene, methyl alcohol, and 1,3-butadiene. Airport HAP emissions are 127 tons, while non-airport motor vehicles contribute an additional six tons.

TABLE 5.3-9
EMISSIONS INVENTORY – HAZARDOUS AIR POLLUTANTS: INTERIM NO ACTION

Pollutant	Tons in Interim No Action Year												
						On-Airport Motor Vehicles					Off-Airport Motor Vehicles		
						Passenger-Related			Employee				
	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	On-Airport Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
1,1,1-trichloroethane	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
1,3-butadiene	6.95	<0.01	--	--	0.20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	7.19
2,2,4-trimethylpentane	--	--	0.19	--	--	0.02	0.04	0.06	<0.01	0.04	0.07	0.45	0.87
2-methylnaphthalene	0.85	<0.01	--	--	--	--	--	--	--	--	--	--	0.85
Acetaldehyde	17.61	<0.01	0.18	--	--	0.01	<0.01	0.02	0.01	0.02	0.03	0.26	18.15
Acetone	1.52	<0.01	--	--	0.04	--	--	--	--	--	--	--	1.56
Acrolein	10.10	<0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	10.15
Benzaldehyde	1.94	<0.01	0.03	--	--	--	--	--	--	--	--	--	1.97
Benzene	6.93	<0.01	0.22	0.94	0.55	0.02	0.02	0.06	<0.01	0.03	0.07	0.59	9.44
Butyl cellosolve	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Chlorobenzene	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Cyclohexane	--	--	--	--	0.05	--	--	--	--	--	--	--	0.05
Ethyl acetate	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Ethylbenzene	0.72	<0.01	0.09	--	0.02	0.01	0.02	0.04	<0.01	0.02	0.05	0.35	1.33
Ethylene glycol	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Formaldehyde	50.74	<0.01	0.52	--	0.41	0.02	0.01	0.05	0.04	0.05	0.06	0.63	52.52
Isomers of xylene	--	--	--	--	0.04	--	--	--	--	--	--	--	0.04
Isopropylbenzene	0.01	<0.01	--	--	<0.01	--	--	--	--	--	--	--	0.01
M & P-xylene	1.16	<0.01	--	--	0.07	--	--	--	--	--	--	--	1.24
Methyl alcohol	7.44	<0.01	--	--	--	--	--	--	--	--	--	--	7.44

Pollutant	Tons in Interim No Action Year												
						On-Airport Motor Vehicles					Off-Airport Motor Vehicles		
						Passenger-Related			Employee				
	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	On-Airport Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
Methyl ethyl ketone	--	--	--	--	0.03	--	--	--	--	--	--	--	0.03
M-xylene	--	--	0.24	--	--	--	--	--	--	--	--	--	0.24
Naphthalene	2.23	<0.01	--	--	<0.01	--	--	--	--	--	--	--	2.23
N-heptane	0.26	<0.01	0.09	--	0.10	--	--	--	--	--	--	--	0.46
N-hexane	--	--	0.20	--	0.24	0.02	0.03	0.06	<0.01	0.04	0.07	0.35	1.00
O-xylene	0.68	<0.01	0.12	--	0.03	--	--	--	--	--	--	--	0.83
Phenol	2.99	<0.01	--	--	--	--	--	--	--	--	--	--	2.99
Propionaldehyde	3.00	<0.01	0.11	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	3.14
Styrene	1.27	<0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	1.30
Toluene	2.65	<0.01	0.38	--	0.31	0.09	0.16	0.27	<0.01	0.15	0.33	1.76	6.09
Xylene	--	--	--	--	--	0.05	0.08	0.16	<0.01	0.08	0.19	1.25	1.83
Total	**119.05**	**<0.01**	**2.37**	**0.94**	**2.17**	**0.24**	**0.37**	**0.73**	**0.07**	**0.44**	**0.88**	**5.74**	**133.01**

Note: -- designates pollutants for which AEDT does not provide emissions.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.3.4.3 Build Out No Action

Criteria Air Pollutant/Pollutant Precursors

Emissions Inventory

The emission inventory for the Build Out No Action is provided in **Table 5.3-10.** Estimates for airport-related sources range from 52 to 6,139 tons depending on pollutant. For airport sources and non-airport motor vehicles, the estimates range from 57 to 6,835 tons. Regardless of pollutant, the source of the greatest emissions is aircraft.

TABLE 5.3-10 EMISSIONS INVENTORY – CRITERIA AIR POLLUTANTS/OPERATIONAL: BUILD OUT NO ACTION

Source Category			Tons in Build Out No Action Year					
			CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Airport	Aircraft		5,356	556	5,589	506	31	31
	APU		29	2	23	3	3	3
	GSE		455	17	37	6	3	3
	Training Fires		2	2	--	--	8	8
	Stationary Sources		43	10	174	2	9	6
	Airport Motor Vehicles	Off-Airport Roadways	86	1	4	<1	3	<1
		On-Airport Roadways	106	2	5	<1	4	1
		Parking Lots	13	1	1	<1	1	<1
		Terminal Curbsides	28	1	1	<1	2	<1
		Employee Busing from Parking Lots to Terminals	1	<1	2	<1	<1	<1
		Employee Airfield to Parking Lots	20	1	3	<1	1	<1
	Subtotal		**6,139**	**595**	**5,839**	**517**	**65**	**52**
Non/Off-Airport Motor Vehicles			697	15	74	1	18	4
Total			**6,835**	**610**	**5,914**	**518**	**83**	**57**

Notes: Table values are rounded for reporting, and as such, may not sum to the presented totals.

-- designates pollutants for which AEDT does not provide emissions data.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Macroscale

The maximum predicted pollutant concentrations for the Build Out No Action are compared with the NAAQS in **Table 5.3-11.** As shown, except for one-hour NO_2, the concentrations are below the NAAQS. While the modeled concentration of one-hour NO_2 is greater than the standard, as previously discussed, dispersion modeling overestimates concentrations of this pollutant and for this averaging time. Based on comparing modeled versus measured concentrations in **Section 5.3.3.2**, the modeled one-hour NO_2 concentration for Build Out No Action is likely to be at least 55 percent greater than what would be measured in the future (i.e., future measured one-hour NO_2 concentration would be lower than the NAAQS).

Elements related to airfield simulation modeling (see A**ppendix D**) of the No Action and Proposed Action are reflected in the dispersion modeling results. In particular, the cargo aircraft departures are heavily centered in late evening hours when meteorological conditions are often conducive to higher pollutant concentrations. The airfield simulation modeling also processes Airbus A380 departures differently for the Build Out No Action compared with the Build Out Proposed Action by placing more of these operations on Runway 9R for the Build Out No Action. The effect of these situations is likely assigning a greater number of heavy aircraft for departure on Runway 9R during late evening periods for the Build Out No Action versus Build Out Proposed Action. The greater number of heavy aircraft for departure on Runway 9R is likely the primary reason for the higher one-hour NO_2 concentrations during Build Out No Action than Build Out Proposed Action (209 $\mu g/m^3$ versus 182 $\mu g/m^3$).

TABLE 5.3-11
DISPERSION MODELING RESULTS – MACROSCALE: BUILD OUT NO ACTION

	Maximum Predicted Pollutant Concentrations ($\mu g/m^3$)								
	CO		NO_2		SO_2		PM_{10}	$PM_{2.5}$	
Criteria	**1-Hour**	**8-Hour**	**1-Hour**	**Annual**	**1-Hour**	**3-Hour**	**24-Hour**	**24-Hour**	**Annual**
Predicted Concentration	1,756	895	192	25	77	75	16	4	2
Background Concentration	1,606	1,222	17	5	9	12	53	21	8
Total Concentration	**3,361**	**2,118**	**209**	**30**	**86**	**87**	**69**	**25**	**10**
Receptor ID	R03A	R02A	28	R06A	R02A	R06A	R03A	R03A	R03A
NAAQS	40,000	10,000	188	100	196	1,300	150	35	12
Percent of NAAQS	8	21	111	30	44	6	46	71	83
Exceeds NAAQS?	No	No	Yes	No	No	No	No	No	No

Notes: Values have been rounded to whole numbers for reporting.
The sources of the background concentrations are provided in **Appendix E**.
Appendix E provides the maximum predicted concentration for all pollutants at each modeled receptor.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Microscale

Table 5.3-12 presents the maximum CO and $PM_{2.5}$ concentrations at each of the evaluated locations for Build Out No Action. As shown, the results of the analysis indicate that the ambient levels of both pollutants would be below or meet—but not exceed—the NAAQS. As for the Interim No Action, the background level of $PM_{2.5}$ represents more than 55 percent of both the 24-hour and annual predicted $PM_{2.5}$ levels.

TABLE 5.3-12
DISPERSION MODELING RESULTS – MICROSCALE: BUILD OUT NO ACTION

Intersections	CO (ppm)		$PM_{2.5}$ (µg/m^3)	
	1-Hour	8-Hour	24-Hour	Annual
York Road and Irving Park Road	2	1	--	--
Mannheim Road and Irving Park Road	2	1	32	12
Mannheim Road and Higgins Road, Mannheim Road and Zemke Boulevard (see note)	2	1	--	--
Higgins Road and Lee Street, I-90 Eastbound Ramp (see note)	2	1	--	--
NAAQS	35	9	35	12

Note: These intersections are near one another and were evaluated together.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Hazardous Air Pollutants

The HAP emissions inventory for the Build Out No Action is provided in **Table 5.3-13.** Formaldehyde occurs in the greatest amounts, followed by acetaldehyde, acrolein, benzene, methyl alcohol, and 1,3-butadiene. The airport HAP emissions are 116 tons, while non-airport motor vehicles contribute an additional four tons.

TABLE 5.3-13
EMISSIONS INVENTORY – HAZARDOUS AIR POLLUTANTS: BUILD OUT NO ACTION

	Tons in Build Out No Action Year												
						On-Airport Motor Vehicles							
						Passenger-Related			Employee		Off-Airport Motor Vehicles		
Pollutant	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
1,1,1-trichloroethane	--	--	--	--	0.03	--	--	--	--	--	--	--	0.03
1,3-butadiene	6.35	<0.01	--	--	0.20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	6.55
2,2,4-trimethylpentane	--	--	0.18	--	--	0.02	0.04	0.05	<0.01	0.03	0.04	0.30	0.66
2-methylnaphthalene	0.77	<0.01	--	--	--	--	--	--	--	--	--	--	0.77
Acetaldehyde	16.07	<0.01	0.18	--	--	<0.01	<0.01	0.01	0.01	0.01	0.01	0.18	16.48
Acetone	1.39	<0.01	--	--	0.04	--	--	--	--	--	--	--	1.43
Acrolein	9.21	<0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	9.24
Benzaldehyde	1.77	<0.01	0.03	--	--	--	--	--	--	--	--	--	1.80
Benzene	6.32	<0.01	0.21	0.94	0.56	0.01	0.01	0.04	<0.01	0.01	0.03	0.36	8.50
Butyl cellosolve	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Chlorobenzene	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Cyclohexane	--	--	--	--	0.05	--	--	--	--	--	--	--	0.05
Ethyl acetate	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Ethylbenzene	0.65	<0.01	0.08	--	0.02	0.01	0.02	0.03	<0.01	0.02	0.02	0.22	1.09
Ethylene glycol	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Formaldehyde	46.31	<0.01	0.54	--	0.41	0.01	0.00	0.03	0.02	0.02	0.02	0.49	47.86
Isomers of xylene	--	--	--	--	0.05	--	--	--	--	--	--	--	0.05
Isopropylbenzene	0.01	<0.01	--	--	<0.01	--	--	--	--	--	--	--	0.01
M & P-xylene	1.06	<0.01	--	--	0.07	--	--	--	--	--	--	--	1.14

	Tons in Build Out No Action Year												
						On-Airport Motor Vehicles							
						Passenger-Related			Employee		Off-Airport Motor Vehicles		
Pollutant	**Aircraft**	**APU**	**GSE**	**Training Fires**	**Stationary Sources**	**Parking Lots**	**Terminal Curbsides**	**Roadways**	**From Parking**	**To Parking**	**Airport-Related**	**Non-Airport**	**Total**
Methyl alcohol	6.79	<0.01	--	--	--	--	--	--	--	--	--	--	6.79
Methyl ethyl ketone	--	--	--	--	0.03	--	--	--	--	--	--	--	0.03
M-xylene	--	--	0.23	--	--	--	--	--	--	--	--	--	0.23
Naphthalene	2.04	<0.01		--	<0.01	--	--	--	--	--	--	--	2.04
N-heptane	0.24	<0.01	0.09	--	0.11	--	--	--	--	--	--	--	0.44
N-hexane	--	--	0.19	--	0.25	0.02	0.03	0.05	<0.01	0.03	0.04	0.35	0.95
O-xylene	0.62	<0.01	0.11	--	0.03	--	--	--	--	--	--	--	0.77
Phenol	2.73	<0.01	--	--	--	--	--	--	--	--	--	--	2.73
Propionaldehyde	2.73	<0.01	0.11	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	2.86
Styrene	1.16	<0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.17
Toluene	2.42	<0.01	0.36	--	0.32	0.09	0.16	0.23	<0.01	0.13	0.16	1.39	5.26
Xylene	--	--	--	--	--	0.04	0.08	0.13	<0.01	0.06	0.09	0.85	1.24
Total	**108.64**	**<0.01**	**2.33**	**0.94**	**2.22**	**0.20**	**0.35**	**0.58**	**0.04**	**0.29**	**0.41**	**4.19**	**120.21**

Note: -- designates pollutants for which AEDT does not provide emissions.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.3.4.4 Interim Proposed Action

Criteria Air Pollutants/Pollutant Precursors

Emissions Inventory – Construction

Construction of the O'Hare improvements evaluated in this EA is expected to take ten years to complete. The Interim Condition represents the third year of construction. Construction-related emissions result from on-site construction equipment (referred to as non-road equipment) and delivery/haul truck and construction worker commute trips (on-road vehicles). The emission estimates for non-road equipment were made using the USEPA's NONROAD and the emission estimates for on-road vehicles were made using the USEPA's MOVES. Additional details regarding the methodology used to prepare the construction emission estimates are provided in **Appendix E.**

For the Interim Condition, estimates of CO, VOC, NO_x, SO_x, PM_{10}, and $PM_{2.5}$ were prepared for the first three years of the proposed construction schedule for 1) projects supporting long-term development of the airport's passenger terminal facilities (i.e., the Proposed Action) and 2) projects previously planned but not yet completed under the previous capital program (referred to as the Baseline projects).

Table 5.3-14 provides the Proposed Action construction emissions inventory. The levels of emissions vary depending on the year and pollutant, with all pollutant emissions estimated to be greatest in the second year of the construction schedule. Emissions of NO_x are greater than those of other pollutants in all three years.

TABLE 5.3-14
EMISSIONS INVENTORY – CRITERIA AIR POLLUTANTS/CONSTRUCTION: YEARS 1-3

	Tons					
Year	**CO**	**VOC**	**NO_x**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
1	34	6	67	<1	15	5
2	61	9	115	<1	28	9
3 (Interim Condition)	42	6	71	<1	24	6

Notes: Values have been rounded to whole numbers for reporting.
[1] Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Emissions Inventory – Operation

The Interim Proposed Action emissions inventory is provided in **Table 5.3-15.** As shown, estimates for airport-related sources range from 53 to 6,363 tons, depending on pollutant. For airport-related sources and non-airport motor vehicles, the estimates range from 59 to 7,236 tons, depending on pollutant.

TABLE 5.3-15
EMISSIONS INVENTORY – CRITERIA AIR POLLUTANTS/OPERATIONAL: INTERIM PROPOSED ACTION

Source Category			Tons in Interim Condition Year					
			CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Airport	Aircraft		5,410	593	4,712	459	31	31
	APU		29	2	29	4	4	4
	GSE		470	18	43	5	3	3
	Training Fires		2	2	--	--	8	8
	Stationary Sources		45	10	172	3	9	7
	Airport Motor Vehicles	Off-Airport Roadways	182	3	14	<1	4	1
		On-Airport Roadways	137	3	11	<1	4	1
		Parking Lots	20	1	2	<1	1	<1
		Terminal Curbsides	38	1	1	<1	2	<1
		Employee Busing from Parking Lots to Terminals	2	<1	5	<1	<1	<1
		Employee Airfield to Parking Lots	28	1	6	<1	1	<1
	Subtotal		**6,363**	**636**	**4,995**	**472**	**67**	**53**
Non/Off-Airport Motor Vehicles			873	23	121	2	18	6
Total			**7,236**	**658**	**5,117**	**474**	**85**	**59**

Notes: Table values are rounded for reporting, and as such, may not sum to the presented totals.
-- designates pollutants for which AEDT does not provide emissions data.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Table 5.3-16 provides the increase and decrease in pollutants for Interim Proposed Action when compared with Interim No Action. As shown, the Interim Proposed Action emissions are essentially the same or would increase minimally for all sources except aircraft and non-airport motor vehicles. The increase in aircraft emissions results directly from higher forecast taxi times for the Proposed Action Alternative compared with the No Action Alternative. The increase in emissions (less than one percent) from non-airport-related motor vehicle traffic results from modeling variations in the traffic assignment process used to evaluate future surface transportation scenarios (i.e., the emissions associated with non-airport-related motor vehicle activity in the study area would not change much).

TABLE 5.3-16
CHANGE IN CRITERIA AIR POLLUTANT EMISSIONS INVENTORY – INTERIM CONDITION

Source Category			Tons in Interim Condition Year					
			CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Airport	Aircraft		312	25	63	16	1	1
	APU		0	0	0	0	0	0
	GSE		4	<1	<1	<1	<1	<1
	Training Fires		0	0	--	--	0	0
	Stationary Sources		3	<1	3	1	<1	<1
	Airport Motor Vehicles	Off-Airport Roadways	10	0	1	0	0	0
		On-Airport Roadways	0	0	0	0	0	0
		Parking Lots	1	0	0	0	0	0
		Terminal Curbsides	2	0	0	0	0	0
		Employee Busing from Parking Lots to Terminals	0	0	0	0	0	0
		Employee Airfield to Parking Lots	0	0	0	0	0	0
	Subtotal		**333**	**26**	**68**	**16**	**1**	**1**
Non/Off-Airport Motor Vehicles			8	<1	1	<1	<1	<1
Total			**341**	**26**	**69**	**16**	**1**	**1**

Notes: Table values are rounded for reporting, and as such, may not sum to the presented totals.
-- designates pollutants for which AEDT does not provide emissions data.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Macroscale

The maximum predicted short-term and annual pollutant concentrations for the Interim Proposed Action were compared with the NAAQS in **Table 5.3-17.** As shown, the concentrations fall below the NAAQS. Concentrations of CO, annual NO_2, SO_2, PM_{10}, and $PM_{2.5}$ are predicted to be the greatest adjacent to the terminal curbsides due primarily to aircraft taxiing in the area, GSE, and motor vehicles. Concentrations of one-hour NO_2 are greatest at the ends of the runways; aircraft departing the airport and idling on taxiway and in queue contribute most of these impacts.

TABLE 5.3-17
DISPERSION MODELING RESULTS – MACROSCALE: INTERIM PROPOSED ACTION

Criteria	Maximum Predicted Pollutant Concentrations (µg/m³)								
	CO		NO_2		SO_2		PM_{10}	$PM_{2.5}$	
	1-Hour	8-Hour	1-Hour	Annual	1-Hour	3-Hour	24-Hour	24-Hour	Annual
Predicted Concentration	2,151	971	163	28	85	75	13	4	2
Background Concentration	1,606	1,222	22	5	9	12	53	21	8
Total Concentration	**3,757**	**2,193**	**185**	**32**	**94**	**87**	**66**	**26**	**10**
Receptor ID	R03A	R01A	28	R01A	R06A	R06A	R01A	R01A	R01A
NAAQS	40,000	10,000	188	100	196	1,300	150	35	12
Percent of NAAQS	9	22	98	32	48	6	44	74	83
Exceeds NAAQS?	No	No	No	No	No	No	No	No	No

Notes: Values have been rounded to whole numbers for reporting.
Background concentrations are found in **Appendix E**.
Appendix E provides the maximum predicted concentration for all pollutants at each modeled receptor.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Microscale

Table 5.3-18 presents the maximum CO concentrations and $PM_{2.5}$ levels at each of the evaluated locations for the Interim Proposed Action. Results of the analysis indicate that the ambient levels of both pollutants would be below or meet—but not exceed—the NAAQS. As for the No Action Condition, the background level of $PM_{2.5}$ (i.e., the level emitted by sources outside the study area) represents more than 55 percent of both the 24-hour and annual predicted $PM_{2.5}$ levels.

TABLE 5.3-18
DISPERSION MODELING RESULTS – MICROSCALE: INTERIM PROPOSED ACTION

Intersections	CO (ppm)		$PM_{2.5}$ (µg/m³)	
	1-Hour	8-Hour	24-Hour	Annual
York Road and Irving Park Road	2	1	--	--
Mannheim Road and Irving Park Road	2	1	30	12
Mannheim Road and Higgins Road, Mannheim Road and Zemke Boulevard (see note)	2	2	--	--
Higgins Road and Lee Street, I-90 Eastbound Ramp (see note)	2	1	--	--
NAAQS	35	9	35	12

Note: These intersections are near one another and were evaluated together.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Hazardous Air Pollutants

Table 5.3-19 shows the HAP emissions inventory for the Interim Proposed Action**.** Formaldehyde occurs in the greatest amounts, followed by acetaldehyde, acrolein, benzene, methyl alcohol, and 1,3-butadiene. The airport HAP emissions are 134 tons, while non-airport motor vehicles contribute an additional six tons. As for the criteria air pollutants, total emissions of HAP are forecast to increase with the Proposed Action (from 133 tons to 140 tons) in the Interim Condition. This increase is primarily a result of an increase in aircraft taxi times for the Proposed Action.

TABLE 5.3-19
EMISSIONS INVENTORY – HAZARDOUS AIR POLLUTANTS: INTERIM PROPOSED ACTION

Pollutant	Tons in Interim Condition Year												
						On-Airport Motor Vehicles							
						Passenger-Related			Employee		Off-Airport Motor Vehicles		
	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	On-Airport Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
1,1,1-trichloroethane	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
1,3-butadiene	7.34	<0.01	--	--	0.20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	7.58
2,2,4-trimethylpentane	--	--	0.19	--	--	0.02	0.04	0.06	<0.01	0.04	0.08	0.45	0.88
2-methylnaphthalene	0.90	<0.01	--	--	--	--	--	--	--	--	--	--	0.90
Acetaldehyde	18.60	<0.01	0.18	--	--	0.01	0.01	0.02	0.01	0.02	0.03	0.26	19.14
Acetone	1.61	<0.01	--	--	0.04	--	--	--	--	--	--	--	1.65
Acrolein	10.66	<0.01	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.04	10.71
Benzaldehyde	2.05	<0.01	0.03	--	--	--	--	--	--	--	--	--	2.08
Benzene	7.32	<0.01	0.23	0.94	0.57	0.02	0.02	0.06	<0.01	0.03	0.08	0.60	9.86
Butyl cellosolve	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Chlorobenzene	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Cyclohexane	--	--	--	--	0.05	--	--	--	--	--	--	--	0.05
Ethyl acetate	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Ethylbenzene	0.76	<0.01	0.09	--	0.02	0.02	0.02	0.04	<0.01	0.02	0.06	0.35	1.38
Ethylene glycol	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Formaldehyde	53.59	<0.01	0.53	--	0.44	0.02	0.01	0.05	0.04	0.05	0.06	0.64	55.41
Isomers of xylene	--	--	--	--	0.04	--	--	--	--	--	--	--	0.04
Isopropylbenzene	0.01	<0.01	--	--	<0.01	--	--	--	--	--	--	--	0.01
M & P-xylene	1.23	<0.01	--	--	0.07	--	--	--	--	--	--	--	1.30

Pollutant	Tons in Interim Condition Year												
						On-Airport Motor Vehicles							
						Passenger-Related			Employee		Off-Airport Motor Vehicles		
	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	On-Airport Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
Methyl alcohol	7.86	<0.01	--	--	--	--	--	--	--	--	--	--	7.86
Methyl ethyl ketone	--	--	--	--	0.03	--	--	--	--	--	--	--	0.03
M-xylene	--	--	0.24	--	--	--	--	--	--	--	--	--	0.24
Naphthalene	2.36	<0.01	--	--	<0.01	--	--	--	--	--	--	--	2.36
N-heptane	0.28	<0.01	0.09	--	0.10	--	--	--	--	--	--	--	0.47
N-hexane	--	--	0.20	--	0.24	0.02	0.03	0.06	0.00	0.04	0.07	0.35	1.01
O-xylene	0.72	<0.01	0.12	--	0.03	--	--	--	--	--	--	--	0.87
Phenol	3.16	<0.01	--	--	--	--	--	--	--	--	--	--	3.16
Propionaldehyde	3.16	<0.01	0.11	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	3.31
Styrene	1.35	<0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	1.37
Toluene	2.79	<0.01	0.39	--	0.32	0.10	0.17	0.27	<0.01	0.15	0.35	1.78	6.31
Xylene	--	--	--	--	--	0.06	0.09	0.16	<0.01	0.08	0.21	1.26	1.86
Total	**125.75**	**<0.01**	**2.39**	**0.94**	**2.23**	**0.26**	**0.38**	**0.72**	**0.07**	**0.44**	**0.94**	**5.81**	**139.90**

Note: -- designates pollutants for which AEDT does not provide emissions.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.3.4.5 Build Out Proposed Action

Criteria Air Pollutants/Pollutant Precursors

Emissions Inventory – Construction

As previously stated, construction improvements to O'Hare evaluated in this EA are expected to take ten years. The Build Out Condition represents the tenth (and last) year of construction. For the Build Out Condition, estimates of CO, VOC, NO_x, SO_x, PM_{10}, and $PM_{2.5}$ were prepared from years four through ten for the Proposed Action. The emissions inventory is provided in **Table 5.3-20**. As shown, the level of emissions varies depending on the year. In the second portion of construction, emissions are forecast to be greatest in the fourth year, with NO_x emissions being the highest in each of the seven years.

TABLE 5.3-20
EMISSIONS INVENTORY – CRITERIA AIR POLLUTANTS/CONSTRUCTION: YEARS 4-10

Year	Tons					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
4	27	4	53	<1	24	5
5	17	2	24	<1	14	3
6	16	2	27	<1	11	3
7	17	2	26	<1	19	4
8	15	2	22	<1	20	4
9	1	<1	2	<1	4	1
10 (Build Out Condition)	<1	<1	1	<1	1	<1

Notes: Values have been rounded to whole numbers for reporting.
[2] Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Emissions Inventory – Operation

The emissions inventory for the Build Out Proposed Action is provided in **Table 5.3-21**. For airport-related sources, estimates range from 54 to 6,097 tons depending on pollutant. For airport-related sources and non-airport motor vehicles, estimates range from 59 to 6,739 tons. As with the Build Out No Action, most emissions result from aircraft operations.

TABLE 5.3-21
EMISSIONS INVENTORY – CRITERIA AIR POLLUTANTS/OPERATIONAL: BUILD OUT PROPOSED ACTION

Source Category		Tons in Build Out Condition Year					
		CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Airport	Aircraft	5,281	551	5,573	502	31	31
	APU	29	2	23	3	3	3

Source Category			Tons in Build Out Condition Year					
			CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
	GSE		451	17	37	6	3	3
	Training Fires		2	2	--	--	8	8
	Stationary Sources		70	12	207	3	12	9
	Airport Motor Vehicles	Off-Airport Roadways	89	2	4	<1	3	1
		On-Airport Roadways	101	2	5	<1	4	1
		Parking Lots	19	1	1	<1	1	<1
		Terminal Curbsides	27	1	1	<1	2	<1
		Employee Busing from Parking Lots to Terminals	1	<1	1	<1	<1	<1
		Employee Airfield to Parking Lots	26	1	4	<1	1	<1
	Subtotal		**6,097**	**592**	**5,855**	**514**	**68**	**54**
Non/Off-Airport Motor Vehicles			642	14	69	1	17	4
Total			**6,739**	**605**	**5,923**	**515**	**85**	**59**

Notes: Table values are rounded for reporting, and as such, may not sum to the presented totals.
-- designates pollutants for which AEDT does not provide emissions data.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Table 5.3-22 provides the increase and decrease in pollutants for the Build Out Proposed Action. Except for aircraft, stationary sources, and motor vehicles, the Build Out Proposed Action emissions either reduce slightly from those of the Build Out No Action, are essentially the same, or show a minimal increase. The forecasted decrease in aircraft emissions is due to shorter aircraft taxi times. The increase in stationary source emissions would result from installing the proposed heating and refrigeration (H&R) plant, which would provide air conditioning to the larger terminal space. Airport-related motor vehicle emissions are forecast to increase due to an increase in motor vehicle travel distance. The decrease in emissions by non-airport-related motor vehicle traffic would result from roadway improvements including intersection and ramp improvements at the Bessie Coleman Drive/Balmoral Avenue intersection near Terminal 5. An additional improvement that contributes to the decrease in emissions is the improvement that would provide direct access to I-190 eastbound and Balmoral Avenue without having to pass through the Coleman intersection. The Elgin O'Hare Western Access west of the airport, which shifts traffic from the existing airport access roadways, would also result in fewer emissions from the non-airport-related motor vehicle traffic.

Overall, when comparing the Build Out Proposed Action to the No Action, operational emissions of CO, VOC, and SO_x are forecast to decrease. Emissions of NO_x, PM_{10}, and $PM_{2.5}$ are forecast to increase by ten and two tons, respectively.

TABLE 5.3-22
CHANGE IN CRITERIA AIR POLLUTANT OPERATIONAL EMISSIONS INVENTORY – BUILD OUT CONDITION

Source Category			Tons in Build Out Condition Year					
			CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Airport	Aircraft		-75	-5	-16	-4	0	0
	APU		0	0	0	0	0	0
	GSE		-4	-0	0	-0	0	0
	Training Fires		0	0	--	--	0	0
	Stationary Sources		27	2	33	1	2	2
	Airport Motor Vehicles	Off-Airport Roadways	3	0	0	0	0	0
		On-Airport Roadways	-4	0	0	0	0	0
		Parking Lots	6	0	0	0	0	0
		Terminal Curbsides	-1	0	0	0	0	0
		Employee Busing from Parking Lots to Terminals	0	0	-2	0	0	0
		Employee Airfield to Parking Lots	6	0	1	0	0	0
	Subtotal		**-41**	**-3**	**15**	**-3**	**3**	**2**
Non/Off-Airport Motor Vehicles			-54	-1	-6	0	-1	0
Total			**-96**	**-4**	**10**	**-3**	**2**	**2**

Notes: Values have been rounded to whole numbers for reporting.
-- designates pollutants for which AEDT does not provide emissions data.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Macroscale

Table 5.3-23 compares the maximum predicted pollutant concentrations for Build Out Proposed Action to the NAAQS. As shown, all concentrations fall below the NAAQS. Except for one-hour NO_2, the maximum concentrations are predicted to be the greatest adjacent to the terminal curbsides. Sources contributing most of the emissions are motor vehicles, GSE, and aircraft taxiing in the area.

TABLE 5.3-23
DISPERSION MODELING RESULTS – MACROSCALE: BUILD OUT PROPOSED ACTION

Criteria	Maximum Predicted Pollutant Concentrations (µg/m³)								
	CO		NO_2		SO_2		PM_{10}	$PM_{2.5}$	
	1-Hour	8-Hour	1-Hour	Annual	1-Hour	3-Hour	24-Hour	24-Hour	Annual
Predicted Concentration	1,936	1,015	166	30	115	103	13	4	2
Background Concentration	1,606	1,222	16	5	9	12	53	21	8
Total Concentration	**3,542**	**2,237**	**182**	**34**	**124**	**115**	**66**	**24**	**10**
Receptor ID	R06A	R06A	28	R06A	R06A	R06A	R01A	R03A	R03A
NAAQS	40,000	10,000	188	100	196	1,300	150	35	12
Percent of NAAQS	9	22	97	35	63	7	44	69	83
Exceeds NAAQS?	No	No	No	No	No	No	No	No	No

Notes: Values have been rounded to whole numbers for reporting.
Background concentrations are found in **Appendix E**.
Appendix E provides the maximum predicted concentration for all pollutants at each modeled receptor.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

Dispersion Modeling – Microscale

Table 5.3-24 presents the maximum CO concentrations and $PM_{2.5}$ levels at each evaluated location for the Build Out Proposed Action. The analysis indicates that the ambient levels of both pollutants would fall below the NAAQS. Notably, the predicted CO concentrations and $PM_{2.5}$ levels for the Build Out Proposed Action are lower than those of the Build Out No Action. Emissions at the evaluated intersections/interchange are forecast to decrease due primarily to lower motor vehicle delays resulting from improvements to the roadway geometry.

TABLE 5.3-24
DISPERSION MODELING RESULTS – MICROSCALE: BUILD OUT PROPOSED ACTION

Intersections	CO (ppm)		$PM_{2.5}$ (µg/m³)	
	1-Hour	8-Hour	24-Hour	Annual
York Road and Irving Park Road	2	1	--	--
Mannheim Road and Irving Park Road	2	1	22	9
Mannheim Road and Higgins Road, Mannheim Road and Zemke Boulevard (see note)	2	2	--	--
Higgins Road and Lee Street, I-90 Eastbound Ramp (see note)	2	1	--	--
NAAQS	35	9	35	12

Note: These intersections are near one another and were evaluated together.

Intersections	CO (ppm)		$PM_{2.5}$ (μg/m³)	
	1-Hour	8-Hour	24-Hour	Annual
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021				

Hazardous Air Pollutants

The HAP emission inventory for the Build Out Proposed Action is provided in **Table 5.3-25.** Formaldehyde occurs in the greatest amount, followed by acetaldehyde, acrolein, benzene, methyl alcohol, and 1,3-butadiene. The total airport HAP emissions are 118 tons, while non-airport motor vehicles contribute an additional four tons.

TABLE 5.3-25
EMISSIONS INVENTORY – HAZARDOUS AIR POLLUTANTS: BUILD OUT PROPOSED ACTION

Pollutant	Tons in Build Out Condition Year												
						On-Airport Motor Vehicles					Off-Airport Motor Vehicles		
						Passenger-Related			Employee				
	Aircraft	APU	GSE	Training Fires	Stationary Sources	Parking Lots	Terminal Curbsides	On-Airport Roadways	From Parking	To Parking	Airport-Related	Non-Airport	Total
1,1,1-trichloroethane	--	--	--	--	0.03	--	--	--	--	--	--	--	0.03
1,3-butadiene	6.42	<0.01	--	--	0.20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	6.62
2,2,4-trimethylpentane	--	--	0.18	--	--	0.03	0.04	0.05	<0.01	0.04	0.04	0.28	0.66
2-methylnaphthalene	0.78	<0.01	--	--	--	--	--	--	--	--	--	--	0.78
Acetaldehyde	16.25	<0.01	0.18	--	--	<0.01	<0.01	0.01	<0.01	0.01	0.01	0.17	16.64
Acetone	1.40	<0.01	--	--	0.04	--	--	--	--	--	--	--	1.45
Acrolein	9.32	<0.01	--	--	--	<0.01	<0.01	0.00	<0.01	<0.01	<0.01	0.02	9.34
Benzaldehyde	1.79	<0.01	0.03	--	--	--	--	--	--	--	--	--	1.82
Benzene	6.40	<0.01	0.21	0.94	0.72	0.01	0.01	0.04	<0.01	0.01	0.03	0.33	8.71
Butyl cellosolve	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Chlorobenzene	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Cyclohexane	--	--	--	--	0.09	--	--	--	--	--	--	--	0.09
Ethyl acetate	--	--	--	--	0.02	--	--	--	--	--	--	--	0.02
Ethylbenzene	0.66	<0.01	0.08	--	0.02	0.02	0.02	0.03	<0.01	0.02	0.02	0.21	1.09
Ethylene glycol	--	--	--	--	<0.01	--	--	--	--	--	--	--	<0.01
Formaldehyde	46.83	<0.01	0.53	--	0.74	0.01	<0.01	0.03	<0.01	0.02	0.02	0.46	48.65
Isomers of xylene	--	--	--	--	0.05	--	--	--	--	--	--	--	0.05
Isopropylbenzene	0.01	<0.01	--	--	<0.01	--	--	--	--	--	--	--	0.01
M & P-xylene	1.07	<0.01	--	--	0.07	--	--	--	--	--	--	--	1.15

	Tons in Build Out Condition Year												
						On-Airport Motor Vehicles					Off-Airport Motor Vehicles		
						Passenger-Related			Employee				
Pollutant	**Aircraft**	**APU**	**GSE**	**Training Fires**	**Stationary Sources**	**Parking Lots**	**Terminal Curbsides**	**On-Airport Roadways**	**From Parking**	**To Parking**	**Airport-Related**	**Non-Airport**	Total
Methyl alcohol	6.87	<0.01	--	--	--	--	--	--	--	--	--	--	6.87
Methyl ethyl ketone	--	--	--	--	0.03	--	--	--	--	--	--	--	0.03
M-xylene	--	--	0.23	--	--	--	--	--	--	--	--	--	0.23
Naphthalene	2.06	<0.01		--	<0.01	--	--	--	--	--	--	--	2.06
N-heptane	0.24	<0.01	0.09	--	0.11	--	--	--	--	--	--	--	0.44
N-hexane	--	--	0.19	--	0.25	0.03	0.03	0.05	<0.01	0.04	0.04	0.32	0.94
O-xylene	0.63	<0.01	0.11	--	0.03	--	--	--	--	--	--	--	0.77
Phenol	2.76	<0.01	--	--	--	--	--	--	--	--	--	--	2.76
Propionaldehyde	2.77	<0.01	0.11	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	2.89
Styrene	1.18	<0.01	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.19
Toluene	2.44	<0.01	0.36	--	0.40	0.14	0.15	0.22	0.01	0.16	0.17	1.29	5.36
Xylene	--	--	--	--	--	0.07	0.07	0.12	<0.01	0.07	0.09	0.79	1.22
Total	**109.88**	**<0.01**	**2.31**	**0.94**	**2.83**	**0.31**	**0.32**	**0.56**	**0.02**	**0.38**	**0.43**	**3.89**	**11.89**

Note: -- designates pollutants for which AEDT does not provide emissions.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.3.4.6 Clean Air Act General Conformity

As previously stated, O'Hare is in an area designated by the USEPA as a "serious nonattainment" area for an O_3 standard promulgated by the USEPA in 2008 and a "marginal nonattainment" area for an O_3 standard promulgated in 2015.[21] As such, the SIP conformance requirements of the CAA apply to the Proposed Action if project-related emissions of VOC or NO_x (the precursors to O_3) exceed *de minimis* levels. The 2008 O_3 standard reflects the more restrictive *de minimis* level than the 2015 standard. Therefore, the Proposed Action emissions conformity to the Illinois SIP must be demonstrated if project-related VOC or NO_x emissions (i.e., construction emissions and net operational emissions when comparing the No Action to the Proposed Action) are equal to or greater than 50 tons in any evaluated year.[22] Based on estimates of construction and operational emissions, project-related emissions of NO_x will exceed this *de minimis* level, and as a result, a General Conformity Determination is required.

Conformity Determination

One way to demonstrate conformance with the CAA regarding O_3 is to document that emissions are accounted for in the applicable SIP's Attainment Demonstration [40 CFR Section 93.158(a)(1)]. The applicable SIP for the Chicago nonattainment area is the Attainment Demonstration for the 2008 O_3 NAAQS. This SIP was approved by the USEPA on August 19, 2020.[23] To determine whether the Proposed Action emissions are accounted for in the Chicago Attainment Demonstration, the FAA provided emissions data to the IEPA. After comparing the level of Proposed Action emissions to the O'Hare-specific emissions in the SIP, the IEPA determined that the emissions are accounted for in the Attainment Demonstration (see **Appendix E**, Attachment 2 for further details and IEPA concurrence letter).

5.3.5 Permits and Approvals

The proposed heating and refrigeration plants will require stationary source permits, modification to the airport's Title V Operating Permit, and IEPA and USEPA approvals.

5.3.6 Mitigation and Minimization

As demonstrated, the Proposed Action would not cause or contribute to any exceedances of the NAAQS nor delay attainment of the O_3 standard (for which the Chicago area is designated "nonattainment"). In addition, the air pollutant and pollutant precursor emissions that would result from the Proposed Action are included in the SIP, and as such, no mitigation measures are required. Regardless, the CDA is committed to implementing best practices to reduce public health and environmental effects during construction and operation of the Proposed Action to the extent practicable. These best practices are described in the City of Chicago's Sustainable Airport Manual (SAM).[24]

The City developed the SAM, and it has become an integral part of overall design and construction standards for airport projects. The SAM supports the City's ongoing efforts to implement more environmentally sustainable buildings and infrastructure. Many of these initiatives build on the City's existing environmental best management practices and are intended to supplement existing federal, state, and/or local regulatory requirements with additional best practice environmental strategies and

[21] United States Environmental Protection Agency, Nonattainment Areas for Criteria Pollutants, https://www.epa.gov/green-book
[22] United States Environmental Protection Agency, General Conformity *De Minimis* Tables, https://www.epa.gov/general-conformity/de-minimis-tables
[23] Volume 85, No. 161 of the Federal Register (Page 50955), August 19, 2020, 2020-16246.pdf (govinfo.gov)
[24] Chicago Department of Aviation, Sustainable Airport Manual Version 4.0, https://www.flychicago.com/SiteCollectionDocuments/Community/Environment/SAM/Full_SAM_v4.0.pdf.

considerations. The recommendations in the SAM are considered by the airport in every step of the design, planning, and implementation of improvements at O'Hare.

The capital projects included in the Proposed Action would be constructed in accordance with the provisions of the current version of FAA AC 150/5370-10, Standard Specifications for Construction of Airports.[25] The following measures, described in and/or consistent with the SAM, will be considered to reduce pollutant emissions and minimize any temporary adverse effects on air quality:

- Scrap metal from construction, repair, and demolition activities would be gathered on-site at the airport in staged, dedicated recycling dumpsters.
- Construction and demolition debris would be recycled and prevented from entering area landfills.
- Ultra-low sulfur diesel fuel could be used in diesel-powered construction equipment.
- Where practicable, diesel engine retrofit technology could be used in off-road equipment, including technology such as diesel oxidation catalyst/diesel particulate filters, engine upgrades, engine replacements, or combinations of these strategies.
- Encourage use of construction equipment with engines that have increased combustion efficiency (for example, equipment greater than 50 horsepower could target Tier 4 emission standards, and construction equipment that is less than 50 horsepower could target Tier 3 emission standards).[26]
- Heavy-duty off-road diesel equipment should have an engine model year of 2010 or later, heavy-duty alternative fuel vehicles should have an engine model year of 2010 or later, and any equipment retrofitted with Level 3 controls should have the emissions that are equal to an engine model year of 2010 or later.
- Limit unnecessary idling times on diesel-powered engines.
- Use electrically powered equipment rather than diesel power equipment, where available.
- Control construction dust by implementing a dust-control plan that includes:
    - Spraying water on dirt piles and streets/roads
    - Reducing dust-generating activities in periods of high winds

5.3.7 Cumulative Impacts

Projects at O'Hare, such as the South Airfield Drainage Consolidation and Taxiway A/B, are forecast to continue through the first six years of implementation of the Proposed Action. To disclose the potential cumulative impact of emissions, air pollutant and pollutant precursor emission estimates were prepared for these projects (referred as Baseline projects).

Table 5.3-26 presents the Baseline and Proposed Action emissions that would occur over the first six years of implementation of the Proposed Action. As shown, emission levels vary depending on the year and the pollutant/precursor. Notably, emission estimates for the Baseline projects were included in the data the

[25] Federal Aviation Administration, AC 150/5370-10, Standard Specifications for Construction of Airports, December 21, 2018, Current version at the time this EA was prepared was version 10H, https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentnumber/150_5370-10

[26] USEPA has implemented regulations and a tiering system to reduce emissions from off-road equipment with increasing combustion efficiency (i.e., decreasing emissions) where Tier 1 is the least efficient (greatest emissions) and Tier 4 is the most efficient (least emissions). The regulations have been implemented over time such that Tier 1 was phased out in the 1990's and Tier 2 was required, followed by implementation of Tier 3 and Tier 4 by 2015 with a phase out of Tier 2.

FAA provided to the IEPA for its review and determination that O'Hare-specific emissions are accounted for in the Chicago Attainment Demonstration SIP. See **Section 5.16** for further information.

TABLE 5.3-26
CUMULATIVE EMISSIONS – CRITERIA AIR POLLUTANTS/CONSTRUCTION: PROPOSED ACTION AND BASELINE PROJECTS

Year	Condition	Tons					
		CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
1	Baseline	20	3	35	<1	4	2
	Proposed Action	34	6	67	<1	15	5
	Total	54	9	102	<1	19	7
2	Baseline	10	2	16	<1	2	1
	Proposed Action	61	9	115	<1	28	9
	Total	71	11	131	<1	30	10
3	Baseline	10	2	17	<1	2	1
	Proposed Action	42	6	71	<1	24	6
	Total	52	8	88	<1	26	7
4	Baseline	3	1	5	<1	1	<1
	Proposed Action	27	4	53	<1	24	5
	Total	30	5	58	<1	25	5
5	Baseline	2	<1	3	<1	<1	<1
	Proposed Action	17	2	24	<1	14	3
	Total	19	2	27	<1	14	3
6	Baseline	<1	<1	<1	<1	<1	<1
	Proposed Action	16	2	27	<1	11	3
	Total	16	2	27	<1	11	3

Note: Values have been rounded to whole numbers for reporting.
[3] Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

5.4 CLIMATE

The terms "global warming" and "global climate change" describe the change in the average temperature of the earth's near-surface air and oceans since the mid-20th century and its projected continuation.

5.4.1 Definition of Resource

Evidence of warming of the climate system is now considered to be unequivocal, with the global surface temperature increasing approximately 1.33 degrees Fahrenheit over the last 100 years and continued warming projected to increase the global average temperature between two and 11 degrees over the same timeframe.[27] The International Panel on Climate Change (IPCC) concluded that variations in natural phenomena, such as solar radiation and volcanoes, produced most of the warming from pre-industrial times to 1950.[28] After 1950, an increase in the emissions that trap heat in the atmosphere from human activity, such as fossil fuel burning and deforestation, is responsible for most of the observed temperature increase.

Gases that trap heat in the atmosphere are referred to as greenhouse gases (GHG) because, much like a greenhouse does, they capture heat radiated from the sun as the heat is reflected into the atmosphere. The primary GHG are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and various synthetic chemicals.[29] While the primary GHG in the atmosphere occur naturally, they are also generated by human activities, which increases the rate at which these compounds occur in the Earth's atmosphere. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing associated with agricultural practices, coal mines, and landfills. N_2O is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Synthetic chemicals, such as hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other synthetic gases, are released through commercial, industrial, or household uses. Other gases known to trap heat in the atmosphere include water vapor—which occurs naturally as part of the global water cycle—and ozone. Ozone occurs naturally in the stratosphere (i.e., upper atmosphere) and is found in the troposphere (i.e., lower atmosphere) largely due to human activities.

5.4.2 Regulatory Context

There are currently no regulatory standards for CO_2 or other GHG. However, in 2009, based primarily on the scientific assessments of the United States Global Change Research Program, the National Research Council, the IPCC, and the USEPA issued a finding that it is reasonable to assume that changes in climate caused by elevated concentrations of GHG in the atmosphere endanger the health and welfare of current and future generations.[30] By 2016, the USEPA acknowledged that scientific assessments "highlight the urgency of addressing the rising concentration of CO_2 in the atmosphere."[31]

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[27] National Oceanic and Atmospheric Administration, Climate Change: Global Temperature, https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature

[28] International Panel on Climate Change, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

[29] United States Environmental Protection Agency, Greenhouse Gases and Their Sources, https://www.epa.gov/report-environment/greenhouse-gases

[30] Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66496 (December 15, 2009), https://www.govinfo.gov/content/pkg/FR-2009-12-15/pdf/E9-29537.pdf

[31] United States Environmental Protection Agency, Final Rule for Carbon Pollution Emission Guidelines for Existing Stationary Sources Electric Utility Generating Units, 80 Fed. Reg. 64661, 64677 (October 23, 2015), https://www.govinfo.gov/content/pkg/FR-2015-10-23/pdf/2015-22842.pdf

The USEPA and the FAA traditionally work within the standard setting process of the International Civil Aviation Organization's (ICAO's) Committee on Aviation Environmental Protection (CAEP). The ICAO/CAEP leads the effort to establish international emission standards and related requirements that individual nations later adopt into domestic law.

In 2016, the ICAO/CAEP agreed on the first-ever international standards to regulate CO_2 emissions from aircraft. In the same year, the USEPA formally announced that GHG emissions from certain classes of aircraft engines contribute to climate change.[32] In 2017, the ICAO adopted a new aircraft CO_2 emission standard intended to reduce the impact of aviation GHG emissions on the global climate. The USEPA adopted the same GHG emissions standard on January 11, 2021, the first aircraft GHG-related standard in United States (U.S.) history.[33] The standard applies to civil subsonic jet aircraft and larger civil subsonic propeller-driven aircraft designed after January 2020 or in production by 2028.

The CEQ, which coordinates federal environmental efforts and works closely with governmental agencies and other White House offices to develop environmental policies and initiatives, indicated that climate should be considered for projects subject to NEPA. In 2016, CEQ released guidance that focused on the consideration of potential impacts to global climate change by actions undertaken by federal agencies. The following year, pursuant to Executive Order (EO) 13783, the guidance was withdrawn for revision and update. In 2019, CEQ published draft NEPA guidance for considering GHG emissions, and in January 2021, EO 13990 directed all executive departments and agencies to commence work immediately to confront the climate crisis. One month later, CEQ rescinded the 2019 draft guidance and began to review, revise, and update the 2016 guidance. While this effort is ongoing, agencies are to consider all available tools and resources in assessing GHG emissions and the impacts proposed projects have on climate change.

In 2019, Illinois Governor Pritzker signed EO 2019-06 entering the state in the United States Climate Alliance, a group of states committed to reducing GHG emissions consistent with the United Nations Paris Agreement. Every member commits to:

- Implementing policies that advance the goals of the Paris Agreement, aiming to reduce GHG emissions by at least 26 to 28 percent below 2005 levels by 2025;
- Tracking and reporting progress to the global community in appropriate settings, including when the world convenes to take stock of the Paris Agreement; and
- Accelerating new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal levels.

5.4.3 Affected Environment

Since the early 1990s, the USEPA has prepared a GHG inventory for all manmade sources in the U.S. In 2018, the U.S. emitted approximately 6,672 million metric tons of CO_2 equivalents (CO_2e).[34] In 2019, the estimate was 6,558 million metric tons of CO_2e, a two percent decrease. According to the USEPA, a shift from coal to natural gas and the use of renewables in the electric power sector largely drove the reduction. In 2019, the transportation sector (i.e., motor vehicles, aircraft, trains, and ships/boats) contributed 1,876

32 United States Environmental Protection Agency, Final Rule for Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare, (August 15, 2016), https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-finding-greenhouse-gas-emissions-aircraft

33 United States Environmental Protection Agency, Control of Air Pollution From Airplanes and Airplane Engines: GHG Emission Standards and Test Procedures, (January 11, 2021), https://www.epa.gov/regulations-emissions-vehicles-and-engines/control-air-pollution-airplanes-and-airplane-engines-ghg

34 Because of the differential heat absorption potential of various GHG, GHG emissions are frequently reported in "carbon dioxide-equivalents," which present a weighted average based on each gas's heat absorption (or "global warming") potential.

million metric tons (approximately 29 percent of total emissions) of CO_2e to those 6,558 million metric tons, with aircraft emissions representing approximately ten percent of the transportation sector's emissions (i.e., approximately 188 million metric tons of CO_2e).[35]

In 2019, the City of Chicago published a report providing a 2017 GHG emissions inventory. The inventory boundary (i.e., the study area) is stated as the City's jurisdiction in Cook County, an area encompassing both O'Hare and the Chicago Midway International Airport. In the City's estimate, man-made sources generated approximately 31 million metric tons of CO_2e to the U.S. total (less than one percent of the U.S. total), with the two airports contributing approximately 1.6 million metric tons (less than 0.3 percent of total U.S. emissions during 2019).[36] The City's report also indicates that the 2017 aircraft-related estimate is approximately ten percent less than the aircraft-related estimate during 2005.

5.4.3.1 Methodology

The FAA has not established a significance threshold for climate, nor has the FAA identified specific factors to consider in making a significance determination for GHG emissions. However, in accordance with FAA guidance, if it is determined that an emissions inventory of the USEPA criteria pollutants (and their precursors) is warranted, it is expected that an inventory of GHG will also be conducted. In this way, project/action-related criteria pollutants and GHG emissions can be accounted for and disclosed[37] Because emissions of criteria air pollutants, pollutant precursors, and HAP were quantified to evaluate the Proposed Action (**Section 5.3**), GHG emissions have also been quantified.

GHG emissions inventories were prepared using the following guidelines:

- Transportation Research Board, Airport Cooperative Research Program Report 11, Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories;[38]
- USEPA Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance, Optional Emissions from Commuting, Business Travel and Product Transport;[39] and
- 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories used in conjunction with the original 2006 IPCC Guidelines for National Greenhouse Gas Inventories.[40,41]

The guidelines require that both direct and indirect GHG emissions be addressed. These emissions are defined as follows:

- Direct Emissions: Direct airport-related sources of GHG emissions include aircraft, APU, GSE, on-airport stationary sources (e.g., heating and refrigeration plants, generators), motor vehicle traffic (e.g., passenger, employee, construction delivery, haul trucks, and worker commute trips), and construction equipment.

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[35] United States Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks, April 2021, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

[36] City of Chicago, Greenhouse Gas Inventory Report, December 2019, https://www.chicago.gov/content/dam/city/progs/env/GHG_Inventory/Chicago-2017-GHG-Report_Final.pdf

[37] Aviation Emissions and Air Quality Handbook, Version 3, Update 1 (2015), Chapter 4

[38] Transportation Research Board, Airport Cooperative Research Program. Report 11, Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories, 2009, http://www.trb.org/Publications/Blurbs/160829.aspx

[39] United States Environmental Protection Agency, Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance, Optional Emissions from Commuting, Business Travel and Product Transport, May 2008, https://nepis.epa.gov/Exe/ZyPDF.cgi/P1001177.PDF?Dockey=P1001177.pdf

[40] International Panel on Climate Change, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

[41] International Panel on Climate Change, Guidelines for National Greenhouse Gas Inventories, 2006, https://www.ipcc-nggip.iges.or.jp/public/2006gl/

- Indirect Emissions: An indirect source of GHG emissions is the generation of electricity. These emissions typically occur at a location away from an airport.

The methodologies used to prepare GHG emission inventories generally mirror the methodologies used to prepare inventories of the criteria air pollutants and their pollutant precursors (see **Section 5.3**). The level of GHG emissions from aircraft activity is directly attributable to fuel consumption.[42] For the evaluation of the Proposed Action, aircraft fuel consumption data was obtained from the FAA's AEDT, Version 2d Service Pack 2.[43] Fuel usage is also used to estimated GHG emissions from APU, GSE, and stationary sources. For APU, fuel rates (in gallons per hour) are based on manufacturer data and GHG emissions are determined using emission factors for Jet A and APU operating times (typically 3.5 minutes during arrival and departure). For GSE, GHG emissions factors are obtained from USEPA's NONROAD,[44] and emissions are a function of the number of pieces of equipment, equipment size, and hours of operation.

For the Existing Condition stationary sources, actual fuel use rates are obtained from airport records. The same use rates are assumed for the No Action Alternative for both the Interim Condition and Build Out Condition. For the Proposed Action Alternative, fuel use rates are scaled as a function of changes in the square footage of buildings. A similar methodology is used to estimate GHG emissions due to electrical consumption and applicable emission factors.[45]

For construction activities, GHG emission factors for motor vehicles are obtained from USEPA's MOVES, Version 2014b model,[46] and emissions are derived as a function of traffic volume and travel distance. Similarly, for construction equipment, emissions factors are obtained from USEPA's NONROAD model,[47] and emissions are a function of equipment type, number of pieces of equipment, equipment size, and total hours of operation.

CO_2 is the reference gas for climate change because it is the predominant GHG. The effect that each gas can have on global warming is a combination of the mass of their emissions and their global warming potential (GWP). On a pound-for-pound basis, GWP indicates how much a gas is predicted to contribute to global warming relative to how much warming would be predicted to be caused by the same mass of CO_2. CH_4 and N_2O are substantially more potent GHG than CO_2, with GWPs of 28 and 265 times that of CO_2, respectively.[48]

In emissions inventories, GHG emissions are reported in terms of pounds or metric tons of CO_2e, which are calculated as the product of the mass emitted of a given GHG and its specific GWP.

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[42] United States Environmental Protection Agency, Center for Corporate Climate Leadership GHG Emission Factors Hub, March 2020, GHG Emission Factors Hub | US EPA

[43] Federal Aviation Administration, Aviation Environmental Design Tool (AEDT) Users Guide, September 2017, https://aedt.faa.gov/; AEDT 2d, Service Pack 2 was released on September 5, 2019

[44] United States Environmental Protection Agency, NONROAD Model, https://19january2017snapshot.epa.gov/moves/nonroad-model-nonroad-engines-equipment-and-vehicles_.html and United States Environmental Protection Agency, Non-Road Model Worksheet, December 2008

[45] United States Environmental Protection Agency, eGrid, https://www.epa.gov/egrid/summary-data

[46] United States Environmental Protection Agency, Motor Vehicle Emissions Simulator (MOVES) User Guide for MOVES2014b, December 2018, https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves

[47] United States Environmental Protection Agency, NONROAD Model, https://19january2017snapshot.epa.gov/moves/nonroad-model-nonroad-engines-equipment-and-vehicles_.html and United States Environmental Protection Agency, Non-Road Model Worksheet, December 2008

[48] International Panel on Climate Change, 2014: Climate Change 2014: Synthesis Report, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

5.4.3.2 Existing Condition

As shown in **Table 5.4-1**, it is estimated that the airport-related sources in the study area emitted approximately 1.4 million metric tons of CO_2e for the Existing Condition. A comparison of this level of emissions to the level of CO_2e emitted in the U.S. in 2018—6,672 million metric tons of CO_2e—indicates that O'Hare GHG emissions represent approximately 0.02 percent of total U.S. GHG emissions. As shown, most airport GHG emissions are CO_2 (99 percent), and most emissions are from aircraft operations (78 percent). **Table 5.4-1** also provides the estimated GHG emissions from non-airport-related motor vehicles in the study area. As shown, non-airport sources are estimated to emit approximately 0.2 million metric tons of CO_2e.

TABLE 5.4-1
GHG EMISSIONS INVENTORY: EXISTING CONDITION

Source Category			**Metric Tons of CO_{2e} in Existing Condition Year**			
			CO_2	**CH_4**	**N_2O**	**Total**
Airport	Aircraft		1,054,736	117	8,600	1,063,453
	APU		15,217	18	124	15,359
	GSE		39,850	181	399	40,430
	Training Fires		745	1	2	747
	Stationary Sources		47,662	27	29	47,718
	Airport Motor Vehicles	Off-Airport Roadways	36,656	10	46	36,712
		On-Airport Roadways	30,368	8	41	30,417
		Parking Lots	3,788	1	<1	3,789
		Terminal Curbsides	12,237	4	36	12,278
		Employee Busing from Parking Lots to Terminals	1,631	1	1	1,633
		Employee Airfield to Parking Lots	4,705	1	<1	4,707
	Electrical Consumption		106,124	288	390	106,802
	Subtotal		**1,353,719**	**658**	**9,669**	**1,364,045**
Off/Non-Airport Motor Vehicles			190,096	67	199	190,361
Total			**1,543,815**	**725**	**9,868**	**1,554,406**

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.4.4 Environmental Consequences

This section presents the results of an analysis to evaluate potential impacts to climate from the Proposed Action. A GHG inventory of emissions resulting from the construction activities required to implement the Proposed Action, as well as inventories of airport operation emissions for the Interim Condition (2025) and the Build Out Condition (2032) for the No Action and the Proposed Action Alternatives, are presented.

5.4.4.1 Construction

If the Proposed Action were implemented, construction-related GHG emissions would occur over a ten-year construction period, including the use of construction equipment and motor vehicles (delivery, haul truck, and construction worker commute trips). Estimates of GHG emissions were prepared for projects that support long-term development of the airport's passenger terminal facilities and projects previously planned but not yet completed under the capital program (referred to as Airport Layout Plan [ALP] projects).

Table 5.4-2 presents the GHG emissions inventory for the Proposed Action. As shown, the level of CO_2e varies from year to year with the greatest level estimated to occur in the second year of the construction schedule.

TABLE 5.4-2
GHG EMISSIONS INVENTORY: CONSTRUCTION

Year	Metric Tons of CO_2e			
	CO_2	CH_4	N_2O	Total
1	28,587	25	11	28,623
2	51,184	42	20	51,246
3	34,864	29	15	34,908
4	21,223	17	9	21,248
5	14,855	11	6	14,871
6	17,445	14	7	17,466
7	16,323	13	7	16,342
8	15,600	14	7	15,621
9	1,940	2	1	1,943
10	642	<1	<1	643

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

5.4.4.2 Interim No Action

The GHG emissions inventory for the Interim No Action is provided in **Table 5.4-3**. As shown, it is estimated that airport-related and non-airport sources in the study area would emit approximately 1.4 million and 0.2 million metric tons of CO_2e, respectively.

TABLE 5.4-3
GHG EMISSIONS INVENTORY: INTERIM NO ACTION

Source Category		Metric Tons of CO_2e in Interim Condition Year			
		CO_2	CH_4	N_2O	Total
Airport	Aircraft	1,080,378	124	8,809	1,089,311

Source Category			Metric Tons of CO_{2e} in Interim Condition Year			
			CO_2	CH_4	N_2O	Total
	APU		11,594	14	95	11,703
	GSE		45,549	199	463	46,210
	Training Fires		745	1	2	747
	Stationary Sources		53,555	34	41	53,630
	Airport Motor Vehicles	Off-Airport Roadways	32,137	8	35	32,180
		On-Airport Roadways	25,307	6	29	25,343
		Parking Lots	3,136	1	<1	3,137
		Terminal Curbsides	8,580	1	22	8,604
		Employee Busing from Parking Lots to Terminals	1,595	2	1	1,598
		Employee Airfield to Parking Lots	4,616	2	<1	4,618
	Electrical Consumption		113,501	309	417	114,227
	Subtotal		**1,380,696**	**699**	**9,913**	**1,391,308**
Off/Non-Airport Motor Vehicles			177,137	80	154	177,371
Total			**1,557,833**	**779**	**10,068**	**1,568,679**

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.4.4.3 Build Out No Action

The GHG emissions inventory for the Build Out No Action is provided in **Table 5.4-4**. As shown, it is estimated that the airport-related and non-airport sources in the study area would emit approximately 1.5 million and 0.2 million metric tons of CO_2e, respectively.

TABLE 5.4-4
GHG EMISSIONS INVENTORY: BUILD OUT NO ACTION

Source Category			Metric Tons of CO_{2e} in Build Out Condition Year			
			CO_2	CH_4	N_2O	Total
Airport	Aircraft		1,230,902	131	10,036	1,241,069
	APU		9,687	11	79	9,777
	GSE		48,778	214	494	49,487
	Training Fires		745	1	2	747
	Stationary Sources		53,555	34	41	53,630
	Airport Motor Vehicles	Off-Airport Roadways	17,006	4	20	17,030
		On-Airport Roadways	23,465	5	29	23,500
		Parking Lots	3,009	1	<1	3,010
		Terminal Curbsides	8,402	1	24	8,427

Source Category			Metric Tons of CO_{2e} in Build Out Condition Year			
			CO_2	CH_4	N_2O	Total
		Employee Busing from Parking Lots to Terminals	1,582	2	1	1,585
		Employee Airfield to Parking Lots	4,366	1	<1	4,367
	Electrical Consumption		113,501	309	417	114,227
	Subtotal		**1,514,998**	**715**	**11,144**	**1,526,856**
Off/Non-Airport Motor Vehicles			181,222	71	158	181,450
Total			**1,696,220**	**785**	**11,302**	**1,708,307**

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

5.4.4.4 Interim Proposed Action

The GHG emissions inventory for the Interim Proposed Action is provided in **Table 5.4-5**. As shown, it is estimated that the airport-related and non-airport sources in the study area would emit approximately 1.4 million and 0.2 million metric tons of CO_2e, respectively.

TABLE 5.4-5
GHG EMISSIONS INVENTORY: INTERIM PROPOSED ACTION

Source Category			Metric Tons of CO_{2e} in Interim Condition Year			
			CO_2	CH_4	N_2O	Total
Airport	Aircraft		1,118,381	124	9,119	1,127,624
	APU		11,594	14	95	11,703
	GSE		45,994	201	467	46,662
	Training Fires		745	1	2	747
	Stationary Sources		57,045	36	43	57,125
	Airport Motor Vehicles	Off-Airport Roadways	34,104	8	37	34,149
		On-Airport Roadways	25,287	6	29	25,323
		Parking Lots	3,524	1	<1	3,526
		Terminal Curbsides	8,964	1	24	8,989
		Employee Busing from Parking Lots to Terminals	1,595	2	1	1,598
		Employee Airfield to Parking Lots	4,616	2	<1	4,618
	Electrical Consumption		124,130	337	456	124,924
	Subtotal		**1,435,982**	**733**	**10,272**	**1,446,987**
Off/Non-Airport Motor Vehicles			178,982	81	157	179,220
Total			**1,614,964**	**813**	**10,429**	**1,626,206**

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

Table 5.4-6 provides the estimated difference in GHG emissions for the Interim Proposed Action compared with the Interim No Action. As shown, the Proposed Action would increase emissions from all sources except APU and training fires during the Interim Condition. Most of the increase would result from a rise in fuel consumption due to greater aircraft taxi times. The next greatest increase would be from new stationary sources and additional electrical consumption. Overall, CO_2e emissions would increase approximately 0.1 million metric tons of CO_2e for the Interim Proposed Action compared with the Interim No Action.

TABLE 5.4-6
CHANGE IN GHG EMISSIONS: INTERIM CONDITION

Source Category			Metric Tons of CO_{2e} in Interim Condition Year			
			CO_2	CH_4	N_2O	Total
Airport	Aircraft		38,003	<1	310	38,313
	APU		0	0	0	0
	GSE		446	2	5	452
	Training Fires		0	0	0	0
	Stationary Sources		3,490	2	2	3,494
	Airport Motor Vehicles	Off-Airport Roadways	1,966	0	2	1,969
		On-Airport Roadways	-20	0	0	-20
		Parking Lots	388	0	0	388
		Terminal Curbsides	384	0	1	385
		Employee Busing from Parking Lots to Terminals	0	0	0	0
		Employee Airfield to Parking Lots	0	0	0	0
	Electrical Consumption		10,629	29	39	10,697
	Subtotal		**55,286**	**34**	**359**	**55,679**
Off/Non-Airport Motor Vehicles			1,845	1	3	1,848
Total			**57,131**	**35**	**361**	**57,527**

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021.

5.4.4.5 Build Out Proposed Action

The GHG emissions inventory for the Build Out Proposed Action is provided in **Table 5.4-7.** As shown, it is estimated that the airport-related and non-airport sources in the study area would emit approximately 1.6 million and 0.2 million metric tons of CO_2e, respectively.

TABLE 5.4-7
GHG EMISSIONS INVENTORY: BUILD OUT PROPOSED ACTION

Source Category			Metric Tons of CO_{2e} in Build Out Condition Year			
			CO_2	**CH_4**	**N_2O**	**Total**
Airport	Aircraft		1,221,083	131	9,956	1,231,171
	APU		9,687	11	79	9,777
	GSE		48,214	212	488	48,914
	Training Fires		745	1	2	747
	Stationary Sources		89,513	53	59	89,625
	Airport Motor Vehicles	Off-Airport Roadways	17,727	4	21	17,752
		On-Airport Roadways	22,563	5	28	22,596
		Parking Lots	4,898	1	<1	4,899
		Terminal Curbsides	7,978	1	23	8,002
		Employee Busing from Parking Lots to Terminals	526	<1	1	527
		Employee Airfield to Parking Lots	5,613	2	<1	5,615
	Electrical Consumption		162,688	442	598	163,728
	Subtotal		**1,591,235**	**865**	**11,254**	**1,603,354**
Off/Non-Airport Motor Vehicles			167,468	65	147	167,681
Total			**1,758,704**	**930**	**11,401**	**1,771,035**

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford Murphy & Tilly, Inc./RCH Group, 2021

Table 5.4-8 provides the estimated difference in GHG emissions for the Build Out Proposed Action compared with the Build Out No Action. As shown, emissions from aircraft, GSE, and non-airport-related motor vehicles are estimated to decrease, emissions from APU and training fires would remain the same, and emissions from stationary sources and electrical consumption would increase due to more building square footage. Overall, emissions of CO_2e would increase approximately 0.1 million metric tons for the Build Out Proposed Action compared with the Build Out No Action.

TABLE 5.4-8
CHANGE IN GHG EMISSIONS: BUILD OUT CONDITION

Source Category		Metric Tons of CO_{2e} in Build Out Condition Year			
		CO_2	**CH_4**	**N_2O**	**Total**
Airport	Aircraft	-9,818	<0	-80	-9,898
	APU	0	0	0	0
	GSE	-565	-2	-6	-573
	Training Fires	0	0	0	0
	Stationary Sources	35,958	19	18	35,995

Source Category			Metric Tons of CO_{2e} in Build Out Condition Year			
			CO_2	CH_4	N_2O	Total
	Airport Motor Vehicles	Off-Airport Roadways	721	0	1	722
		On-Airport Roadways	-902	0	-1	-904
		Parking Lots	1,890	0	0	1,890
		Terminal Curbsides	-424	0	-2	-425
		Employee Busing from Parking Lots to Terminals	-1,056	-1	-1	-1,058
		Employee Airfield to Parking Lots	1,247	0	0	1,247
	Electrical Consumption		49,187	134	181	49,501
	Subtotal		**76,237**	**150**	**110**	**76,498**
Off/Non-Airport Motor Vehicles			-13,753	-5	-11	-13,769
Total			**62,484**	**145**	**100**	**62,728**

Note: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021

The greatest decrease in GHG emissions would result from lower aircraft taxi times for the Proposed Action Alternative compared with the No Action Alternative. The greatest increase would be due to new stationary sources (e.g., boilers), a new heating and refrigeration plant, and greater electrical consumption due to expanded and new structures. Overall, CO_2e emissions would increase approximately 0.1 million metric tons for the Build Out Proposed Action when compared with the Build Out No Action.

5.4.5 Permits and Approvals

The proposed heating and refrigeration plant would require a stationary source permit, modification to the airport's Title V Operating Permit, and approval by the IEPA and the USEPA.

5.4.6 Mitigation and Minimization

There would be increased airport-related emissions as part of the Proposed Action. As stated previously, there are currently no regulatory standards for GHG emissions. Therefore, the estimated increase in airport-related emissions for the Proposed Action Alternative does not require mitigation. Regardless, the City of Chicago is committed to the use of best practices that would reduce public health impacts and environmental impacts during construction and operation of the Proposed Action. The best practices are outlined in the City's Sustainable Airport Manual,[49] which provides guidance on incorporating sustainable elements into a project. Many of these elements reduce GHG emissions. For example, the City encourages contractors working on projects at O'Hare to use clean vehicles—those fueled by compressed natural gas or fuel/electric hybrids—for employee shuttle buses and light-duty vehicles.

The City also requires staging areas for employees to congregate and board multiple-occupancy vehicles to access project sites. Another requirement is that new heating, ventilation, and air conditioning (HVAC)

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[49] Chicago Department of Aviation, Sustainable Airport Manual Version 4.0, https://www.flychicago.com/SiteCollectionDocuments/Community/Environment/SAM/Full_SAM_v4.0.pdf

systems use low GWP refrigerants to minimize emissions (i.e., encouraging the use of CO_2, ammonia, and propane).

5.4.7 Cumulative Impacts

The potential for a cumulative increase in GHG emissions would result from the additive emissions of projects with previous environmental approval (i.e., reasonably foreseeable emissions). Projects at O'Hare, including the South Airfield Drainage Consolidation and Taxiway A/B, are forecast to continue during the first six years of implementation of the Proposed Action. To disclose the potential cumulative increase in emissions, a GHG emissions inventory was prepared for these "Baseline" projects. **Table 5.4-9** presents the cumulative emissions (i.e., emissions resulting from Baseline and Proposed Action) that would occur over the first six years of implementation of the Proposed Action. See **Section 5.16** for further information.

TABLE 5.4-9
CUMULATIVE GHG EMISSIONS: CONSTRUCTION: PROPOSED ACTION AND BASELINE PROJECTS

		Metric Tons of CO_2e			
Year	Condition	CO_2	CH_4	N_2O	Total
1	Baseline	17,146	15	7	17,168
	Proposed Action	28,587	25	11	28,623
	Total	45,733	40	18	45,791
2	Baseline	8,174	7	3	8,185
	Proposed Action	51,184	42	20	51,246
	Total	59,358	49	23	59,431
3	Baseline	10,320	12	5	10,337
	Proposed Action	34,864	29	15	34,908
	Total	45,184	41	20	45,245
4	Baseline	3,666	5	2	3,673
	Proposed Action	21,223	17	9	21,248
	Total	24,889	22	11	24,921
5	Baseline	2,142	2	1	2,145
	Proposed Action	14,855	11	6	14,871
	Total	16,997	13	7	17,016
6	Baseline	340	<1	<1	340
	Proposed Action	17,445	14	7	17,466
	Total	17,785	14	7	17,806

Notes: Table values are rounded for reporting and, as such, may not sum to the presented totals.
Source: Crawford, Murphy & Tilly, Inc./RCH Group, 2021