8. NOISE ANALYSIS

This section summarizes the aircraft noise analysis for the MKE MPU. The analysis considered the existing conditions (2018) and the conditions for two future years (2023 and 2028) to determine the noise exposure levels related to the MPU's preferred alternative. This includes both the No Project and With Project conditions for the two future years. The No Project conditions assume no changes to the airfield and facilities that would impact flight operations. The With Project conditions assume implementation of the MPU's preferred alternative, which involves decommissioning Runway 1R-19L and will impact runway use at MKE.

For the purposes of this analysis, the aircraft-related noise exposure is described using noise contours prepared with the FAA's Aviation Environmental Design Tool (AEDT) Version 3c, in compliance with 14 CFR Part 150, *Airport Noise Compatibility Planning,* FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, 42 United States Code (U.S.C.) 4332(2)(c), 49 U.S.C. 303, 23 U.S.C. 138, and the Council on Environmental Quality (CEQ) guidelines. Per FAA guidance, AEDT Version 3c may continue to be used if an environmental analysis began prior to March 29, 2021, which is the release date for the most current AEDT Version 3d.[1] The aircraft noise modeling analysis in support of the MKE MPU commenced prior to that date.

8.1 NOISE AND EFFECTS ON PEOPLE

The following subsections provide basic information on noise and its characteristics, as well as the effects of noise on people.

8.1.1 CHARACTERISTICS OF SOUND

Sound can be described in terms of amplitude (loudness), frequency (pitch), and duration (time). The standard unit of measurement of the loudness of sound is the decibel (dB). Decibels are based on the logarithmic scale, which compresses the wide range in sound pressure levels to a more usable range of numbers in a manner like the Richter scale that is used to measure earthquakes.

The human hearing system is not equally sensitive to sound at all frequencies. Sound waves below 16 hertz (Hz) are not heard at all but are "felt" as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above 10,000 Hz and below 200 Hz. Because the human ear is not equally sensitive to sound at all frequencies, a frequency-dependent rating scale was devised to relate noise to human sensitivity. The scale for A-weighted decibels (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. Community noise levels are measured in terms of dBA or dB.

8.1.2 PROPAGATION OF NOISE

Outdoor sound levels decrease because of several factors, including distance from the sound source, atmospheric absorption (characteristics in the atmosphere that absorb sound), and ground attenuation (characteristics on the ground that absorb sound). If sound is radiated from a source in a homogeneous and undisturbed manner, then

[1] US Department of Transportation, Federal Aviation Administration, https://aedt.faa.gov/3c_information.aspx (accessed November 2, 2020).

the sound travels in spherical waves. As the sound wave travels away from the source, the sound energy is spread over a greater area, dispersing the sound power of the wave.

Temperature and humidity of the atmosphere also influence the sound levels received by the observer. The influence of the atmosphere and the resultant fluctuations increase with distance and become particularly important at distances greater than 1,000 feet. The degree of absorption depends on the frequency of the sound, as well as the humidity and air temperature. For example, when the air is cold and humid, and therefore denser, atmospheric absorption is lowest. Higher frequencies are more readily absorbed than the lower frequencies. Over large distances, lower frequency sounds become dominant as the higher frequencies are attenuated.

8.1.3 NOISE METRICS

The analysis and reporting of community noise levels must account for the complexity of the human response to noise and the variety of noise metrics that have been developed for describing noise impacts. Each metric attempts to quantify noise levels with respect to community response.

Noise metrics can be divided into two categories: single event and cumulative. Single event metrics describe the noise levels from an individual event, such as an aircraft flyover. Cumulative metrics average the total noise over a specific period, which is typically from 1 to 24 hours for community noise levels.

Maximum noise level (Lmax) is the peak sound level during an aircraft noise event. The metric only accounts for the instantaneous peak intensity of the sound, not for the duration of the event. As an aircraft passes by an observer, the sound level increases to a maximum level and then decreases. Typical single event noise levels range from over 90 dBA close to the Airport to 50 to 60 dBA at more distant locations.

Sound exposure level (SEL) is calculated by summing the decibel levels during a noise event and compressing that noise into one second. The SEL value is the integration of all the acoustic energy contained within the noise event (for example, an aircraft overflight or automobile pass-by). This metric considers both the Lmax of the event and the duration of the event. For aircraft flyovers, the SEL value is approximately 10 dB higher than the Lmax.

Day-night average sound level (DNL) is a 24-hour, time-weighted average noise level based on the dBA. Time-weighted refers to the fact that noise is penalized for occurring during certain sensitive time periods. The nighttime period (10:00 p.m. to 7:00 a.m.) is penalized by 10 dB. This penalty was selected to account for increased human sensitivity to noise during the quieter period of a day, when sleep is the most common activity. DNLs near airports range from DNL 75 dBA on an airport's property to below DNL 45 dBA at more distant locations.

8.2 NOISE REGULATIONS AND POLICIES

The noise analysis was conducted in compliance with 14 CFR Part 150, *Airport Noise Compatibility Planning*, FAA Order 1050.1F, and FAA Order 5050.4B. As shown in **Table 8-1**, DNL 65 dBA and higher is the threshold to determine land use compatibility for noise-sensitive land uses (e.g., residences, schools, places of worship). In general, commercial, industrial, and outdoor recreation land uses are compatible with aircraft noise.

TABLE 8-1 TITLE 14 CODE OF FEDERAL REGULATIONS PART 150 LAND USE TABLE

LAND USE	YEARLY DAY-NIGHT AVERAGE SOUND LEVEL (DNL) IN DECIBELS					
	BELOW 65	65–70	70–75	75–80	80–85	OVER 85
Residential						
Residential other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home park	Y	N	N	N	N	N
Transient lodgings	Y	N[1]	N[1]	N[1]	N	N
Public Use						
Schools	Y	N[1]	N[1]	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
Commercial Use						
Offices, business, and professional	Y	Y	25	30	N	N
Wholesale and retail – building materials, hardware, and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail trade – general	Y	Y	Y[2]	Y[3]	Y[4]	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production, and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusement parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

NOTES:

Y – Yes, land use and related structures are compatible without restrictions.

N – No, land use and related structures are not compatible and should be prohibited.

1 Where the community determines that residential or school uses must be allowed, measures to achieve an outdoor-to-indoor noise level reduction (NLR) of at least 25 A-weighted decibels (dBA) to 30 dBA should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dBA, thus the reduction requirements are often stated as 5, 10, or 15 dBA over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.

2 Measures to achieve an NLR of 25 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where normal noise level is low.

3 Measures to achieve an NLR of 30 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where normal noise level is low.

4 Measures to achieve an NLR of 35 dBA must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where normal noise level is low.

5 Land use is compatible provided that special sound reinforcement systems are installed.

6 Residential buildings require an NLR of 25 dBA.

7 Residential buildings require an NLR of 30 dBA.

8 Residential buildings are not permitted.

SOURCE: Title 14 Code of Federal Regulations Part 150, *Airport Noise Compatibility Planning*, Table 2-1, "Land Use Compatibility with Yearly Day-Night Average Sound Levels (DNL),".

8.3 SURROUNDING JURISDICTION LAND USE

The Airport is surrounded by several jurisdictions. Generally, the jurisdictions do not have specific land use zoning or other land use applications related to Airport operations. The FAR Part 150 Study completed in 2008 provided a comprehensive list of surrounding cities and their zoning related to Airport operations.[2] Of the eight surrounding cities and one county, the following cities have adopted compatible land use recommendations related to Airport operations: Cudahy, Oak Creek, Franklin, and Greenfield.

8.4 CODE OF FEDERAL REGULATIONS PART 150 LAND USE RECOMMENDATIONS

The most recent 14 CFR Part 150 Study Update for MKE included recommendations for land use management and administration actions; the FAA accepted the Noise Exposure Maps in December 2008 and approved the Noise Compatibility Program in June 2009 with a Record of Approval. This section summarizes these recommendations.

8.4.1 LAND USE MANAGEMENT RECOMMENDATIONS

- Recommendation 1 – Sound insulate noise sensitive uses, at or above the 65 DNL noise contour.
- Recommendation 2 – Voluntary acquisition of non-compatible land or undeveloped non-compatible land zoned for residential use.
- Recommendation 3 – Voluntary acquisition of noise easements over non-compatible land use.
- Recommendation 4 – Voluntary sales assistance for non-compatible land use.

8.4.2 PROGRAM MANAGEMENT AND ADMINISTRATIVE RECOMMENDATIONS

- Recommendation 1 – Upgrade aircraft flight track/noise monitoring system (NMS) with multilateration.
- Recommendation 2 – Install remote cameras to monitor ground activity, engine run-ups, and use of APU (auxiliary power unit).
- Recommendation 3 – Complete subsequent Part 150 Study Updates.

8.5 NOISE ABATEMENT PROCEDURES

The noise abatement procedures for jet aircraft at the Airport have been in place for over 30 years and were designed for aircraft to fly over areas where sound insulation has been completed. These noise abatement procedures include the following:

- Runway 1L – Maintain runway heading until leaving 2,000 feet MSL.
- Runway 7R – Maintain runway heading until leaving 2,000 feet MSL.
- Runway 25L – Maintain runway heading until leaving 2,000 feet MSL.
- Runway 19R – After departure, aircraft turn to the east or west by 15 degrees and maintain that heading until reaching 3,000 feet MSL. For aircraft turning to the west, the turn should not be further than a heading of 270 degrees to the west until reaching 3,000 feet MSL. For aircraft turning to the east, aircraft may turn once, reaching 3,000 feet MSL or 3 NM from the Airport.

[2] Mead & Hunt, https://www.mitchellairport.com/mkepart150/NCP_Documents/A_Inventory.pdf (accessed June 2021).

8.6 EXISTING AND FUTURE NOISE CONDITIONS

The existing aircraft noise environment at MKE was evaluated based on the modeling of the aircraft operations in 2018. This section describes the data and assumptions used to develop the Noise Exposure Map for the 2018 existing conditions and the conditions for the future years (2023 and 2028). For this analysis, data from multiple sources were used, including the following:

- MKE L3Harris NMS operational and flight track information (calendar years 2016, 2017, 2018, 2019, and 2020)
- FAA Traffic Flow Management System Counts (TFMSC) operations and fleet mix data (calendar year 2018)
- FAA Operations Network (OPSNET) tower counts (calendar year 2018)
- FAA TAF data
- MKE MPU forecasts

Runway use and day/night distribution were estimated based on an analysis of annual aircraft operational data collected through the monitoring systems previously noted. MKE typically experiences runway closures due to construction on a yearly basis, normally during summer months. To account for this, runway use is based on the average runway use for the 4-year period of 2016 through 2019. All other assumptions listed above are based on 2018 operations and activity levels, as well as using the default AEDT weather inputs for MKE.

8.7 EXISTING CONDITIONS AIRCRAFT ACTIVITY

Activity levels for the 2018 existing conditions at MKE were derived from the sources listed in Section 8.6, Existing and Future Noise Conditions. The AEDT requires a variety of operational data to model the noise environment around an airport. These data include the following, which are discussed in detail in this section:

- aircraft activity levels
- aircraft fleet mix
- stage length
- runway use

8.7.1 AIRCRAFT OPERATIONS

As shown in **Table 8-2**, there were 111,712 operations at the Airport in 2018 (an average of 306 operations per day), as derived from the OPSNET. An operation is one takeoff or one landing. The Boeing B737-700 narrowbody jet had the most operations, accounting for 17,505 operations, or 16 percent of the operations, which was based on data from the Airport's Noise Monitoring System (NMS). Using these data sources, the operations were then put into the appropriate aircraft category per the MPU's Section 3, Aviation Activity Forecasts, Table 3-19 Forecast Aircraft Fleet Mix. The tables in the following sections include helicopter and touch-and-go operations; touch and go operations are included in the overall operational totals due to the small percentage of operations.

TABLE 8-2 ANNUAL OPERATIONS BY AIRCRAFT CATEGORY – 2018 EXISTING CONDITIONS

AIRCRAFT CATEGORY	AIRCRAFT SIZE	ANNUAL OPERATIONS (2018)
Widebody Jet	All Sizes	2,604
Narrowbody Jet	Small	749
Narrowbody Jet	Medium	32,457
Narrowbody Jet	Large	10,429
Narrowbody Jet	Cargo/Long Haul	1,825
Regional Jet	Small	15,795
Regional Jet	Medium	15,584
Business Jet	All Sizes	12,298
Twin Propeller	All Sizes	9,941
Single Propeller	All Sizes	7,621
Military	All Sizes	2,059
Helicopter	All Sizes	350
TOTAL		**111,712**

NOTE:
The aircraft categories consist of different types of aircraft sizes; these sizes are categorized as small, medium, and large, while other categories include "all" aircraft. This is based on the aircraft categories presented in Section 3, Aviation Activity Forecasts, of the Master Plan Update.
SOURCE: FAA Operations Network (OPSNET), May 2021; BridgeNet International, June 2021.

8.7.2 FLEET MIX

Table 8-3 presents the average annual day (AAD)[3] operations for 2018, which were used as the operations input for the AEDT. As shown, this table lists the AAD number of operations by specific AEDT aircraft type, aircraft category, and aircraft size for MKE in 2018. Table 8-3 also reports the AAD number of operations by time of day and mode of operation (arrival or departure). The NMS data were used to identify the number of operations by each type of aircraft. The radar data were scaled to match the OPSNET aircraft tower counts. Aircraft with a small number of operations were grouped with a similar aircraft type.

Several aircraft operate in the MKE fleet that are unique to the Airport. The Airport's primary operations are narrowbody and regional jets that provide commercial service to MKE. The Wisconsin Air National Guard's (ANG's) 128th Air Refueling Wing has its base at MKE, which includes 10 Boeing KC-135 Stratotankers that are four-engine widebody aircraft and occasional fighter jets. Most of the cargo operations are conducted by UPS, FedEx, DHL, and the US Postal Service with Boeing B-767 and DC-10/MD-11 aircraft, as well as cargo feeder companies using Cessna Caravan and King Air 90 aircraft.

[3] An AAD activity profile is computed by adding all aircraft operations occurring during a year and dividing the result by 365. As such, AAD does not reflect activities on any one specific day, but it represents the average conditions as they occur during the year.

TABLE 8-3 AVERAGE ANNUAL DAY FLEET MIX OPERATIONS BY TIME OF DAY AND OPERATION MODEL – 2018 EXISTING CONDITIONS

AEDT AIRCRAFT TYPES AND CATEGORIES			2008 AVERAGE DAILY OPERATIONS						
			ARR DAY	ARR NIGHT	DEP DAY	DEP NIGHT	ARRIVALS	DEPARTURES	TOTAL
1 7773ER	Widebody	All	0.0352	0.0027	0.0379		0.04	0.04	0.08
2 767300	Widebody	All	0.0818	0.0753	0.0867	0.0704	0.16	0.16	0.31
3 A300 622R	Widebody	All	1.1673	0.7881	1.1619	0.7936	1.96	1.96	3.91
4 DC1040	Widebody	All	0.6523	0.0384	0.6744	0.0163	0.69	0.69	1.38
5 MD11PW	Widebody	All	0.0975	0.6283	0.5002	0.2256	0.73	0.73	1.45
6 717200	Narrowbody	Small	1.0211	0.0054	1.0184	0.0081	1.03	1.03	2.05
7 737400	Narrowbody	Medium	0.8613	0.6175	0.6551	0.8237	1.48	1.48	2.96
8 737700	Narrowbody	Medium	19.1316	4.8486	19.5547	4.4255	23.98	23.98	47.96
9 A319 131	Narrowbody	Medium	2.6322	0.9023	3.4884	0.0460	3.53	3.53	7.07
10 A320 211	Narrowbody	Medium	2.8640	1.1390	3.0117	0.9913	4.00	4.00	8.01
11 MD83	Narrowbody	Medium	6.5491	0.9938	7.3966	0.1463	7.54	7.54	15.09
12 MD9028	Narrowbody	Medium	3.4397	0.4821	3.3665	0.5552	3.92	3.92	7.84
13 737800	Narrowbody	Large	7.6082	2.6729	8.1794	2.1017	10.28	10.28	20.56
14 737900	Narrowbody	Large	2.4159	0.9046	2.2101	1.1104	3.32	3.32	6.64
15 737MAX8	Narrowbody	Large	0.5542	0.1310	0.5986	0.0867	0.69	0.69	1.37
16 7S7RR	Narrowbody	Cargo/Long	0.3420	0.7278	0.6825	0.3873	1.07	1.07	2.14
17 A321 232	Narrowbody	Cargo/long	1.3757	0.0544	1.3434	0.0867	1.43	1.43	2.86
18 EMB145	Regional	Small	5.5143	1.7415	6.3072	0.9486	7.26	7.26	14.51
19 CL601	Regional	Small	12.8891	1.4925	11.0042	3.3774	14.38	14.38	28.76
20 CRJ9- ER	Regional	Medium	7.2051	0.8307	6.4135	1.6223	8.04	8.04	16.07
21 CRJ9 LR	Regional	Medium	3.1139	0.4801	3.2690	0.3250	3.59	3.59	7.19
22 EMB17S	Regional	Medium	7.8815	1.8362	8.1712	1.5465	9.72	9.72	19.44
23 Misc Jets	Business Jet	All	15.7302	1.1161	15.0750	1.7713	16.85	16.85	33.69
24 1900D	Twin Prop	All	11.5947	2.0232	8.8619	4.7560	13.62	13.62	27.24
25 GASEPV	Single Prop	All	10.0997	0.3401	8.6430	1.7968	10.44	10.44	20.88
26 KC13SR	Military	All	2.3077	0.5128	2.7296	0.0910	2.82	2.82	5.64
27 EC130	Helicopter	All	0.4215	0.0579	0.3142	0.1652	0.48	0.48	0.96
		TOTAL	127.5867	25.4435	124.7553	28.2749	153.03	153.03	306.06

NOTES:
AEDT – Aviation Environmental Design Tool
Totals are subject to rounding +/- 1 operation. Air taxi and general aviation are shown only as subtotals to save space.
Data from the Noise Monitoring System are grouped into categories per Section 3, Aviation Activity Forecasts, of the Master Plan Update.
SOURCE:BridgeNet International, 2021.

In addition to aircraft type, the time of day an operation occurs can affect the DNL contours because the nighttime 10-dB penalty is applied from 10:00 p.m. to 7:00 a.m. In this study, the approximate percentage of flights occurring during nighttime hours throughout the year was 16 percent for arrivals and 17 percent for departures, which was derived from the Airport's NMS. The percentage of nighttime operations varies due to commercial and cargo jets having a higher percentage of nighttime operations while GA and piston aircraft operations occur more during the daytime hours.

8.8 DEPARTURE STAGE LENGTH

Aircraft departures were grouped within the following five stage length categories:

- Departure stage length 1: 0 to 500 NM (great circle distance[4])
- Departure stage length 2: 501 to 1,000 NM
- Departure stage length 3: 1,001 to 1,500 NM
- Departure stage length 4: 1,501 miles to 2,500 NM
- Departure stage length 5: 2,501 NM or greater

An aircraft with a short stage length is assumed to be carrying less fuel and cargo and fewer passengers than an aircraft with a long stage length. Aircraft with longer stage lengths are assumed to be heavier, with longer stage lengths requiring more fuel. The assigned departure stage length affects departure noise levels because weight affects aircraft performance and resulting noise levels. The stage length assumptions used in noise modeling are determined based on the distance flown from origin to destination (for example, from MKE to JFK or MKE to LAX). This is the FAA's standard method of determining the appropriate departure climb performance profile (altitude, speed, and thrust). In reviewing the radar data for commercial aircraft, this standard methodology provides a realistic approximation of the actual aircraft climb altitude profiles at MKE.

8.9 RUNWAY USE

An additional consideration in developing the noise exposure contours is the percentage of time each runway is used. The speed and direction of the wind and other operational factors dictate the runway direction that is used by an aircraft. From a safety standpoint, it is desirable, and usually necessary, to arrive and depart an aircraft into the wind. When the wind direction changes, the operations are shifted to the runway end that favors the wind direction.

Table 8-4 shows the runway use percentage by class of aircraft, as based on the actual runway use data compiled from the NMS for the existing conditions and the No Project conditions. The No Project conditions do not include any changes to the airfield layout, operational levels, or fleet mix. Runway use by aircraft class is based on many factors, including aircraft weight, destination, weather, air traffic operational need, and any operational changes, such as a runway closed for maintenance.

[4] The great circle distance is the shortest distance between any two points on the surface of the earth.

TABLE 8-4 RUNWAY USE – EXISTING AND NO PROJECT CONDITIONS

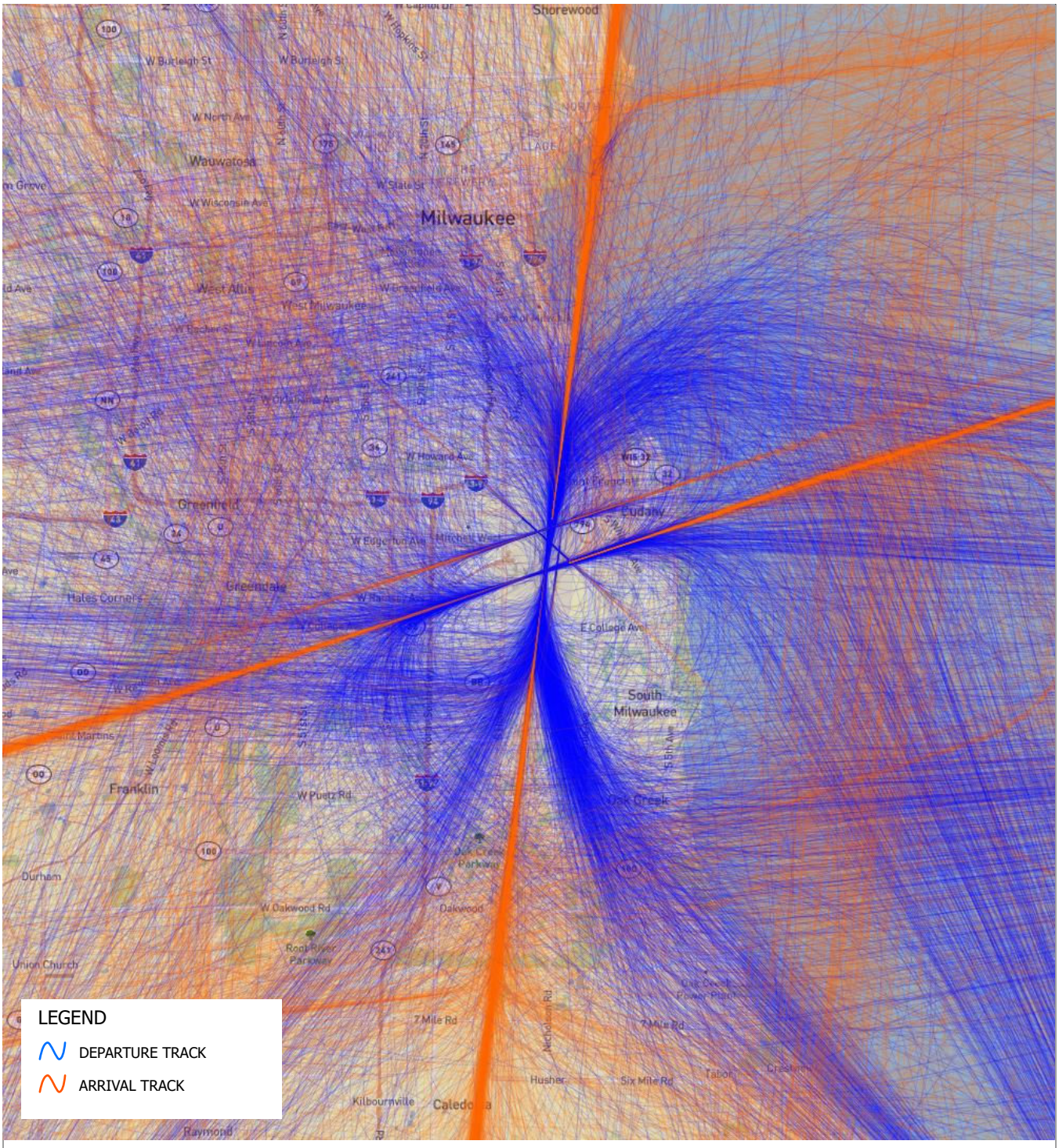
			EXISTING AND NO PROJECT CONDITIONS									
OPERATION	TIME OF DAY	CLASS	1L	19R	7R	25L	1R	19L	7L	25R	13	31
Arrivals	Day	Commercial Jets	24.0%	19.0%	20.0%	37.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arrivals	Day	Business Jets	24.5%	18.1%	20.0%	36.2%	0.0%	0.0%	0.0%	0.1%	0.1%	1.0%
Arrivals	Day	Propeller	18.9%	16.6%	18.1%	24.4%	0.5%	0.4%	5.7%	12.7%	1.6%	1.1%
Arrivals	Night	Commercial Jets	42.0%	31.0%	8.0%	19.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arrivals	Night	Business Jets	41.0%	26.0%	9.0%	23.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%
Arrivals	Night	Propeller	37.4%	23.0%	10.4%	23.1%	0.3%	0.1%	1.0%	3.4%	0.5%	0.8%
Departures	Day	Commercial Jets	24.0%	37.0%	19.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Departures	Day	Business Jets	23.1%	44.5%	12.2%	16.2%	0.0%	0.0%	0.0%	0.0%	3.4%	0.6%
Departures	Day	Propeller	16.3%	21.5%	10.0%	26.8%	0.8%	0.9%	9.2%	10.3%	2.1%	2.1%
Departures	Night	Commercial Jets	33.0%	43.0%	10.0%	14.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Departures	Night	Business Jets	30.5%	50.6%	6.7%	10.1%	0.0%	0.0%	0.0%	0.1%	1.8%	0.2%
Departures	Night	Propeller	21.5%	14.7%	12.4%	44.5%	0.2%	0.1%	1.9%	3.4%	0.4%	0.9%

NOTE:
The totals and percentages are subject to rounding of +/- 0.1 percent; a 0.0 percent cell indicates 0 operations. Commercial jets represent scheduled operations; business jets are operated by private owners, and propeller aircraft are operated by private, cargo, or charter operators.
SOURCE: BridgeNet International, 2021 using NMS radar data from the four-year average of 2016 – 2019

The runway use modeled for 2018 is based on the average runway use from January 1, 2016, through December 12, 2019. An average runway use for multiple years was used to account for the seasonal construction, as well as runway use during winter weather conditions. It should be noted that Runways 1L-19R and 1R-19L are in proximity, approximately 1,000 feet apart, centerline to centerline. Given that the radar coverage often does not start until the aircraft is in the air, for some departing aircraft it is not possible to determine which of the parallel runways was used for departure. While this does not occur often, affecting less than 0.1 percent of all operations, it is possible to have aircraft in the NMS assigned to the wrong parallel runway. Additionally, Runway 7L-25R is used by propeller aircraft; this runway is not used by jet aircraft, therefore, no jets were modeled arriving or departing to this runway.

8.10 FLIGHT PATHS AND FLIGHT PATH USE

Radar tracks from the Airport's NMS from calendar year 2018 were used in the development of the nominal flight tracks and flight path dispersions in the AEDT. Including these radar tracks, instead of flight procedure tracks, most accurately depicts how aircraft fly at the Airport. **Exhibit 8-1** through **Exhibit 8-5** present a random sample of 30 days of radar flight tracks for the year 2018; these exhibits provide a visual representation of the tracks for the entire year. However, a full calendar year of data of all operations were used to generate the nominal flight tracks. Propeller and jet operations were modeled using the same tracks. Helicopter operations were modeled arriving and departing from the ramp on the north side of the Airport to the north and south of the Airport. For illustrative purposes, Exhibit 8-1 presents a random sample of 30 days of radar data for all operations for the 2018 base period. Exhibit 8-2 and Exhibit 8-3 present the same data for jet departures only during the daytime and nighttime periods, respectively. Exhibit 8-4 and Exhibit 8-5 present the same data for jet arrivals only during the daytime and nighttime periods, respectively.



NOTES:

The 30-day statistical sample from the 2018 radar tracks are used to illustrate the flight paths. The noise modeling flight paths were determined from a full year of radar data.

SOURCES: MAP: MAPBOX OPENSTREET MAP, 2021. FLIGHT TRACKS: L3HARRIS NMS, 2018. BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-1

NORTH N.T.S.

AIRCRAFT DEPARTURE AND ARRIVAL RADAR TRACKS

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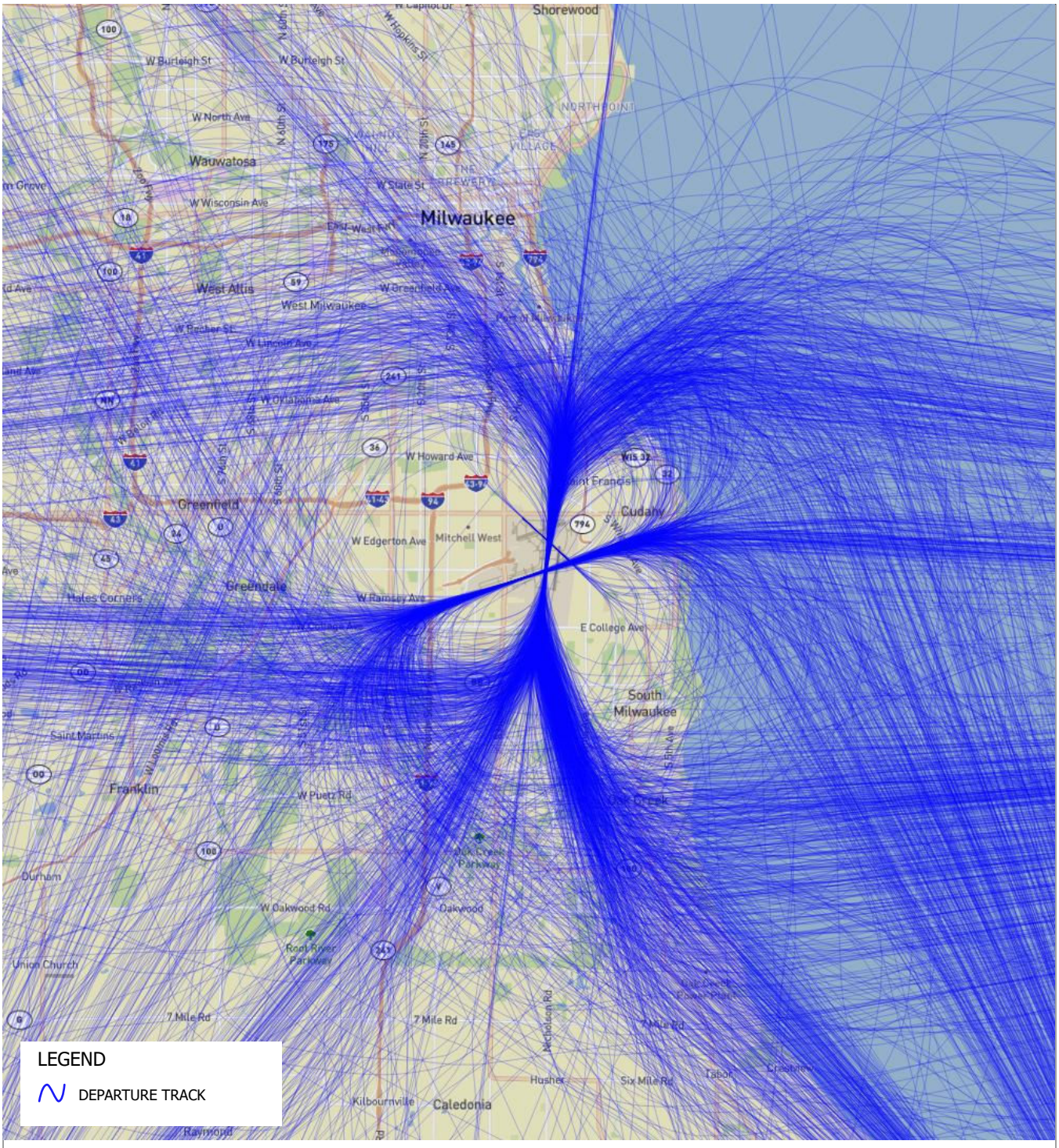

NOTES:

The 30-day statistical sample from the 2018 radar tracks are used to illustrate the flight paths. The noise modeling flight paths were determined from a full year of radar data.

SOURCES: MAP: MAPBOX OPENSTREET MAP, 2021. FLIGHT TRACKS: L3HARRIS NMS, 2018. BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-2

N.T.S.

NORTH

DAYTIME JET DEPARTURE RADAR TRACKS

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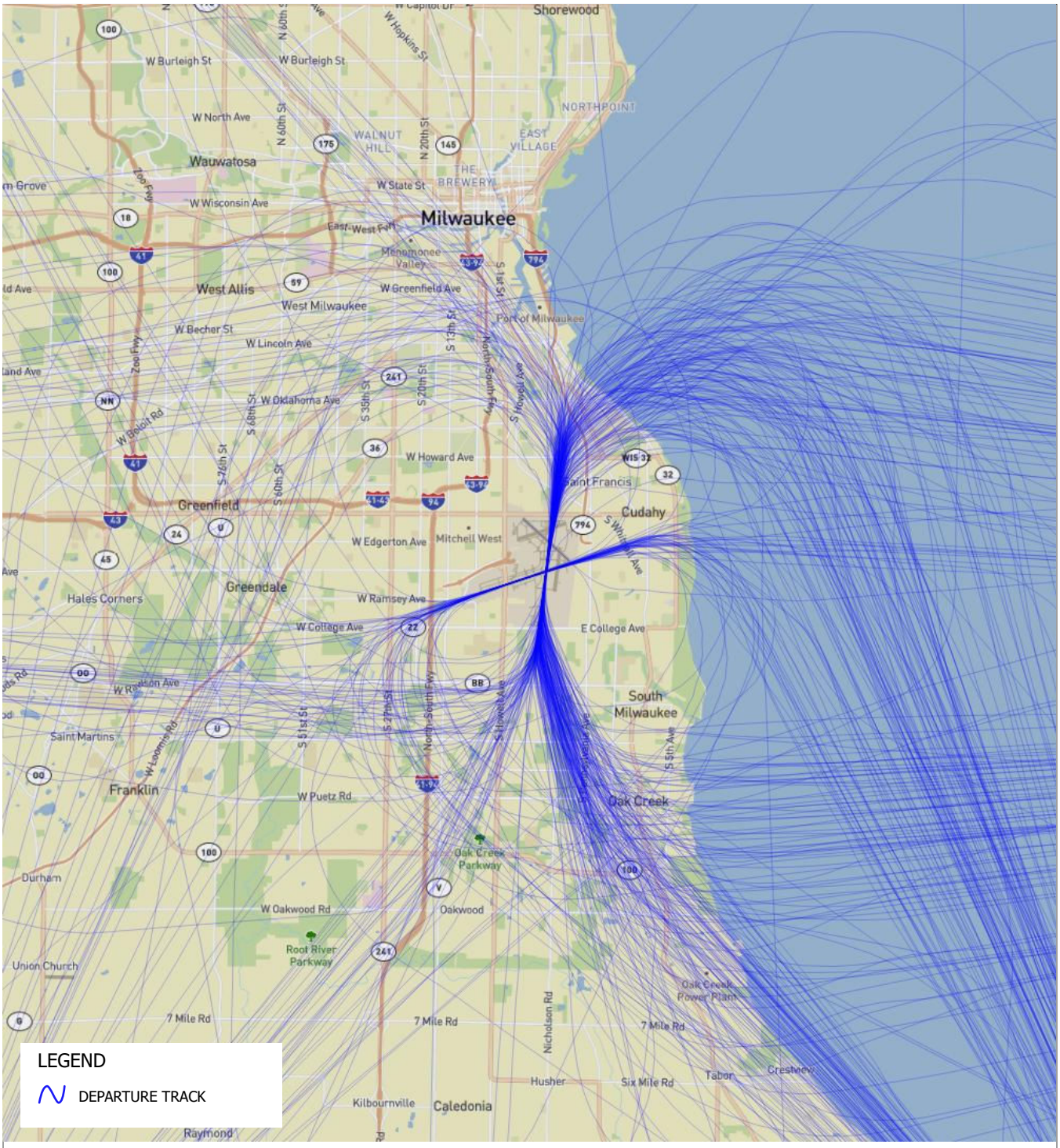

NOTES:

The 30-day statistical sample from the 2018 radar tracks are used to illustrate the flight paths. The noise modeling flight paths were determined from a full year of radar data.

SOURCES: MAP: MAPBOX OPENSTREET MAP, 2021. FLIGHT TRACKS: L3HARRIS NMS, 2018. BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-3

N.T.S.

NORTH

NIGHTIME JET DEPARTURE RADAR TRACKS

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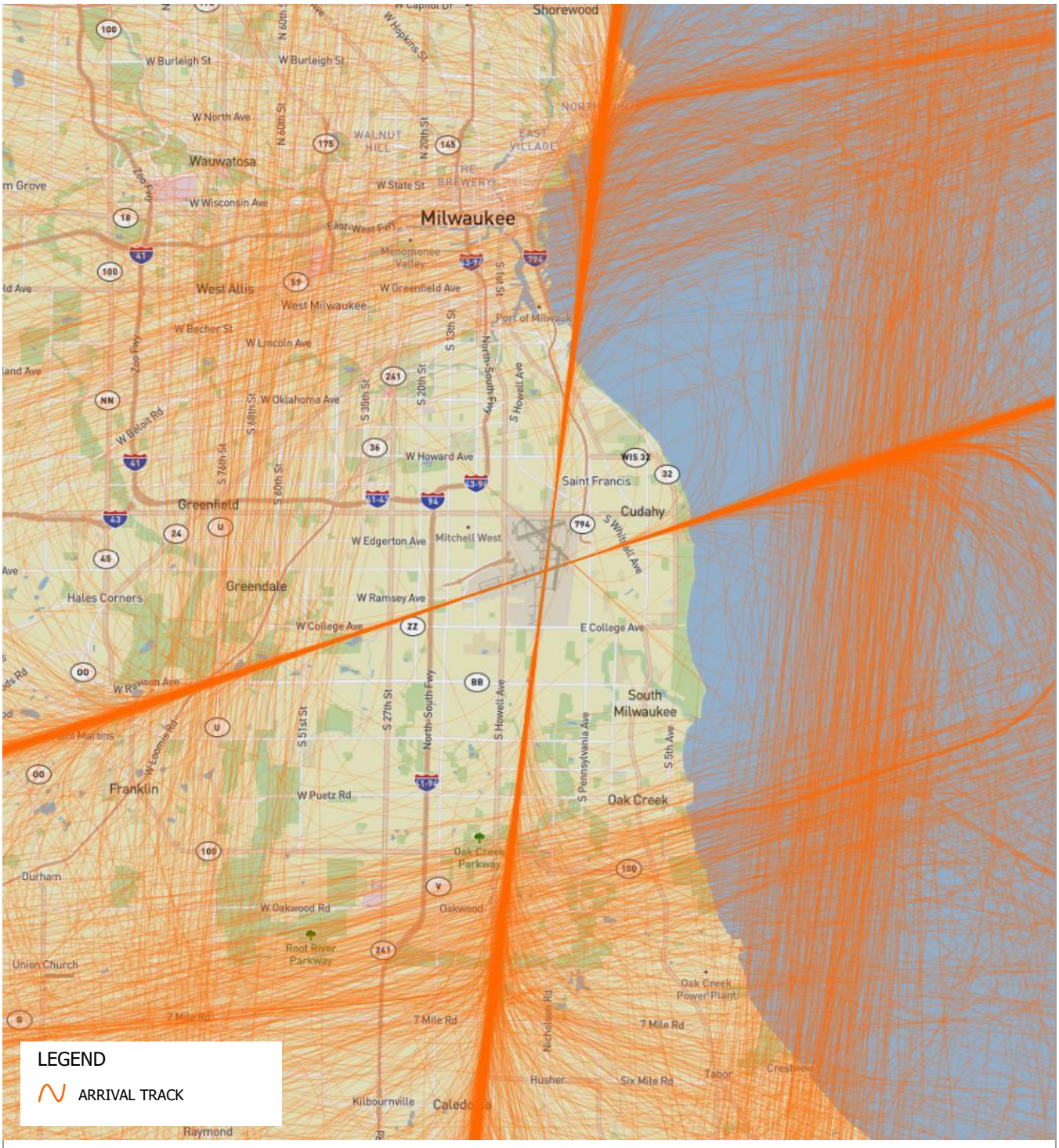

NOTES:

The 30-day statistical sample from the 2018 radar tracks are used to illustrate the flight paths. The noise modeling flight paths were determined from a full year of radar data.

SOURCES: MAP: MAPBOX OPENSTREET MAP, 2021. FLIGHT TRACKS: L3HARRIS NMS, 2018. BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-4

N.T.S.

NORTH

DAYTIME JET ARRIVAL RADAR TRACKS

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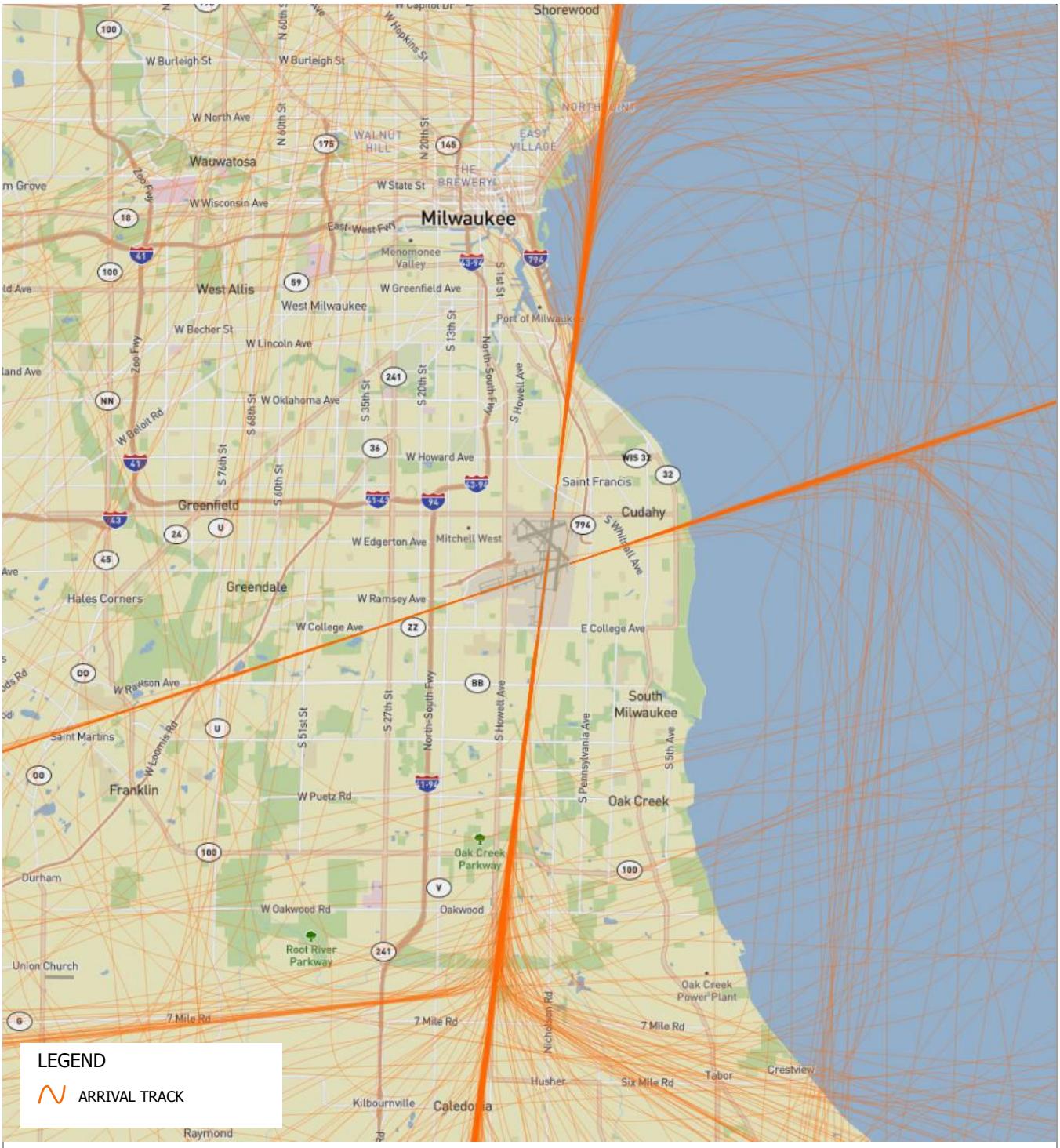

NOTES:

The 30-day statistical sample from the 2018 radar tracks are used to illustrate the flight paths. The noise modeling flight paths were determined from a full year of radar data.

SOURCES: MAP: MAPBOX OPENSTREET MAP, 2021. FLIGHT TRACKS: L3HARRIS NMS, 2018. BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-5

NORTH N.T.S.

NIGHTIME JET ARRIVAL RADAR TRACKS

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8.11 EXISTING CONDITIONS NOISE EXPOSURE

As described in the preceding sections, the compiled data were used as inputs to the FAA's AEDT for the calculation of noise in the Airport environs. The DNL contours do not represent the noise levels present on any specific day; rather, they represent the daily energy-average of all 365 days during the year. The relative distance of the contours from the Airport along each route is a function of the frequency of use of each runway for total arrivals and departures, time of day, and the type of aircraft assigned to the runway.

Based on the operational conditions presented previously, DNL contours were developed. **Exhibit 8-6** presents the noise exposure contours (DNL 60, 65, and 70 dBA) for the existing conditions. **Table 8-5** summarizes the noise exposure for the 2018 existing conditions. As shown, there are 330 persons located within the DNL 65 dBA and higher noise contour, and there are 10 persons located in areas with a DNL greater than 70 dBA. Note that all the people within the DNL 65 dBA and higher noise contour are within the Noise Insulation Boundary of the Airport[5]. Milwaukee County invested over $130 million in a combination of programs that included the sound insulation of approximately 2,300 homes, multiple schools, and nursing homes, as well as the acquisition of nearby noncompatible land in the cities of Milwaukee, St. Francis, Oak Creek, and Cudahy. **Exhibit 8-7** shows the noise insulation eligibility boundary.

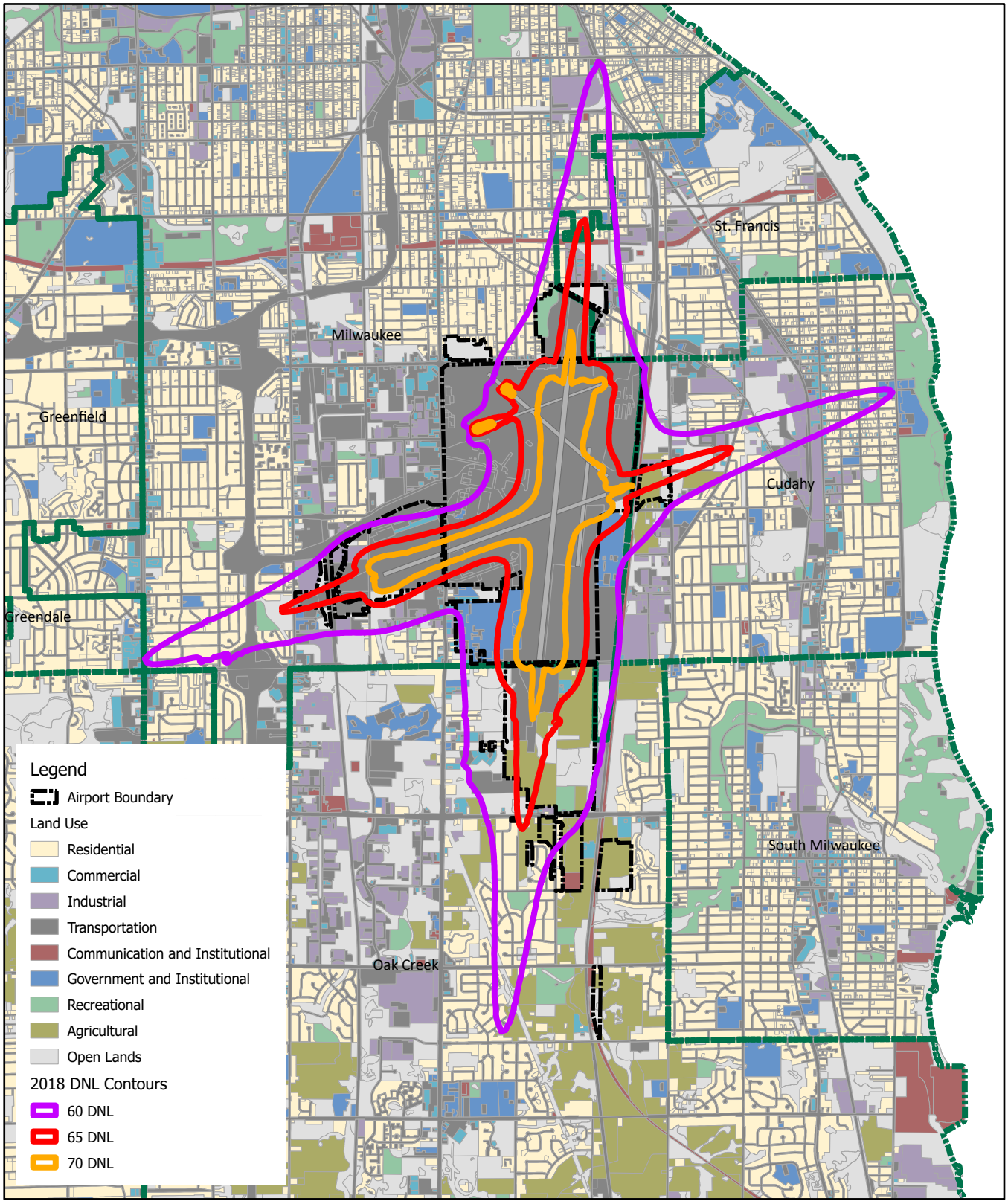
TABLE 8-5 SUMMARY OF NOISE EXPOSURE – 2018 EXISTING CONDITIONS

	NOISE LEVEL RANGE (DNL)		
CATEGORY	>60 dBA	>65 dBA	>70 dBA
Population Count (persons)	6,690	330	10
Housing (units)	2,967	144	4
Land Use (acres)			
Residential	437	4	0
Commercial	54	6	0
Industrial	142	13	0
Transportation	2,016	1,139	551
Communication and Institutional	22	4	0
Government and Institutional	169	51	4
Recreation	66	0	0
Agricultural	275	66	0
Open Lands	498	66	0
Water	0	0	0
Total Land Area (acres)	**3,680**	**1,349**	**556**

NOTES:
dBA – A-Weighted Decibels
DNL – Day-Night Average Sound Level
Totals and percentages are subject to rounding of +/- 0.1%.
SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Design Tool, Version 3c, 2020 US Census Bureau, 2010.

Note that these noise contours are smaller than prior years' noise contours. This is a result of the reduction in the number of operations at the Airport and the transition to a quieter fleet of aircraft that serve MKE. As a comparison, the official 14 CFR Part 150 2009 noise contours are presented on **Exhibit 8-8**. There were 2,200 homes within the DNL 65 dBA noise contour boundary for 2009; the 2009 contour represented the future year conditions.

[5] The Noise Insulation Boundary is the area within which eligible homes, schools and nursing homes were sound insulated and noncompatible lands were purchased by the Airport.



SOURCES: MAP: MILWAUKEE COUNTY GIS, 2003. MILWAUKEE COUNTY, DEC 2021 (PROPERTY LINE). NOISE CONTOUR: BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-6

NORTH 0 5,000 ft

EXISTING CONDITIONS 2018 DAY-NIGHT AVERAGE SOUND LEVEL NOISE CONTOURS

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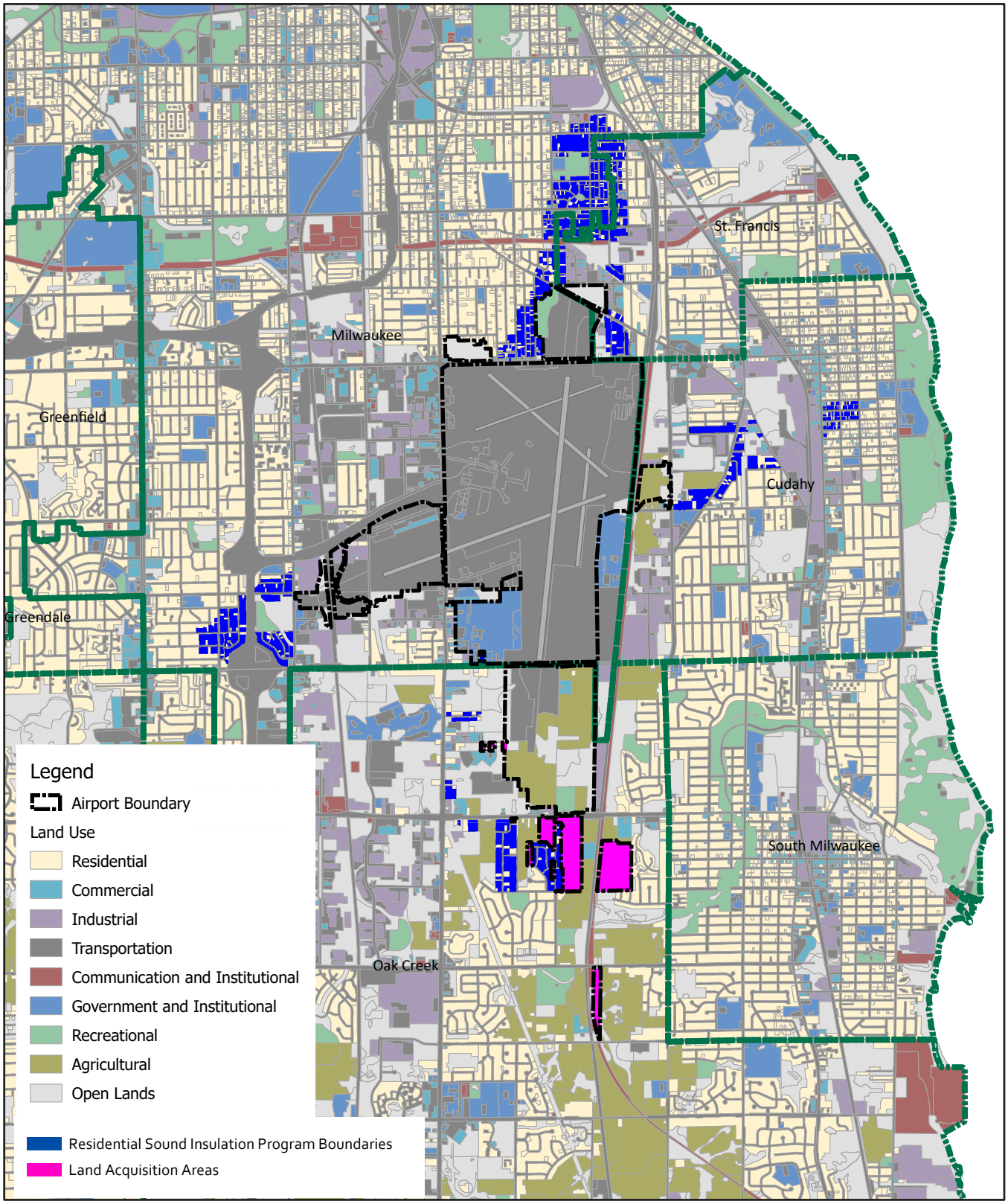

SOURCES: MAP: MILWAUKEE COUNTY GIS, 2003. MILWAUKEE COUNTY, 2021 (PROPERTY LINE). RESIDENTIAL SOUND INSULATION PROGRAM BOUNDARY: MILWAUKEE MITCHELL INTERNATIONAL AIRPORT CFR 14 PART 150, 2009

EXHIBIT 8-7

NORTH 0 5,000 ft

RESIDENTIAL SOUND INSULATION BOUNDARY

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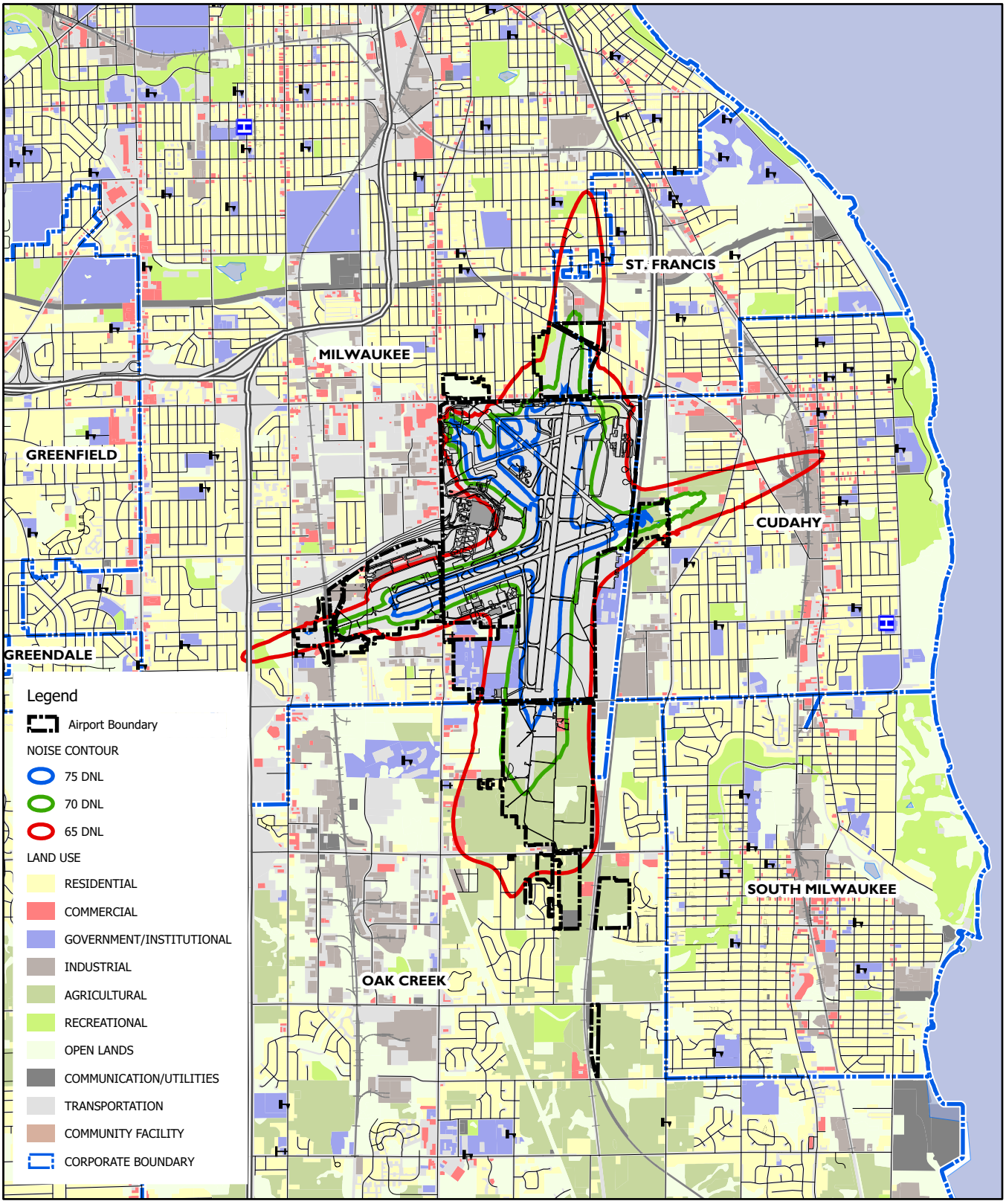

SOURCES: REPRODUCED FROM THE MILWAUKEE MITCHELL INTERNATIONAL AIRPORT CFR 14 PART 150, 2009. MILWAUKEE COUNTY, DEC 2021 (PROPERTY LINE).

EXHIBIT 8-8

NORTH 0 5,000 ft

2009 FUTURE YEAR CONDITIONS 14 CODE OF FEDERAL REGULATIONS PART 150
DAY-NIGHT AVERAGE SOUND LEVEL NOISE CONTOURS

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8.12 FUTURE YEAR NO PROJECT NOISE CONDITIONS – 2023 AND 2028

The future noise environment at MKE under the No Project conditions was analyzed based on forecast 2023 and 2028 operations. The aircraft operational levels and fleet mix were derived from the FAA approved forecast (Section 3, Aviation Activity Forecasts). **Table 8-6** summarizes the forecast annual operations data by aircraft category and size. **Tables 8-7** and **8-8** show the detailed fleet mix data by time of day and operation mode for the two future years. The aircraft in blue are new generation aircraft replacing those aircraft that are assumed to be no longer operating at the Airport due to airlines retiring older, less efficient aircraft, which began in 2020.

As previously stated, the noise modeling inputs for the No Project condition's runway use, flight tracks, and flight track use were kept the same as the existing conditions for each future year.

TABLE 8-6 FORECAST ANNUAL OPERATIONS BY AIRCRAFT CATEGORY – 2023 AND 2028

AIRCRAFT CATEGORY	AIRCRAFT SIZE[1]	ANNUAL OPERATIONS – 2023	ANNUAL OPERATIONS – 2028
Widebody Jet	All	3,222	4,101
Narrowbody Jet	Small	2,626	4,237
Narrowbody Jet	Medium	26,981	24,153
Narrowbody Jet	Large	18,305	22,713
Narrowbody Jet	Cargo/Long	2,805	3,788
Regional Jet	Small	6,367	1,695
Regional Jet	Medium	24,115	29,577
Business Jet	All	17,268	17,520
Twin Propeller	All	7,674	8,501
Single Propeller	All	7,674	8,501
Military	All	2,059	2,059
Helicopter	All	424	428
TOTAL		**119,520**	**127,273**

NOTES:
The operations are subject to a rounding of +/- 1 operation.
1 The aircraft categories consist of different types of aircraft sizes; these sizes are categorized as small, medium, and large, while other categories include "all" aircraft. This is based on the aircraft categories presented in Section 3, Aviation Activity Forecasts, of the Master Plan Update.
SOURCES: BridgeNet International, 2021; Ricondo & Associates, Inc., June 2019 (forecast).

TABLE 8-7 AVERAGE DAILY FLEET MIX OPERATIONS BY TIME OF DAY AND OPERATION MODEL – 2023

AEDT AIRCRAFT TYPES AND CATEGORIES			2023 AVERAGE DAILY OPERATIONS						
			ARR DAY	ARR NIGHT	DEP DAY	DEP NIGHT	ARRIVALS	DEPARTURES	TOTAL
1 7773ER	Widebody	All	0.0436	0.0034	0.0469		0.05	0.05	0.09
2 767300	Widebody	All	0.1012	0.0931	0.1072	0.0871	0.19	0.19	0.39
2 A300 622R	Widebody	All	1.4444	0.9752	1.4377	0.9819	2.42	2.42	4.84
4 DC1040	Widebody	All	0.8071	0.0475	0.8345	0.0201	0.85	0.85	1.71
5 MD11PW	Widebody	All	0.1206	0.7775	0.6190	0.2792	0.90	0.90	1.80
6 BCS 100	Narrowbody	Small	3.5783	0.0190	3.5688	0.0285	3.60	3.60	7.19
7 737400	Narrowbody	Medium	0.7160	0.5133	0.5446	0.6847	1.23	1.23	2.46
8 737700	Narrowbody	Medium	15.9040	4.0306	16.2557	3.6789	19.93	19.93	39.87
9 A319 131	Narrowbody	Medium	2.1881	0.7501	2.8999	0.0383	2.94	2.94	5.88
10 A320 211	Narrowbody	Medium	2.3808	0.9469	2.5036	0.8240	3.33	3.33	6.66
11 737MAX8	Narrowbody	Medium	5.4443	0.8261	6.1488	0.1216	6.27	6.27	12.54
12 A320-271N	Narrowbody	Medium	2.8594	0.4008	2.7986	0.4616	3.26	3.26	6.52
13 737800	Narrowbody	Large	13.3534	4.6913	14.3559	3.6888	18.04	18.04	36.09
14 737900	Narrowbody	Large	4.2402	1.5877	3.8790	1.9490	5.83	5.83	11.66
15 737MAX8	Narrowbody	Large	0.9727	0.2300	1.0505	0.1521	1.20	**1.20**	2.41
16 757RR	Narrowbody	Cargo/Long	0.5257	1.1187	1.0491	0.5953	1.64	1.64	3.29
17 A321 232	Narrowbody	Cargo/Long	2.1145	0.0836	2.0649	0.1332	2.20	2.20	4.40
18 EMB145	Regional	Small	2.2228	0.7020	2.5424	0.3824	2.92	2.92	5.85
19 CL601	Regional	Small	5.1955	0.6016	4.4357	1.3614	5.80	5.80	11.59
20 CRJ9- ER	Regional	Medium	11.1495	1.2855	9.9245	2.5105	12.43	12.43	24.87
21 CRJ9 LR	Regional	Medium	4.8186	0.7429	5.0587	0.5029	5.56	5.56	**11.12**
22 EMB175	Regional	Medium	12.1962	2.8414	12.6445	2.3931	15.04	15.04	30.08
23 GIV	Business Jet	All	22.0876	1.5672	21.1676	2.4872	23.65	23.65	47.31
24 1900D	Twin Prop	All	8.9505	1.5618	6.8410	3.6714	10.51	10.51	21.02
25 GASEPV	Single Prop	All	10.1699	0.3425	8.7031	1.8093	10.51	10.51	21.02
26 KC135R	Military	All	2.3077	0.5128	2.7296	0.0910	2.82	2.82	5.64
27 EC130	Helicopter	All	0.5107	0.0701	0.3807	0.2002	0.58	0.58	1.16
		TOTAL	136.4034	27.3227	134.5924	29.1336	**163.73**	**163.73**	**327.45**

NOTES:
AEDT – Aviation Environmental Design Tool
Totals are subject to rounding +/- 1 operation. Air taxi and general aviation are shown only as subtotals to save space. The aircraft shown in blue represent new generation aircraft replacing older, retired aircraft no longer operating at the Airport.
SOURCES: BridgeNet International, 2021; Ricondo & Associates, Inc., 2019.

TABLE 8-8 AVERAGE DAILY FLEET MIX OPERATIONS BY TIME OF DAY AND OPERATION MODEL – 2028

AEDT AIRCRAFT TYPES AND CATEGORIES			2028 AVERAGE DAILY OPERATIONS						
			ARR DAY	ARR NIGHT	DEP DAY	DEP NIGHT	ARRIVALS	DEPARTURES	TOTAL
1 7773ER	Widebody	All	0.0555	0.0043	0.0597		0.06	0.06	0.12
2 767300	Widebody	All	0.1289	0.1185	0.1365	0.1109	0.25	0.25	0.49
2 A300 622R	Widebody	All	1.8385	1.2413	1.8299	1.2498	3.08	3.08	6.16
4 DC1040	Widebody	All	1.0273	0.0604	1.0621	0.0256	1.09	1.09	2.18
5 MD11PW	Widebody	All	0.1536	0.9896	0.7878	0.3554	1.14	1.14	2.29
6 BCS 100	Narrowbody	Small	5.7735	0.0306	5.7582	0.0459	5.80	5.80	11.61
7 737400	Narrowbody	Medium	0.6409	0.4595	0.4875	0.6129	1.10	1.10	2.20
8 737700	Narrowbody	Medium	14.2370	3.6082	14.5518	3.2933	17.85	17.85	35.69
9 A319 131	Narrowbody	Medium	1.9588	0.6715	2.5960	0.0343	2.63	2.63	5.26
10 A320 211	Narrowbody	Medium	2.1313	0.8476	2.2412	0.7377	2.98	2.98	5.96
11 737MAX8	Narrowbody	Medium	4.8736	0.7395	5.5043	0.1088	5.61	5.61	11.23
12 A320-271N	Narrowbody	Medium	2.5597	0.3588	2.5053	0.4132	2.92	2.92	5.84
13 737800	Narrowbody	Large	16.5690	5.8211	17.8130	4.5771	22.39	22.39	44.78
14 737900	Narrowbody	Large	5.2613	1.9700	4.8130	2.4183	7.23	7.23	14.46
15 737MAX8	Narrowbody	Large	1.2069	0.2854	1.3035	0.1887	1.49	1.49	2.98
16 757RR	Narrowbody	Cargo/Long	0.7099	1.5107	1.4167	0.8039	2.22	2.22	4.44
17 A321 232	Narrowbody	Cargo/Long	2.8555	0.1129	2.7885	0.1799	2.97	2.97	5.94
18 EMB145	Regional	Small	0.5917	0.1869	0.6768	0.1018	0.78	0.78	1.56
19 CL601	Regional	Small	1.3831	0.1602	1.1809	0.3624	1.54	1.54	3.09
20 CRJ9-ER	Regional	Medium	13.6748	1.5767	12.1724	3.0791	15.25	15.25	30.50
21 CRJ9 LR	Regional	Medium	5.9101	0.9112	6.2044	0.6168	6.82	6.82	13.64
22 EMB175	Regional	Medium	14.9587	3.4850	15.5085	2.9352	18.44	18.44	36.89
23 GIV	Business Jet	All	22.4100	1.5900	21.4765	2.5235	24.00	24.00	48.00
24 1900D	Twin Prop	All	9.9151	1.7301	7.5782	4.0670	11.65	11.65	23.29
25 GASEPV	Single Prop	All	11.2658	0.3794	9.6410	2.0042	11.65	11.65	23.29
26 KC135R	Military	All	2.3077	0.5128	2.7296	0.0910	2.82	2.82	5.64
27 EC130	Helicopter	All	0.5155	0.0708	0.3842	0.2021	0.59	0.59	1.17
		TOTAL	144.9136	29.4330	143.2077	31.1389	174.35	174.35	348.69

NOTES:
AEDT – Aviation Environmental Design Tool
Totals are subject to rounding +/- 1 operation. Air taxi and general aviation are shown only as subtotals to save space. The aircraft shown in blue represent new generation aircraft replacing older, retired aircraft no longer operating at the Airport.
SOURCES: BridgeNet International, 2021; Ricondo & Associates, Inc., 2019.

Based on the forecast, data show that for year 2023 a total of 119,510 operations are anticipated to occur at MKE. This equates to an average of 327 operations per day. For future year 2028, a total of 127,273 operations are anticipated to occur, or an average of 348 operations per day. The future year 2023 and 2028 forecasts both include a slight increase of operations over existing year operations that is forecast to occur with or without the preferred Master Plan improvements. The forecast also expects a reduction in smaller regional jet aircraft and an increase in operations by all other aircraft categories. There is an assumed improvement in aircraft emitting less noise due to the increased use of new generation regional jets (Bombardier CS-100) and new generation narrow body jets (Boeing MAX8). For the noise analysis, the CS-100 aircraft was modeled as a Boeing MAX8 since at the time of the analysis, AEDT did not have noise data for the CS-100.

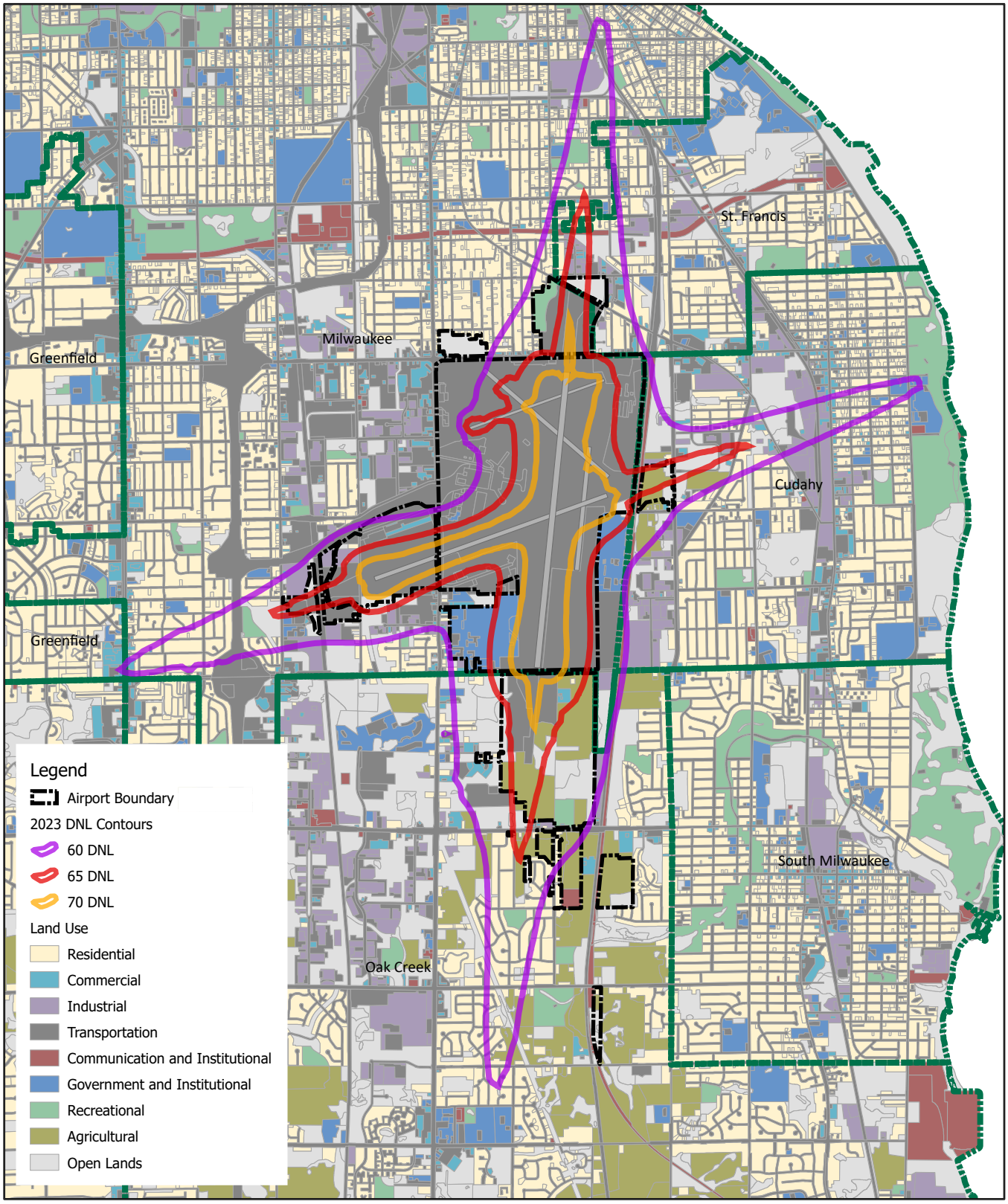
As previously stated, the noise modeling inputs for No Project conditions, including runway utilization, flight tracks, and flight track use were kept the same as the existing operations. The No Project condition's DNL 60, 65, and 70 dBA noise exposure contours for years 2023 and 2028 are represented on **Exhibit 8-9** and **Exhibit 8-10**, respectively.

Table 8-9 summarizes the noise exposure effects for the 2023 and 2028 No Project conditions.

8.13 FUTURE YEAR WITH PROJECT CONDITIONS – 2023 AND 2028

The With Project conditions assumes that Runway 1R-19L will be decommissioned in the future. This will occur prior to 2023, and the runway is assumed to be decommissioned for both future year conditions. The runway is currently used for less than 1% of operations and primarily used by smaller GA aircraft when the winds favor that runway, which is readily available compared to Runway 1L-19R, is more convenient to use due to proximity, and/or is used when those operations need to be separated from Runway 1L-19R.

Table 8-10 presents the runway use assumptions for the With Project conditions. The operations on Runway 1R-19L were shifted primarily to the other two shorter GA runways (13-31 and 7R-25L), as well as the nearby longer parallel Runway 1L-19R. The No Project condition's noise modeling inputs for total operations, fleet mix, flight tracks, and flight track use for both 2023 and 2028 are the same.



SOURCES: MAP: MILWAUKEE COUNTY GIS, 2003. MILWAUKEE COUNTY, DEC 2021 (AIRPORT PROPERTY). NOISE CONTOUR: BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-9

NORTH 0 5,000 ft

NO PROJECT 2023 DAY-NIGHT AVERAGE SOUND LEVEL NOISE CONTOURS

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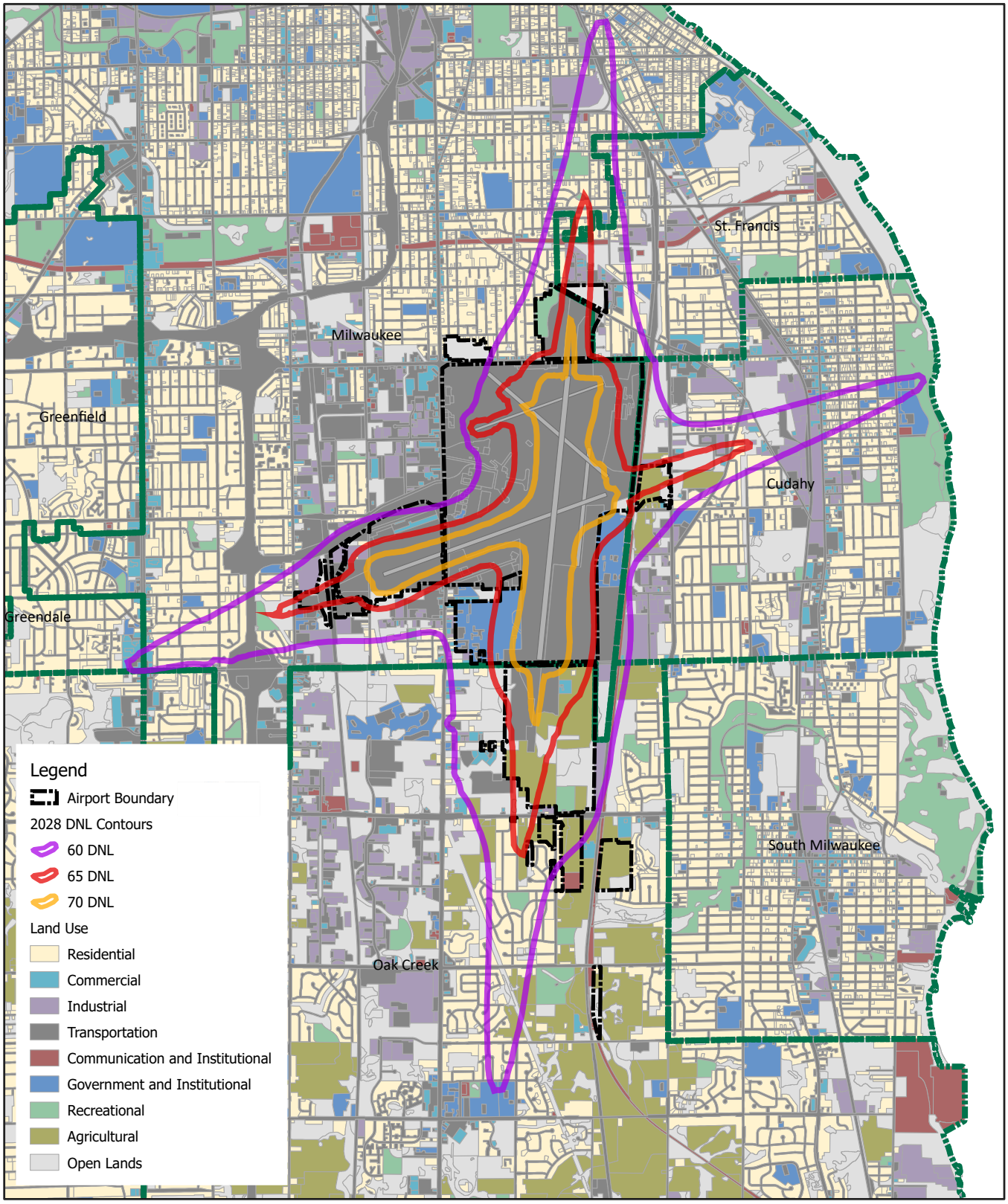

SOURCES: MAP: MILWAUKEE COUNTY GIS, 2003. MILWAUKEE COUNTY, DEC 2021 (AIRPORT PROPERTY). NOISE CONTOUR: BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-10

NORTH 0 5,000 ft

NO PROJECT 2028 DAY-NIGHT AVERAGE SOUND LEVEL NOISE CONTOURS

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TABLE 8-9 NO PROJECT CONDITIONS NOISE EXPOSURE SUMMARY – 2023 AND 2028

CATEGORY	NOISE LEVEL RANGE (DNL)		
	>60 dBA	>65 dBA	>70 dBA
2023			
Population Count (persons)	7,883	438	13
Housing (units)	3,515	190	6
Land Use (acres)			
Residential	520	9	0
Commercial	59	7	0
Industrial	165	16	0
Transportation	2,118	1,201	595
Communication and Institutional	32	4	0
Government and Institutional	184	60	6
Recreational	67	0	0
Agriculture	296	80	0
Open Lands	544	81	0
Water	0	0	0
Total Land Area (acres)	**3,985**	**1,458**	**601**
2028			
Population Count (persons)	9,965	631	21
Housing (units)	4,445	269	9
Land Use (acres)			
Residential	658	20	0
Commercial	71	7	0
Industrial	201	21	0
Transportation	2,249	1,284	648
Communication and Institutional	44	5	0
Government and Institutional	195	71	9
Recreational	73	0	0
Agriculture	337	100	1
Open Lands	601	110	1
Water	0	0	0
Total Land Area (acres)	**4,429**	**1,618**	**659**

NOTES:
dBA – A-Weighted Decibels
DNL – Day-Night Average Sound Level
Totals are subject to a rounding of +/- 1 acre or +/- 1 population count.
SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Design Tool, Version 3c, 2020; US Census Bureau, 2010.

TABLE 8-10 WITH PROJECT CONDITIONS RUNWAY USE – 2023 AND 2028

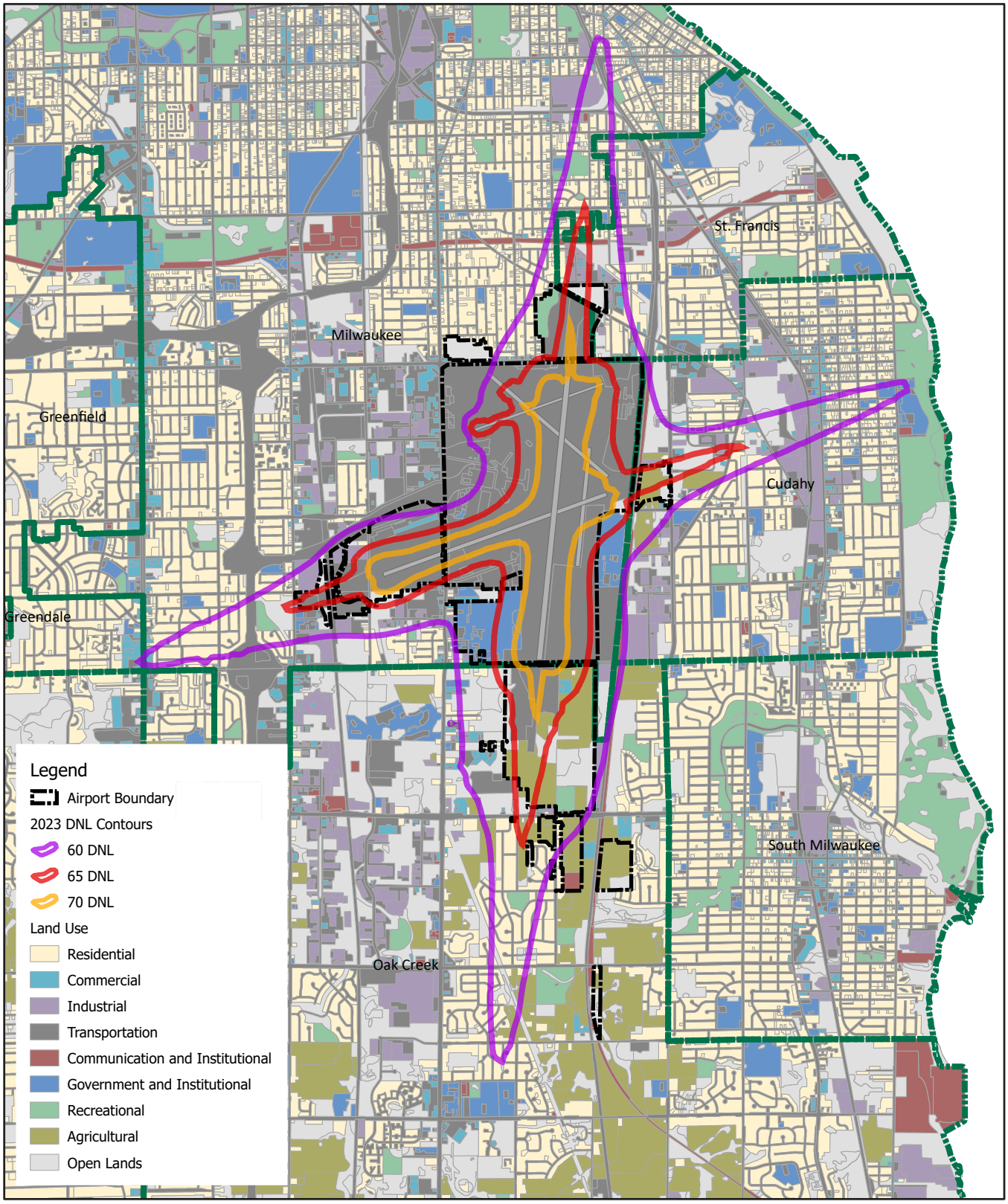
OPERATION	TIME OF DAY	CLASS	1L	19R	7R	25L	1R	19L	7L	25R	13	31
Arrivals	Day	Commercial Jets	24.0%	19.0%	20.0%	37.0%			0.0%	0.0%	0.0%	0.0%
Arrivals	Day	Business Jets	24.5%	18.1%	20.0%	36.2%			0.0%	0.1%	0.1%	1.0%
Arrivals	Day	Propeller	19.1%	16.8%	18.1%	24.4%			5.7%	12.7%	1.8%	1.4%
Arrivals	Night	Commercial Jets	42.0%	31.0%	8.0%	19.0%			0.0%	0.0%	0.0%	0.0%
Arrivals	Night	Business Jets	41.0%	26.0%	9.0%	23.0%			0.0%	0.0%	0.1%	0.9%
Arrivals	Night	Propeller	37.6%	23.1%	10.4%	23.1%			1.0%	3.4%	0.5%	0.9%
Departures	Day	Commercial Jets	24.0%	37.0%	19.0%	20.0%			0.0%	0.0%	0.0%	0.0%
Departures	Day	Business Jets	23.1%	44.5%	12.2%	16.2%			0.0%	0.0%	3.4%	0.6%
Departures	Day	Propeller	16.6%	21.8%	10.0%	26.8%			9.5%	10.6%	2.4%	2.3%
Departures	Night	Commercial Jets	33.0%	43.0%	10.0%	14.0%			0.0%	0.0%	0.0%	0.0%
Departures	Night	Business Jets	30.5%	50.6%	6.7%	10.1%			0.0%	0.1%	1.8%	0.2%
Departures	Night	Propeller	21.7%	14.8%	12.4%	44.5%			1.9%	3.4%	0.4%	0.9%

NOTES:
The aircraft categories consist of different types of aircraft sizes; these sizes are categorized as small, medium, and large, while other categories include "all" aircraft. This is based on the aircraft categories presented in Section 3, Aviation Activity Forecasts, of the Master Plan Update.
Totals and percentages are subject to a rounding of +/- 0.1 percent; a 0.0 percent cell indicates 0 operations.
Runway 1R-19L is assumed to be decommissioned by 2023.
SOURCE:BridgeNet International, 2021.

The With Project DNL 60, 65, and 70 dBA noise exposure contours for 2023 and 2028 are presented on **Exhibit 8-11** and **Exhibit 8-12**, respectively.

Table 8-11 summarizes the noise exposure effects for the 2023 and 2028 With Project conditions. When compared to the No Project conditions for the same future years, there is no visible change to the noise contour and no change to the population within the DNL 65 dBA or higher noise contour.

Of note, the population and overall land area affected by the DNL 65 dBA and higher noise levels change in the future in comparison to the 2018 noise exposure, which is a result of the forecast increase in jet operations each year. The noise levels for both future years are still significantly less than the historical noise levels, as shown by the 14 CFR Part 150 Study and Study Update DNL forecast noise contours for 2009.



SOURCES: MAP: MILWAUKEE COUNTY GIS, 2003. MILWAUKEE COUNTY, DEC 2021 (AIRPORT PROPERTY). NOISE CONTOUR: BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-11

NORTH 0 5,000 ft

WITH PROJECT 2023 DAY-NIGHT AVERAGE SOUND LEVEL NOISE CONTOURS

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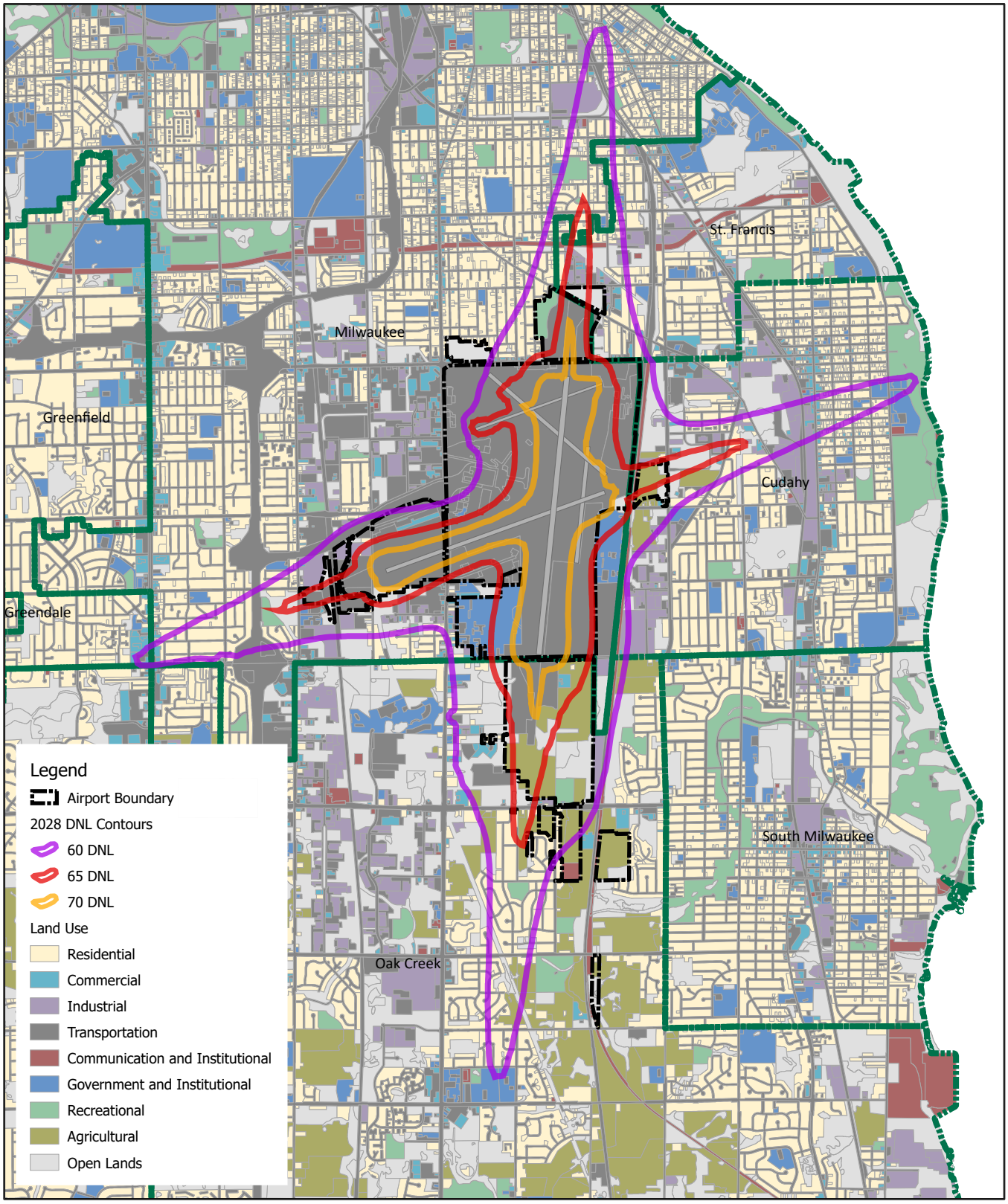

SOURCES: MAP: MILWAUKEE COUNTY GIS, 2003. MILWAUKEE COUNTY, DEC 2021 (AIRPORT PROPERTY). NOISE CONTOUR: BRIDGENET INTERNATIONAL, 2021

EXHIBIT 8-12

NORTH 0 5,000 ft

WITH PROJECT 2028 DAY-NIGHT AVERAGE SOUND LEVEL NOISE CONTOURS

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TABLE 8-11 WITH PROJECT CONDITIONS NOISE EXPOSURE SUMMARY – 2023 AND 2028

CATEGORY	NOISE LEVEL RANGE (DNL)		
	>60 dBA	>65 dBA	>70 dBA
2023			
Population Count (persons)	7,883	438	13
Housing (units)	3,515	190	6
Land Use (acres)			
Residential	520	9	0
Commercial	59	7	0
Industrial	165	16	0
Transportation	2,118	1,201	595
Communication and Institutional	32	4	0
Government and Institutional	184	60	6
Recreational	67	0	0
Agriculture	296	80	0
Open Lands	544	81	0
Water	0	0	0
Total Land Area (acres)	**5**	**1,458**	**601**
2028			
Population Count (persons)	9,965	631	21
Housing (units)	4,443	269	9
Land Use (acres)			
Residential	658	20	0
Commercial	71	7	0
Industrial	201	21	0
Transportation	2,249	1,284	648
Communication and Institutional	44	5	0
Government and Institutional	195	71	9
Recreational	73	0	0
Agriculture	337	100	1
Open Lands	601	110	1
Water	0	0	0
Total Land Area (acres)	**4,429**	**1,618**	**659**

NOTES:
dBA – A-Weighted Decibels
DNL – Day-Night Average Sound Level
Totals were subject to a rounding of +/- 1 acre or +/- 1 population count.
SOURCES: US Department of Transportation, Federal Aviation Administration, Aviation Environmental Design Tool, Version 3c, 2020; US Census Bureau, 2010.

8.14 SUMMARY

This analysis considered the noise exposure levels related to aircraft sources for existing conditions in 2018 and for future years (2023 and 2028) for the With Project and No Project conditions. The existing conditions aircraft noise contours encompass residences near the Airport, and some residential units are within the DNL 65 dBA and higher contour. However, all these units are within the Airport's Noise Insulation Boundary.

According to Table 8-1, DNL 65 dBA is the threshold to determine land use compatibility for noise-sensitive land uses (e.g., residences, schools, places of worship). In general, commercial, industrial, and outdoor recreation land uses are compatible with aircraft noise. The forecast assessment indicates 438 and 631 people will be exposed to DNL 65 dBA and higher levels for 2023 and 2028, respectively. The number of people exposed to this level would be the same for the No Project and With Project conditions; therefore, implementing the MPU's preferred alternative is not expected to change aircraft noise exposure levels compared to not implementing the alternative.