4.7 Noise

This section analyzes the proposed Project's impacts related to noise, including impacts from both construction and operational activities. The noise analysis evaluates the impacts of the proposed Project on noise-sensitive receptors located near the Project site.

This section is organized into three subsections to provide detailed discussions of the primary noise types or sources associated with the proposed Project: Aircraft Noise, Roadway Traffic Noise, and Construction Traffic and Equipment Noise and Vibration. The general characteristics of noise and the metrics used to measure sound, which are presented in Section 4.7.1 below, are common to the noise discussion in each subsection.

4.7.1 Aircraft Noise

4.7.1.1 Introduction

This subsection analyzes the proposed Project's impacts related to aircraft noise, including the impacts of the proposed Project on noise-sensitive receptors. The analysis is based on noise modeling completed by HMMH, with the methodology and technical assumptions provided within **Appendix F.1** of this EIR. This subsection describes the general characteristics of noise, the impact evaluation methodology, the existing conditions (regulatory framework and existing noise conditions), the thresholds of significance, and the potential aircraft noise impacts associated with the proposed Project.

4.7.1.1.1 General Characteristics of Noise

In order to understand results from a noise analysis, it is important to establish a foundation in the basics of sound and metrics used to measure it. This section describes the physics of sound, the methods used to measure sound level and impact, and the effects of noise on humans.

Sound, when transmitted through the air and upon reaching our ears, may be perceived as desirable or unwanted. People normally refer to unwanted sound as noise. The response to sound is subjective; individuals have different perceptions, sensitivities, and reactions to noise. Loud sounds may bother some people, while others may be bothered by certain rhythms or frequencies of sound. Sounds that occur during sleeping hours are usually considered to be more objectionable than those that occur during waking hours and hours of activity (typically daytime).

Aircraft noise originates from both the engines and the airframe of an aircraft, but the engines are typically the more significant source of noise.[1] Motor vehicle noise, such as that associated with cars and trucks moving along a roadway, originates primarily from a combination of the engine, drivetrain (i.e., transmission, rear and/or front differentials), tires interacting with the road surface, and aerodynamic flow around the vehicle. Construction noise originates from a combination of the engines and drivetrains of construction equipment and the specific activity being undertaken.

Meteorological conditions affect the transmission of sound through the air. Wind speed and direction, and the temperature immediately above ground level, cause diffraction[2] and displacement of sound

1 Airframe noise is generated when airflow becomes more turbulent from structures that extend from an aircraft, such as wing flaps and landing gear. Airframe noise can also be generated as air flows past cutouts and cavities, such as uncovered wheel wells. Airframe noise is particularly noticeable on approach, when engine noise is relatively low; the opposite occurs relative to aircraft departures when engine noise is greater. At LAX, aircraft departures are primarily over open water and aircraft arrivals are primarily over developed land. As such, noise-sensitive receptors around LAX are affected primarily by arrivals, with aircraft airframes being the main source of noise.

2 Diffraction is the change in the directions and intensities of a group of waves after passing by an obstacle or through an aperture whose size is approximately the same as the wavelength of the waves.

waves. Humidity and temperature materially affect the transmission of air-to-ground sound through absorption associated with the instability and viscosity of the air.[3]

4.7.1.1.2 Noise Descriptors

Noise levels are measured using a variety of scientific metrics. As a result of extensive research into the characteristics of noise and human response to that noise, standard noise descriptors have been developed for noise exposure analyses. The descriptors used in this noise analysis are described below.

A-Weighted Sound Pressure Level (dBA)

The decibel (dB) is a unit used to describe sound pressure level. When expressed in dBA, the sound has been filtered to reduce the effect of very low and very high frequency sounds, much as the human ear filters sound frequencies. Without this filtering, calculated and measured sound levels would include events that the human ear cannot hear (e.g., dog whistles and low frequency sounds, such as the groaning sounds emanating from large buildings with changes in temperature and wind). With A-weighting, calculations and sound monitoring equipment approximate the sensitivity of the human ear to sounds of different frequencies.

Some common sounds on the dBA scale are listed in **Table 4.7.1-1**. As shown in Table 4.7.1-1, the relative perceived loudness of a sound doubles for each increase of 10 dBA, and a 10 dBA change in the sound level corresponds to a factor of 10 increase or decrease in relative sound energy.

Table 4.7.1-1
Common Sounds on the A-Weighted Decibel Scale

Sound	Sound Level (dBA)	Relative Loudness (Approximate)	Relative Sound Energy
Rock music, with amplifier	120	64	1,000,000
Thunder, snowmobile (operator)	110	32	100,000
Boiler shop, power mower	100	16	10,000
Orchestral crescendo at 25 feet, noisy kitchen	90	8	1,000
Busy street	80	4	100
Interior of department store	70	2	10
Ordinary conversation, 3 feet away	60	1	1
Quiet automobiles at low speed	50	1/2	.1
Average office	40	1/4	.01
City residence	30	1/8	.001
Quiet country residence	20	1/16	.0001
Rustle of leaves	10	1/32	.00001
Threshold of hearing	0	1/64	.000001

Source: U.S. Department of Housing and Urban Development, *Aircraft Noise Impact--Planning Guidelines for Local Agencies*, Figure 2-2. 1972.

In general, humans find a change in sound level of 3 dBA is just noticeable; a change of 5 dBA is clearly noticeable; and a change of 10 dBA is perceived as a doubling or halving of sound level. Because of the logarithmic scale of the decibel unit, sound levels generally cannot be added or subtracted arithmetically. Two sounds of equal physical intensity will result in the sound level increasing by 3 dB, regardless of the

[3] In Southern California, temperature inversions can occur frequently. Temperature inversion occurs when the air temperature increases as altitude increases, which can have the effect of increasing the sound heard by a receiver at ground level.

initial sound level. For example, 60 dBA plus 60 dBA equals 63 dB, and 80 dBA plus 80 dBA equals 83 dB. However, where ambient noise levels are high in comparison to a new noise source, there will be a small change in noise levels. For example, when 70 dBA ambient noise levels are combined with a 60 dBA noise source, the resulting noise level equals 70.4 dB.

Maximum Noise Level (L_{max})

L_{max} is the maximum or peak sound level during a noise event. The metric accounts only for the instantaneous peak intensity of the sound, and not for the duration of the event. As a vehicle or aircraft passes by an observer, the sound level increases to a maximum level and then decreases. Some sound level meters measure and record the maximum or L_{max} level.

Single Event Noise Exposure Level (SENEL) and Sound Exposure Level (SEL)

One metric that is often reported for aircraft flyovers is the Single Event Noise Exposure Level (SENEL). This metric is essentially equivalent to the Sound Exposure Level (SEL). SEL, expressed in dBA, is a time integrated measure, expressed in decibels, of the sound energy of a single noise event at a reference duration of one second. The sound level is integrated over the period that the level exceeds a threshold. Therefore, SEL accounts for both the maximum sound level and the duration of the sound. The standardization of discrete noise events into a one-second duration allows calculation of the cumulative noise exposure of a series of noise events that occur over a period of time. Because of this compression of sound energy, the SEL of an aircraft noise event is typically 7 to 12 dBA greater than the L_{max} of the event. SELs for aircraft noise events depend on the location of the aircraft relative to the noise receptor, the type of operation (landing, takeoff, or overflight), and the type of aircraft. The SEL concept is depicted in **Figure 4.7.1-1.**

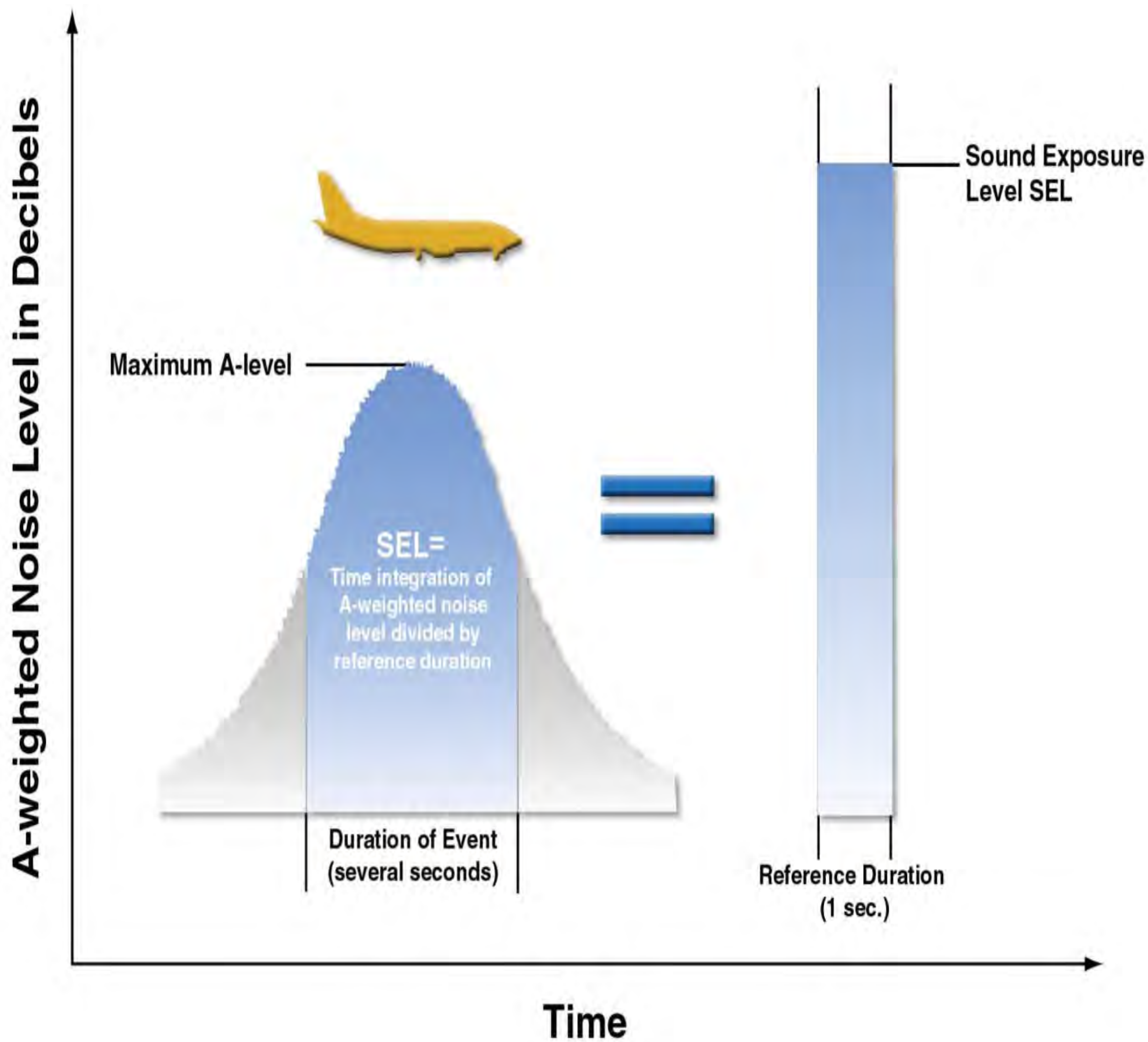
Equivalent Continuous Noise Level (L_{eq})

L_{eq} is the sound level, expressed in dBA, of a steady sound that has the same A-weighted sound energy as the time-varying sound over the averaging period. Unlike SEL, L_{eq} is the average sound level for a specified time period (e.g., 24 hours, 8 hours, 1 hour, etc.). L_{eq} is calculated by integrating the sound energy from all noise events over a given time period and applying a factor for the number of events. L_{eq} can be expressed for any time interval; for example, the L_{eq} representing an averaged level over an 8-hour period would be expressed as $L_{eq}(8)$. L_{eq} hourly measurements are used to develop Community Noise Equivalent Level (CNEL) values (described later in the section).

Day-Night Average Sound Level (DNL)

DNL, formerly referred to as L_{dn}, is expressed in dBA and represents the noise level over a 24-hour period. Because environmental noise fluctuates over time, DNL was devised to relate noise exposure over time to human response. DNL is a 24-hour average of the hourly L_{eq}, but with penalties to account for the increased sensitivity to noise events that occur during the more noise-sensitive nighttime periods. Specifically, DNL penalizes noise 10 dBA during the nighttime time period (10:00 p.m. to 7:00 a.m.), but it does not include an evening penalty (7:00 p.m. to 10:00 p.m.).

The U.S. Environmental Protection Agency (USEPA) introduced the metric in 1976 as a single number measurement of community noise exposure. The Federal Aviation Administration (FAA) adopted DNL as the noise metric for measuring cumulative aircraft noise under Federal Aviation Regulations (FAR) Part 150, *Airport Noise Compatibility Planning*. The Department of Housing and Urban Development, the Veterans Administration, the Department of Defense, the United States Coast Guard, and the Federal Transit Administration have also adopted DNL for measuring cumulative noise exposure.



Source: Brown-Buntin Associates, Inc., November 2004
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project	Sound Exposure Level Concept	Figure 4.7.1-1

DNL, which is the noise metric used to represent cumulative noise exposure for most airports in the U.S. outside of California, is used to describe existing and predicted noise exposure in communities in airport environs based on the average daily operations during the year and the average annual operational conditions at an airport. Therefore, at a specific location near an airport, the noise exposure on a particular day is likely to be higher or lower than the annual average noise exposure, depending on the specific operations at an airport on that day. DNL is widely accepted as the best available method to describe aircraft noise exposure and is the noise descriptor required for aircraft noise exposure analyses and land use compatibility planning under FAR Part 150 and for environmental assessments for airport improvement projects (FAA Order 1050.1F).[4] The FAA guidelines allow for the use of CNEL as a substitute to DNL, as further discussed below.

Community Noise Equivalent Level (CNEL)

CNEL, expressed in dBA, is the standard metric used in California to represent cumulative noise exposure. Similar to DNL, CNEL provides a single-number description of the sound energy to which a person or community is exposed over a period of 24 hours from all noise sources. CNEL includes penalties applied to noise events occurring after 7:00 p.m. and before 7:00 a.m., when noise is considered more intrusive (due to the types of activities that are likely to be affected, including sleep). CNEL also accounts for the typically lower ambient noise levels during these hours. The penalized time period is further subdivided into evening (7:00 p.m. through 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.). When a noise event occurs in the evening, a penalty of 4.77 dBA is added to the nominal sound level (equivalent to a three-fold increase in aircraft operations). A 10-dBA penalty is added to nighttime noise events (equivalent to a ten-fold increase in aircraft operations).

Examples of typical outdoor noise levels measured in terms of CNEL decibel levels include wilderness areas at approximately 35 CNEL, rural residential areas at approximately 40 to 50 CNEL, suburban areas at approximately 60 CNEL, high-density development areas at approximately 70 CNEL, and development adjacent to a major freeway at approximately 85 CNEL.

The CNEL metric used for this aircraft noise analysis is based on an Average Annual Day (AAD) of aircraft operations, generally derived from data for a calendar year. An AAD activity profile is computed by adding all aircraft operations occurring during the course of a year and dividing the result by 365. As such, AAD does not reflect activities on any one specific day, but represents average conditions as they occur during the course of the year.

The evening weighting is the only difference between CNEL and DNL. Typically, DNL is about 1 dBA lower than CNEL, although the difference may be greater if there is an atypical concentration of noise events in the 7:00 p.m. to 10:00 p.m. time period. For purposes of aircraft noise analysis in the State of California, the FAA recognizes the use of CNEL. CNEL is also specified for use in the California Airport Noise Regulations (discussed in Section 4.7.1.3.1 below) and is used by the City of Los Angeles in its General Plan Noise Element for land use compatibility planning.

Time Above (TA)

TA measures the amount of time (in minutes) a source emits a noise that exceeds a designated threshold level. For instance, the threshold could be outdoor speech interference. TA is therefore both a single event and a cumulative noise metric.

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[4] U.S. Department of Transportation, Federal Aviation Administration, *Order 1050.1F, Environmental Impacts: Policies and Procedures*, July 16, 2015. Available: https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf.

4.7.1.1.3 Effects of Noise on Humans

Noise, often described as unwanted sound, is known to have several adverse effects on humans. These noise effects may include hearing loss (not a factor with typical community noise), communication interference, sleep interference, physiological responses, and annoyance. Many of the impacts described in this section are described in greater detail in the *Airport Cooperative Research Program's ACRP Synthesis 9, Effects of Aircraft Noise: Research Update on Selected Topics*,[5] published in 2008. Each of these potential noise impacts are briefly discussed below.

Hearing Loss

Hearing loss is generally not a concern in community noise problems, even very near a major airport or a major freeway. Environmental noise does not have an effect on hearing threshold levels due, in large part, to the fact that environmental noise does not approximate occupational noise exposures found in heavy industry, very noisy work environments with long-term exposure, or certain very loud recreational activities such as target shooting, motorcycle or automobile racing, etc. The Occupational Safety and Health Administration (OSHA) identifies a noise exposure limit of 90 dBA for 8 hours per day to protect from hearing loss (higher limits are allowed for shorter duration exposures). Noise levels in neighborhoods, even in very noisy neighborhoods, are not sufficiently loud to cause hearing loss.

Communication Interference

Communication Interference includes speech interference and interference with activities such as watching television. Normal conversational speech is in the range of 60 to 65 dBA and any noise in this range or louder may interfere with speech.

Sleep Disturbance

Sleep Disturbance is one of the causes of annoyance due to noise. Noise can make it difficult to fall asleep, create momentary disturbances of natural sleep patterns by causing shifts from deep to lighter sleep stages, and cause awakenings, which a person may or may not be able to recall.

The following provides an overview of research and studies that have been completed relative to noise-related sleep disturbance.

Extensive research has been conducted on the effect of noise on sleep disturbance. Some years ago (1981), the National Association of Noise Control Officials published data on the probability of sleep disturbance with various single event noise levels.[6] Based on laboratory experiments conducted in the 1970s, these data indicated noise exposure at 75 dBA interior noise level event could cause noise-induced awakening in 30 percent of the cases.

However, later research from the United Kingdom[7,8] has shown that the probability for sleep disturbance is less than what had been reported in earlier research. These field studies were conducted during the 1990s and used more sophisticated data collection techniques. The field studies indicated that awakenings can be expected at a much lower rate than had been expected based on earlier laboratory studies. This research showed that, once a person was asleep, it was much more unlikely that they would be awakened by a noise. The significant difference in the more recent study is the use of actual in-home

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5 Transportation Research Board of the National Academies, Airport Cooperative Research Program, *ACRP Synthesis 9, Effects of Aircraft Noise: Research Update on Selected Topics*, 2008.

6 National Association of Noise Control Officials, *Noise Effects Handbook*. 1981. Available: http://www.nonoise.org/library/handbook/handbook.htm.

7 Department of Transport [United Kingdom], Department of Safety, Environment and Engineering Civil Aviation Authority, *Report of a Field Study of Aircraft Noise and Sleep Disturbance,* December 1992.

8 Horne J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond, "A Field Study of Sleep Disturbance: Effects of Aircraft Noise and Other Factors on 5,742 Nights of Actimetrically Monitored Sleep in a Large Subject Sample," *Sleep*, 1994 Mar; 17(2):146-59.

sleep disturbance patterns as opposed to laboratory data that had been the historic basis for predicting sleep disturbance. Some of this research has been criticized, because it was conducted in areas where subjects had become habituated to aircraft noise. On the other hand, some of the earlier laboratory sleep studies were criticized, because of the extremely small sample sizes of most laboratory studies and because the laboratory was not necessarily a representative sleep environment. A 1994 sleep study compared the various causes of sleep disturbance using in-home sleep studies. This field study assessed the effects of nighttime aircraft noise on sleep in 400 people (211 women and 189 men, 20-70 years of age, one per household) habitually living at eight sites adjacent to four United Kingdom airports, with different levels of night flying. The main findings were that only a minority of aircraft noise events affected sleep, and, for most subjects, domestic and other non-aircraft factors had much greater effects. As shown in **Figure 4.7.1-2**, aircraft noise was a minor contributor among a host of other factors that lead to awakening response.

The U.S. Federal Interagency Committee on Noise (FICON), in a 1992 document entitled *Federal Interagency Review of Selected Airport Noise Analysis Issues,*[9] recommended an interim dose-response curve for sleep disturbance based on laboratory studies of sleep disturbance. In June 1997, the Federal Interagency Committee on Aviation Noise (FICAN) updated the FICON recommendation with an updated graph/curve (equating SEL to probability of awakening) based on more recent in-home sleep disturbance studies, which showed lower rates of awakening compared to the laboratory studies.[10] The FICAN recommended a curve based on the upper limit of the data presented and, therefore, considered the curve to represent the "maximum percent of the exposed population expected to be behaviorally awakened," or the "maximum awakened." The FICAN recommendation is shown in **Figure 4.7.1-3.** This is a very conservative approach. A more common statistical curve for the data points reflected in Figure 4.7.1-3, for example, would indicate a 10 percent awakening rate at a level of approximately 100 dBA SEL, while the "maximum awakened" curve reflected in Figure 4.7.1-3 shows the 10 percent awakening rate being reached at 80 dBA SEL.

In 2008, FICAN modified its recommendations to include a more recent procedure developed by the American National Standards Institute (ANSI) (ANSI S12.9-2008) for estimating awakenings from nighttime noise, which showed that significantly higher noise levels are required for a population habituated to nighttime noise.[11] The ANSI standard provided a method to predict sleep disturbance in home settings where people are familiar with the neighborhood noise environment; specifically, the probability of awakening at least once to the sound from distributions of single noise events over the course of a whole night. That relationship is shown in **Figure 4.7.1-4**. However, this curve is still considered conservative in that it does not include the cases in which no awakenings were observed in certain noise exposure intervals. These cases include three in the Denver field studies, in which no awakenings were observed in 3 dB-wide sound exposure level (LAE) intervals centered at 91, 94, and 97 dB. Given exclusion of these data points, the probability of awakening at a specific SEL level may be less than the values shown in Figure 4.7.1-4. In addition, the FICAN analysis does not account for combined multiple events, because the dose-response curve does not take into account the number of events. A standard to evaluate the impact of combined multiple events has not been established.

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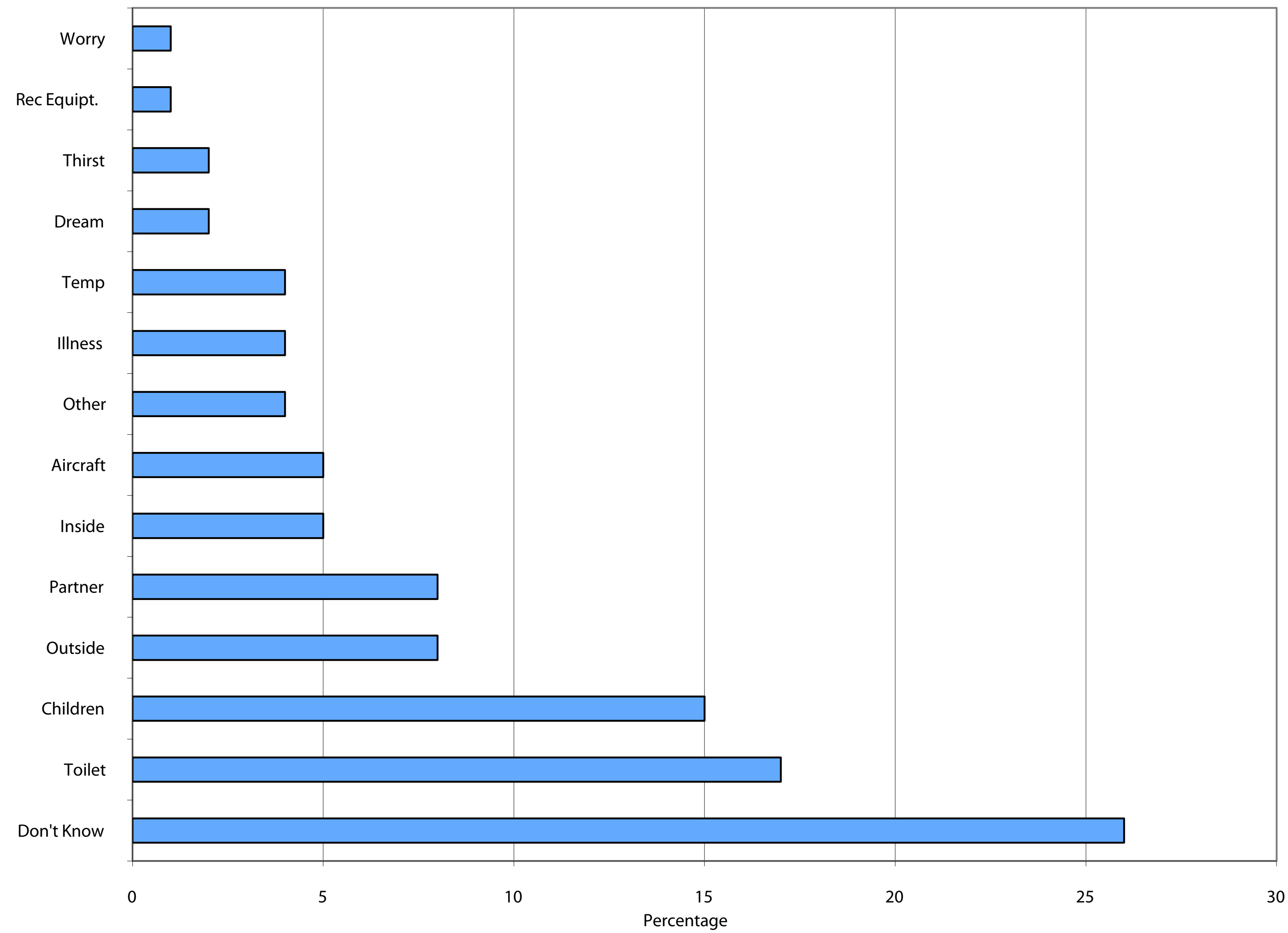
9 Federal Interagency Committee on Noise (FICON), *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992. Available: http://gsweventcenter.com/Draft_SEIR_References/1992_08_Federal_Interagency_Committee_on_Noise.pdf.

10 Federal Interagency Committee on Aircraft Noise (FICAN), *Effects of Aviation Noise on Awakenings from Sleep*, June 1997. Available: https://fican1.files.wordpress.com/2015/10/findings_awakenings_1997.pdf.

11 American National Standards Institute (ANSI), *Quantities and Procedures for Description and Measurement of Environmental Sound -- Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes*, ANSI S12.9-2008/Part 6, 2008.

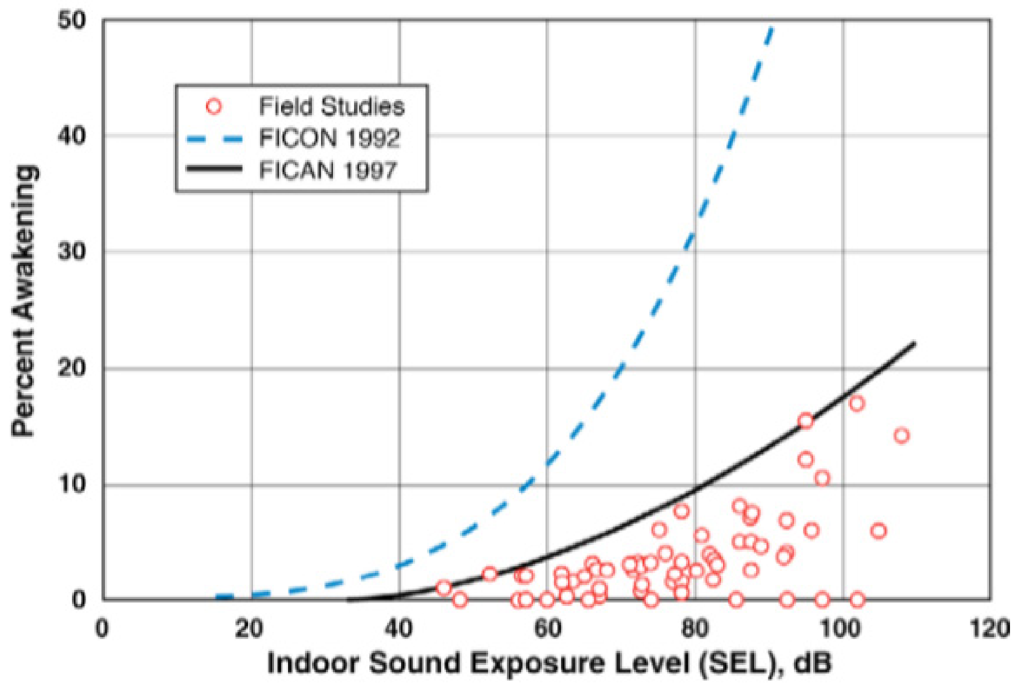
Cause of Reported Awakening



Source: Horne J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond, "A Field Study of Sleep Disturbance: Effects of Aircraft Noise and Other Factors on 5,742 Nights of Actimetrically Monitored Sleep in a Large Subject Sample," Sleep, 1994 Mar; 17(2):146-59, Figure 9

Prepared by: CDM Smith, October 2020

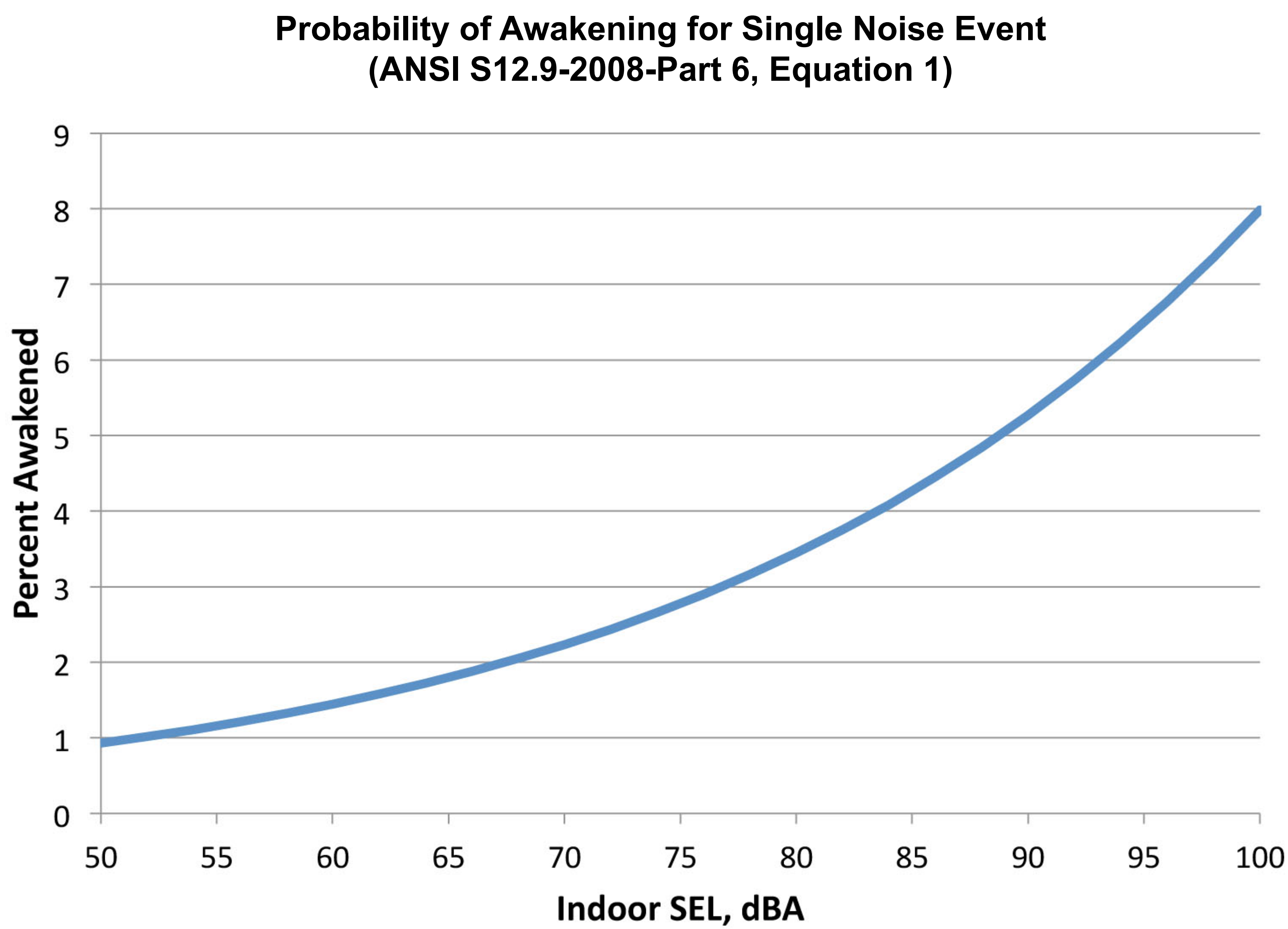
LAX Airfield and Terminal Modernization Project	Causes and Prevalence of All Awakenings	Figure **4.7.1-2**



Source: Federal Interagency Committee on Aircraft Noise (FICAN).
Effects of Aviation Noise on Awakenings from Sleep, June 1997

Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project	FICAN Recommended Sleep Disturbance Curve	Figure **4.7.1-3**



Source: ANSI S12.9-2008/Part 6, Figure B.1
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project	ANSI Equation 1 Showing Percent of Population Awakened as a Function of Indoor Sound Exposure Level	Figure **4.7.1-4**

ANSI S12.9-2008 was withdrawn by the Acoustical Society of America (ASA) in 2018. The review committee concluded that it did not usefully predict transportation-noise-induced sleep disturbance for the following reasons:

- It was based on analysis of a relatively small amount of non-representative information about noise-induced sleep disturbance
- Its predictions of probabilities of "at least one awakening per night" cannot be generalized from one airport to another
- The predicted quantity ("at least one awakening per night") did not usefully distinguish degrees of sleep disturbance among preferred and alternate project actions
- Due to lack of cautions in the language of the Standard, its methods were readily misapplied, and its predictions of "at least one awakening per night" were easily over-interpreted
- The standard attempted to characterize an intuitively appealing form of objectively measured sleep disturbance but, in so doing, it failed to acknowledge the many complexities that impact sleep and other forms of sleep disturbance that are known to be sensitive to nighttime noise exposure
- The standard did not quantitatively address the roles of familiarity with noise sources and habituation to noise exposure as determinants of sleep disturbance

The ASA concluded that the method for calculating "at least one behavioral awakening per night" contained in the former ANSI Standard should no longer be relied upon for environmental impact assessment purposes.[12]

The FAA has initiated a research study to collect representative information on the effects of aircraft noise on sleep. This data will help the FAA update sleep standards. The study is expected to take approximately two years to complete, and the FAA is currently assessing comments received on what should be included in the study (the FAA closed the comment period on January 27, 2020).[13] Following completion of the study, it is anticipated that the FAA will consider the findings of the study relative to any potential updates to, or validation of, the national aviation noise policy.

With regard to addressing potential sleep disturbance impacts within this EIR, the above overview of various studies demonstrates that there has been, and still is, considerable debate within the scientific community and a lack of concurrence regarding the relationship between aircraft noise and sleep disturbance, especially as related to determining a definitive noise dose and the response relationship for sleep disturbance. Thus, even if noise events are measured using supplemental metrics (e.g., SEL, L_{max}, TA, etc.), there is no scientific concurrence on the appropriate "threshold" to compare such measurements against, when it comes to sleep disturbance. Additionally, there is presently no applicable regulatory agency that has established standards specific to sleep disturbance impacts for the purpose of the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), or any other environmental compliance/assessment law. However, both the DNL noise metric and the CNEL noise metric, described above in Section 4.7.1.1.2, incorporate noise "penalties" to account for the increased sensitivity to noise events that occur during the more noise-sensitive nighttime periods such as when most sleeping typically occurs. There are established standards/thresholds that utilize DNL and CNEL as the accepted noise metric in evaluating noise impacts in environmental review documents, such as those under CEQA and NEPA. As described below in Section 4.7.1.4, CNEL is the noise metric used in determining

[12] Acoustical Society of America, *Rationale for Withdrawing ANSI/ASA S12.9-2008/Part 6 (A Technical Report prepared by ANSI-Accredited Standards Committee S12 and registered with ANSI),* July 22, 2018.

[13] U.S. Department of Transportation, Federal Aviation Administration, *Agency Information Collection Activities: Request for Comments; Clearance of a New Approval of Information Collection: National Sleep Study*, 84 Fed. Reg. 65453, November 27, 2019. Available: https://www.federalregister.gov/documents/2019/11/27/2019-25714/agency-information-collection-activities-requests-for-comments-clearance-of-a-new-approval-of.

the significance of aircraft noise impacts associated with the proposed Project. In the absence of any other accepted standards for sleep disturbance, for purposes of this EIR, LAWA uses the CNEL metric to address the potential for sleep disturbance impacts due to its application of penalties to noise events occurring during typical sleep hours.

Physiological Responses

Physiological responses are those measurable effects of noise on people that are realized as changes in pulse rate, blood pressure, etc. Although such effects can be induced and observed, the extent is not known to which these physiological responses cause harm or are a sign of harm. Generally, physiological responses are a reaction to a loud, short-term noise such as a rifle shot or a very loud jet overflight.

Health effects from noise have been studied around the world for over 30 years. Scientists have attempted to determine whether high noise levels can adversely affect human health apart from auditory damage. These research efforts have covered a broad range of potential impacts, from cardiovascular response to fetal weight to mortality. Although a relationship between noise and health effects seems plausible, it has yet to be convincingly demonstrated – that is, shown in a manner that can be repeated by other researchers while yielding similar results.

Although annoyance and sleep/speech interference have been acknowledged, health effects from noise, if they exist, are associated with a wide variety of other environmental stressors. Isolating the effects of aircraft noise alone as a source of long-term physiological change has proved to be nearly impossible. In a review of 30 studies conducted worldwide between 1993 and 1998,[14] a team of international researchers concluded that, while some findings suggest that noise can affect health, improved research concepts and methods are needed to verify or discredit such a relationship. The team of international researchers called for more study of the numerous environmental and behavioral factors than can confound, mediate, or moderate survey findings. Until science refines the research process, a direct link between aircraft noise exposure and non-auditory health effects remains to be demonstrated. Studies by Eriksson[15] and Jarup (HYENA Study)[16] have reported higher rates of hypertension with increasing aircraft noise levels. The HYENA Study identified that the effect occurred only for nighttime aircraft noise. In a 2010 journal article, Fidell, et al., reviewed the current science on predicting sleep disturbance and its effects and concluded:

> Epidemiological evidence does not yet support either reliable prediction of noise-induced sleep disturbance, or well-informed policy debate, much less a plausible technical rationale for regulatory action. The practical, population-level implications of noise-induced sleep disturbance and its consequences remain poorly understood due to design and other limitations of field studies of noise-induced sleep disturbance already undertaken, and to limitations of the statistical analyses performed to date. Published relationships used to assess the probability or prevalence of noise-induced awakening remain highly uncertain and unhelpfully imprecise. Considerable caution must be exercised in extrapolating conclusions about sleep disturbance that have been inferred from the behavior of relatively small and purposive samples of people living near a few airports to wider populations.[17]

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[14] Lercher P., Stansfeld, S.A., Thompson, S.J., "Non-Auditory Health Effects of Noise; Review of the 1993-1998 Period," *Noise Effects-98 Conference Proceedings*, p. 213, November 1998.

[15] Eriksson C., Rosenlund, M., Pershagen, G., et al., "Aircraft Noise and Incidence of Hypertension," *Epidemiology*, Volume 18, Number 6, p. 716-721, November 2007.

[16] Jarup L., Babisch W., Houthuijs D., et al. "Hypertension and Exposure to Noise Near Airports: the HYENA Study," *Environmental Health Perspectives*, Volume 116, Number 3, p. 320-333, March 2008. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2265027/.

[17] Fidell S., Tabachnick, B., Peasons, K., "The State of the Art of Predicting Noise-Induced Sleep Disturbance in Field Settings," *Noise and Health*, Volume 12, Issue 47, p. 77-87, 2010.

In 2008, the ACRP, a part of the National Academies, published a synthesis on the effects of aircraft noise and concluded, "Despite decades of research, including review of old data and new research efforts, health effects of aviation noise continue to be an enigma. Most, if not all, current research concludes that it is yet impossible to determine causal relations between health disorders and noise exposure, despite well-founded hypotheses."[18]

In October 2013, two studies on cardiovascular disease associated with aircraft noise were published in the British Medical Journal. The first was done in the United Kingdom around Heathrow Airport in London, and the second was done in the United States as part of a multi-airport retrospective study led by researchers from Boston University and the Harvard School of Public Health as part of the Partnership for Air Transportation Noise and Emissions Reduction (PARTNER) program sponsored by the FAA. The U.S. study focused on Medicare patients, and the British study was based on the total population living around Heathrow. Both studies identified a correlation linking noise to cardiovascular disease, but due to limitations in the studies and the potential for alternative explanations of casual associations, both studies recommended that further research be done to better understand and strengthen the causal interpretation of the relationship between aircraft noise and cardiovascular disease. Neither study provided a definitive noise dose and response relationship that defines at what noise level cardiovascular health effects start and the rate of increase in response as noise level increases.[19]

With regard to addressing noise-related physiological effects within this EIR, the aforementioned British and U.S. studies provide some information linking noise to cardiovascular disease but, as noted above, still fall short of providing the definitive noise dose and the response relationship. There is presently no applicable regulatory agency that has established standards specific to physiological response for the purpose of CEQA, NEPA, or any other environmental compliance/assessment law. The absence of such regulations can be attributed, at least in part, to the uncertainty of the science.

Section 15145 of the State CEQA Guidelines directs lead agencies who find a particular impact too speculative after a thorough investigation to note this conclusion and terminate discussion of the impact. The discussion above shows that, at this time, the effects of noise on health are too speculative for further evaluation in this CEQA document.

Annoyance

Annoyance is the most difficult of all noise responses to describe. Annoyance is an individual characteristic and can vary widely from person to person. What one person considers tolerable can be quite unbearable to another of equal hearing capability. The level of annoyance, of course, depends on the characteristics of the noise (i.e., loudness, frequency, time, and duration), and how much activity interference (e.g., speech interference and sleep interference) results from the noise. However, the level of annoyance is also a function of the attitude of the receiver. Personal sensitivity to noise varies widely. It has been estimated that 2 to 10 percent of the population is highly susceptible to annoyance from any noise not of their own making, while approximately 20 percent are unaffected by noise. Attitudes are affected by the relationship between the person and the noise source (e.g., is it our dog barking or the neighbor's dog?). Whether one believes that someone is trying to abate the noise will also affect their level of annoyance.

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18 Transportation Research Board of the National Academies, Airport Cooperative Research Program, *ACRP Synthesis 9, Effects of Aircraft Noise: Research Update on Selected Topics,* 2008.

19 County of Orange, *Draft Environmental Impact Report No. 617, John Wayne Airport Settlement Agreement Amendment*, (SCH 2001111135), Appendix C - Noise Analysis Technical Report, April 2014.

There is no current research to suggest that there is a better metric than DNL to relate noise to annoyance levels. **Figure 4.7.1-5** relates DNL noise levels to community response from two surveys. One of the survey curves presented in Figure 4.7.1-5 is the well-known Schultz Curve. It displays the percent of a populace that can be expected to be annoyed by various DNL values for residential land use with outdoor activity areas. At 65 DNL, the Schultz Curve predicts approximately 14 percent of the exposed population reporting themselves to be "highly annoyed." At 60 DNL, this decreases to approximately 8 percent of the population.

As shown in Figure 4.7.1-5, the data used to develop the Schultz Curve (and recent updates) have a very wide range of scatter, with communities near some airports reporting much higher percentages of population highly annoyed at these noise exposure levels. For example, under contract to the FAA, Bolt Beranek & Newman conducted community attitude surveys in the residential areas south of John Wayne Airport in Orange County in 1981 as part of a study of possible "power cutback" departure procedures. That study concluded that the surveyed population had more highly annoyed individuals at various noise levels than would be predicted by the Schultz Curve. When plotted similar to the Schultz Curve, this survey indicated the populations in these areas were approximately 5 dBA more sensitive to noise than the average population predicted by the Schultz Curve. Although the precise reasons for this increased noise sensitivity were not identified, it is possible that non-acoustic factors, including political or the socio-economic status of the surveyed population, may have played an important role in increasing the sensitivity of this community during the period of the survey. Annoyance levels have never been correlated statistically to single event noise exposure levels in airport-related studies.

4.7.1.2 Methodology

4.7.1.2.1 Aircraft Noise Modeling

The methodology for analyzing noise from aircraft follows a generally accepted process that includes the application of a computer model to estimate noise levels associated with a project, and comparison of the results to noise levels of existing baseline conditions in 2018. Modeled aircraft CNEL noise exposure maps are used as planning tools to allow the comparison of different scenarios of operations over a broad geographical area. The aircraft noise modeling analysis methodology outlined in FAR Part 150, *Airport Noise Compatibility Planning*,[20] and FAA's *1050.1F Desk Reference, Version 2* (Chapter 11, Sections 11.1 through 11.3),[21] was followed, where applicable.

The evaluation of project-related noise exposure levels due to LAX aircraft operations utilized the latest version of the FAA Aviation Environmental Design Tool (AEDT), which for this project is Version 3b. AEDT is a software system that models aircraft performance in space and time to estimate fuel consumption, emissions, noise, and air quality consequences.[22] AEDT has an extensive database of civilian and military aircraft noise characteristics and incorporates advanced plotting features.

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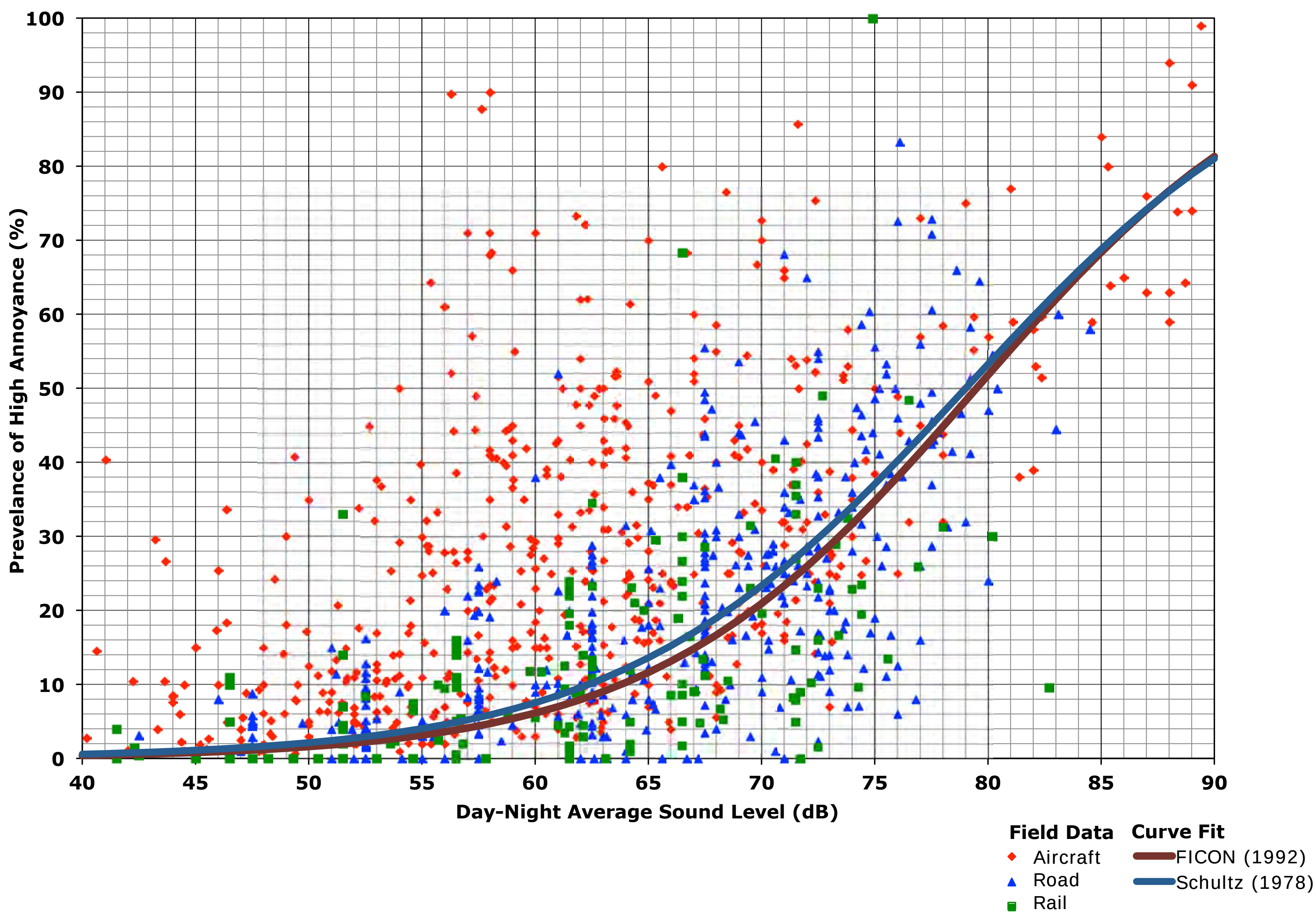
[20] 14 CFR Part 150, A*irport Noise Compatibility Planning*. Available: https://www.ecfr.gov/cgi-bin/text-idx?SID=f8e6df268e3dad2edb848f61b9a0fb51&mc=true&node=pt14.3.150&rgn=div5.

[21] U.S. Department of Transportation, Federal Aviation Administration, *1050.1F Desk Reference, Version 2,* February 2020. Available: https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/.

[22] U.S. Department of Transportation, Federal Aviation Administration, *Aviation Environmental Design Tool webpage*. Available: https://aedt.faa.gov/.



Source: County of Orange, Draft Environmental Impact Report No. 617 – John Wayne Airport Settlement Agreement Amendment, Appendix C – Noise Analysis Technical Report, prepared by Mestre Greve Associated Division of Landrum and Brown, April 2014

Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project	Percent of Population Highly Annoyed as a Function of DNL	Figure 4.7.1-5

AEDT requires the input of the physical and operational characteristics of the airport. Physical characteristics include runway coordinates, airport altitude, and temperature, and optionally, topographical data. Operational characteristics include various types of aircraft data. This includes not only the aircraft types and flight tracks, but also departure procedures, arrival procedures, and stage lengths (flight distance) that are specific to the operations at the airport. **Appendix F.1** describes the AEDT modeling parameters and input data used in this analysis.

Utilizing the FAA's AEDT Version 3b, average annual daily noise contours were developed for (i) existing baseline conditions in 2018, (ii) conditions in 2028 with implementation of the proposed Project, and (iii) conditions in 2028 without Project implementation (i.e., the No Project Alternative), based upon the existing facilities at LAX and the number and type of annual operations that were projected for 2028 under both development scenarios (i.e., with Project and without Project; see **Appendix F.1**).[23] It is important to note that, while the aircraft noise impacts analysis compares future (2028) noise levels associated with the proposed Project to existing baseline conditions, the change in future (2028) aircraft noise conditions compared to existing baseline conditions is attributable to growth in activity anticipated to occur at LAX by 2028 with or without the proposed Project. In other words, the proposed Project itself would have no effect on noise levels associated with aircraft operations; rather, the change in noise levels from 2018 to 2028 aircraft operations will be entirely attributable to growth in aviation activity that will occur with or without the proposed Project. Because of this, estimated aircraft noise levels in 2028 with implementation of the proposed Project are the same as estimated aircraft noise levels in 2028 without the proposed Project.

The noise modeling conducted within AEDT took the effects of terrain into account. Terrain data were obtained from the U.S. Geological Survey (USGS) National Map Viewer. This is a user selection within AEDT, and AEDT uses terrain data to adjust the ground level under the flight path. Terrain data affects the vertical distance between aircraft and a "receiver" on the ground. This, in turn, affects assumptions about how noise propagates over ground.

In addition, the impacts of temporary changes in aircraft noise, due to reassignment of aircraft operations to other runways at LAX during temporary closure of Runway 6L-24R (in 2023) and Runway 6R-24L (in 2024), are evaluated in Section 4.7.1.5.

4.7.1.2.2 Changes in CNEL

LAX aircraft operations data were developed for future years using SIMMOD[24] and provided for the noise analysis by Ricondo & Associates, Inc. (A description of the airfield simulation analysis is provided in **Appendix B.2**). Using the SIMMOD results, noise analyses were conducted with AEDT Version 3b for the baseline year and 2028. For existing baseline conditions (calendar year 2018), data from the LAX Aircraft Noise and Operations Maintenance System (ANOMS) was utilized for the AEDT modeling. For each noise modeling scenario, AEDT produced annual average daily aircraft noise exposure results to address each of the following types of impacts:

- Noise exposure contours representing the area in which aircraft noise exposure is at or above 65 dBA in terms of CNEL to assess land use compatibility changes associated with the proposed Project

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[23] **Appendix F.1** includes annual aircraft operations (see Table 4), which applies to both the proposed Project and the No Project Alternative.

[24] SIMMOD is an airspace and airfield simulation model developed, refined and validated by the FAA and ATAC Corporation for use in airport planning and analysis. The model is used to estimate capacity, travel time, delay and fuel consumption resulting from aircraft operations. It is used to investigate causal relationships between airport facility improvements, air traffic control procedures and their effect on aircraft operations while measuring aircraft delay.

- Aircraft noise exposure levels at distinct grid locations within the 65 CNEL contour to determine grid locations experiencing changes in noise exposure (i.e., increases of 1.5 dBA CNEL or more) to evaluate the potential for a significant impact due to the proposed Project[25]

In addition, construction of the improvements in the north airfield would require the temporary, short-term closure (approximately 4.5 months) of Runway 6L-24R in 2023 and Runway 6R-24L in 2024. During each runway closure, aircraft takeoff and landings would occur from the remaining three runways at LAX, which would temporarily change the aircraft noise contours projected for 2023 and 2024. Potential impacts associated with these changes were evaluated qualitatively.

Potential noise impacts due to changes in aircraft operations expected by the proposed Project were evaluated with respect to thresholds of significance characterized by compatible levels of noise for aircraft operations at an airport and changes in the CNEL, as further described in Section 4.7.1.4 below.

4.7.1.2.3 Classroom Disruption

The evaluation of projected aircraft noise impacts associated with the proposed Project includes an analysis of potential classroom disruption, using metrics that address speech interference, in particular L_{max}, L_{eq}, and TA decibel levels. The metrics describe the peak noise level heard during a period of time (typically an individual noise event), the un-penalized average noise level present during a period of time, and the amount of time the noise level at a given location exceeds a specific decibel level, respectively. Schools that would be exposed to interior single event maximum noise levels of 55 dBA and 65 dBA, as well as to interior hourly average noise levels of 35 dBA L_{eq}(h) or more during typical school hours (8:00 a.m. and 4:00 p.m.) were identified.

The interior single event maximum noise levels of 55 dBA and 65 dBA are based on an August 1992 report published by FICON,[26] a precursor to FICAN. The FICON noise levels reflect that aircraft noise is intermittent, and individual aircraft noise events might interrupt spoken communication among small and large group instruction. Classroom learning occurs in large group settings and in one-on-one or small group discussions. In large group settings, it is assumed that the teacher must be heard approximately 20 feet away; in small group communications, the distance that the voice must carry was assumed to be approximately 6 feet. The intermittent noise criteria include two different thresholds. The FICON report showed that, at a distance of 20 feet (the large group criterion), the in-classroom noise level should not exceed an L_{max} of 55 dBA. At a distance of 6 feet (the small group criterion), the threshold increases to 65 dBA L_{max}. Pre- and post-measurement data from LAX school sound insulation efforts show that the average noise reduction at schools near LAX is 29 dBA with windows closed. In order to attain a level of below 55 dBA and 65 dBA inside the classroom, exterior noise levels would need to be less than 84 and 94 dBA, respectively.

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25 The FAA's 1050.1F Desk Reference, Version 2, requires evaluation of an increase in noise by 1.5 dB or more for areas where existing noise levels are at or greater than 65.0 dB DNL (CNEL is used in California). Based on the FICON 1992 document entitled *Federal Interagency Review of Selected Airport Noise Analysis Issues*, the FAA considers a 1.5 dB increase in the 65 DNL or greater contour to be discernable. The Desk Reference also requires evaluation of an increase in noise by 3.0 dB or more for areas where existing noise levels are between 60 dB and 65.0 dB DNL (CNEL is used in California), but only when DNL 1.5 dB increases are documented within the DNL 65 dB contour. Based on the FICON 1992 document entitled *Federal Interagency Review of Selected Airport Noise Analysis Issues*, the FAA considers a 3.0 dB increase in the 60-65 DNL or greater contour to be discernable. As discussed in Section 4.7.1.5, the proposed Project would not result in a 1.5 dB increase within the 65 dB contour; therefore, evaluation of 3.0 dB increases does not apply to this Project.

26 Federal Interagency Committee on Noise (FICON), *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992, Table 3.3, p. 3-9. Available: http://gsweventcenter.com/Draft_SEIR_References/1992_08_Federal_Interagency_Committee_on_Noise.pdf.

The interior hourly average noise level of 35 dBA $L_{eq}(h)$ or more during typical school hours (8:00 a.m. and 4:00 p.m.) is based on the ANSI standard,[27] which was designed to keep interfering steady-state noise in the classroom at or below an hourly L_{eq} of 35 dBA.

4.7.1.3 Existing Conditions

4.7.1.3.1 Regulatory Setting

4.7.1.3.1.1 Federal

Federal Aviation Regulations (FAR), Part 36

FAR Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification," sets noise standards for issuance of new aircraft type certificates. Aircraft are certified as Stage 1, Stage 2, Stage 3, Stage 4, or Stage 5 aircraft depending on their noise level, weight, number of engines and, in some cases, number of passengers. Stage 1 aircraft, which are the noisiest aircraft, are no longer permitted to operate in the U.S., and Stage 2 aircraft have been phased out of the U.S. fleet (with an exception for Hawaii and Alaska and limited applicability to certain lighter aircrafts, discussed below). Although aircraft meeting higher stage noise certifications specified in Part 36 standards are noticeably quieter than many of the older lower stage aircraft, the regulations make no determination that such aircraft are acceptably quiet for operation at any given airport.

Federal Aviation Administration (FAA) Noise Abatement Policy

This policy establishes the noise abatement authority and responsibilities of the federal government, airport proprietors, state and local governments, air carriers, air travelers and shippers, and airport area residents and prospective residents. It emphasizes that the FAA's role is primarily one of regulating noise at its source (the aircraft), plus supporting local efforts to develop airport noise abatement plans. The FAA gives high priority in the allocation of Airport Development Aid Program (ADAP) funds to projects designed to ensure compatible use of land near airports, but it is the role of state and local governments and airport proprietors to undertake the land use and operational actions necessary to promote compatibility.

Aviation Safety and Noise Abatement Act of 1979

This Act establishes funding for noise compatibility planning and sets the requirements by which airport operators can apply for funding. This is also the law by which Congress mandated that the FAA develop an airport community noise metric to be used by all federal agencies assessing or regulating aircraft noise. The result was DNL. Because California already had a well-established airport community noise metric in CNEL, and because CNEL and DNL are so similar, FAA expressly allows CNEL to be used in lieu of DNL in noise assessments performed for California airports.[28]

Federal Aviation Regulations, Part 150

In recognition of the national aircraft noise issue, the United States Congress passed the Aviation Safety and Noise Abatement Act of 1979 (ASNA), which mandated that the FAA establish a single system for measuring noise around airports and determining noise exposure to individuals. ASNA also required the FAA to identify land uses that are normally compatible with various noise levels. These regulations are

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27 American National Standards Institute, Accredited Standards Committee S12 Noise, *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*, (ANSI S12.60.2002), June 2002.

28 U.S. Department of Transportation, Federal Aviation Administration, *1050.1F Desk Reference, Version 2*, page 11-2, February 2020. Available: https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/media/desk-ref.pdf.

codified in Title 14 of CFR Part 150 (14 CFR Part 150 or simply Part 150), "Airport Noise Compatibility Planning."[29]

Part 150 establishes the average annual DNL to determine cumulative noise exposure from airports. In Part 150, the FAA established compatibility guidelines for aircraft noise exposure levels with land uses in the vicinity of an airport. These guidelines consider all land uses to be compatible with noise levels less than 65 DNL. Some land uses, such as residences, schools, hospitals, and places of worship, are considered to be noise-sensitive and non-compatible with aircraft noise exposure levels at and above 65 DNL. Governmental services, transportation, parking, and some outdoor recreational uses are considered compatible with noise levels up to 70 DNL. However, the FAA guidelines indicate that ultimately "the responsibility for determining the acceptability and permissible land uses remains with the local authorities." **Table 4.7.1-2** presents the Part 150 noise and land use compatibility charts to be used for land use planning with respect to aircraft noise.

Table 4.7.1-2
Federal Aviation Regulation Part 150 Land Use Guidelines

Land Use	Yearly Day-Night Average Sound Level (L_{dn} dBA)					
	<65	65–70	70–75	75–80	80–85	>85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	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	25	30	N	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

29 14 CFR Part 150, *Airport Noise Compatibility Planning*. Available: https://www.ecfr.gov/cgi-bin/text-idx?SID=f8e6df268e3dad2edb848f61b9a0fb51&mc=true&node=pt14.3.150&rgn=div5.

Table 4.7.1-2
Federal Aviation Regulation Part 150 Land Use Guidelines

Land Use	Yearly Day-Night Average Sound Level (L_{dn} dBA)					
	<65	65–70	70–75	75–80	80–85	>85
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
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Source: 14 CFR Part 150, Airport Noise Compatibility Planning Appendix A to Part 150—Noise Exposure Maps, Table 1—Land Use Compatibility with Yearly Day-Night Average Sound Levels. Available: https://www.ecfr.gov/cgi-bin/text-idx?SID=f8e6df268e3dad2edb848f61b9a0fb51&mc=true&node=pt14.3.150&rgn=div5.

Notes:

[1] Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus, the reduction requirements are often stated as 5, 10 or 15 dB 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 NLR 25 dB 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 the normal noise level is low.

[3] Measures to achieve NLR of 30 dB 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 the normal noise level is low.

[4] Measures to achieve NLR 35 dB 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 the normal level is low.

[5] Land use compatible provided special sound reinforcement systems are installed.

[6] Residential buildings require an NLR of 25.

[7] Residential buildings require an NLR of 30.

[8] Residential buildings not permitted.

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally-determined land uses for those determined to be appropriate by local authorities in response to locally-determined needs and values in achieving noise compatible land uses.

Key:
Y (Yes)
N (No)

NLR 25, 30, or 35 = Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dBA must be incorporated into design and construction of structure.
Abbreviations: Ldn - day night average sound level; dBA - A-weighted noise level.

In 1981, the Los Angeles City Department of Airports (now Los Angeles World Airports [LAWA]) in conjunction with the Los Angeles County Department of Regional Planning and the cities of El Segundo, Hawthorne, and Inglewood undertook an Airport Noise Control and Land Use Compatibility (ANCLUC) Study to quantify LAX's aircraft noise exposure and to identify measures to mitigate aircraft noise impacts on the noise-sensitive land uses surrounding LAX. The ANCLUC study process was the predecessor to the FAR Part 150 process. The LAX ANCLUC process was completed in June 1984. The LAX Noise Exposure Map (NEM) included in the ANCLUC and submitted under FAR Part 150 was accepted by FAA on October 16, 1984. On April 13, 1985, the FAA issued a record of approval approving 28 of the recommended measures in the LAX Noise Compatibility Program (NCP). LAWA conducted an LAX Part 150 NEM Update in 2015. LAWA received formal acceptance of the NEM from the FAA on February 18, 2016.[30]

Federal Aviation Administration Order 1050.1F

FAA Order 1050.1F provides FAA's policies and procedures for evaluating environmental impacts of all agency actions in compliance with NEPA and the implementing regulations issued by the federal Council on Environmental Quality (CEQ).[31] FAA Order 1050.1F identifies significance thresholds for aircraft noise. These thresholds are based on the annual average daily DNL. In accordance with FAA Order 1050.1F, a proposed action would have a significant noise impact if it would cause a noise-sensitive land use that is already located within the 65 DNL noise contour to experience an increase in noise of DNL 1.5 dBA or more, or if it would newly expose a noise-sensitive land use to the DNL 65 dBA level due to an DNL 1.5 dBA or greater increase. The Order provides for the use of CNEL instead of DNL in California.

In 1992, FICON recommended that, in addition to significant impacts, less-than-significant noise level changes be identified for noise-sensitive locations exposed to project-related increases in noise levels.[32] FICON recommended reporting any changes in DNL of 3 dBA or more between 60 and 65 DNL, and increases of DNL 5 dBA or more between 45 and 60 DNL. The FAA's subsequent Air Traffic Noise Screening (ATNS) procedure[33] further emphasized the importance of these changes in DNL, so that they also are now included in FAA Order 1050.1F. These recommendations only apply to cases where the significance threshold (increase of 1.5 dBA or more within the 65 dBA DNL contour) is met or exceeded.

Airport Noise and Capacity Act of 1990

The Airport Noise and Capacity Act of 1990 (ANCA or "the Noise Act") (49 U.S.C. 47521 et seq.) sets forth several provisions related to the restriction of aircraft activities at airports. One of the most notable aspects of ANCA is that it further regulates the local imposition of noise and access restrictions proposed after its enactment (October 1990).[34]

NextGen Southern California Metroplex

In 2003, Congress directed the development of a "Next Generation Air Transportation System." NextGen, as it is now called, was intended to improve aviation safety and efficiency through the use of ground-based and, increasingly, space-based technology to improve the way aircraft navigate complex metropolitan areas (Metroplexes) in the United States. An important part of the NextGen initiative is the development of new airspace and air traffic procedures.

FAA's approach to the mandate from Congress was to identify multiple Metroplex areas in the United States. Each of the 21 Metroplexes includes one or more commercial airports that serve at least one major city. LAX, along with a number of other airports, comprise the "Southern California Metroplex." The Southern California Metroplex Project is the FAA's proposal to improve the efficiency and safety of air traffic into and out of the Southern California area. A key feature of the Southern California Metroplex Project is to create more repeatable and predictable flight paths, both vertically and laterally.

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30 Los Angeles World Airports, *LAX Part 150 Noise Exposure Map Update*. Available: https://www.lawa.org/en/lawa-environment/noise-management/lawa-noise-management-lax/lax-part-150-noise-exposure-map-update.

31 U.S. Department of Transportation, Federal Aviation Administration, *Order 1050.1F, Environmental Impacts: Policies and Procedures* July 16, 2015. Available: https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf.

32 Federal Interagency Committee on Noise (FICON), *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992. Available: http://gsweventcenter.com/Draft_SEIR_References/1992_08_Federal_Interagency_Committee_on_Noise.pdf.

33 U.S. Department of Transportation, Federal Aviation Administration, *ATNS Air Traffic Noise Screening Model, Version 2.0 User Manual*, January 1999.

34 Among the provisions of ANCA, restrictions on Stage 3 aircraft must be fully analyzed in a study as detailed in 14 CFR Part 161 (a "161 Study") and approved by FAA.

The Southern California Metroplex Project is completely separate from the proposed Project and is not within the control of LAWA. Flight path procedures are dictated by the FAA, taking into account considerations of operational, safety, and air traffic control procedures. An airport operator, which in this case is LAWA, has no authority to regulate flight paths; therefore, although an airport may advocate for certain noise abatement flight paths to reduce noise, the request must be investigated for its impact on the National Airspace System Plan (NASP). Any new flight path procedures are implemented at the discretion of individual airlines after approval by the FAA. Additionally, the FAA, by law, has the sole authority to manage the Air Traffic Control (ATC) system and the navigable airspace in the United States; therefore, LAWA cannot restrict access to "noisier" aircraft or dictate departure routes. At LAX and all commercial airports, from the time an aircraft departs the terminal and enters the taxiway and runway system, and throughout its flight to, and arrival at the gate of the destination airport, the aircraft moves only by instruction and permission of the FAA, and pursuant to the direction of FAA personnel (not airport personnel). Implementation of the proposed Project would not alter flight path procedures at LAX. In summary, the FAA Southern California Metroplex Project does not affect, nor would it be affected by, the proposed Project.[35]

4.7.1.3.1.2 State

California Airport Noise Regulations

Title 21 of the California Code of Regulations, Subchapter 6 (also known as the California Airport Noise Standards) defines incompatible noise levels as exposure of nearby communities to noise levels of 65 CNEL or greater. Land use incompatibility is most likely to occur for most types of noise-sensitive uses when they are within the 65 CNEL noise contour. The 65 CNEL standard is also referenced in the California Department of Transportation (Caltrans) California Airport Land Use Planning Handbook (Caltrans Handbook) as the basic limit of acceptable noise levels for residential and other noise-sensitive uses within an urban area.[36]

4.7.1.3.1.3 Local

Los Angeles County Airport Land Use Plan

The State Aeronautics Act mandates that each county containing a public airport have an Airport Land Use Commission (ALUC), which is required to coordinate planning for the areas surrounding public use airports.[37] The Los Angeles County Regional Planning Commission is the designated ALUC for Los Angeles County, and is responsible for adopting Airport Land Use Compatibility Plans (ALUCPs) for the airports within Los Angeles County. ALUCPs provide guidance on compatible land uses surrounding airports to protect the health and safety of people and property within the vicinity of an airport, as well as the public in general. An ALUCP focuses on a defined area around each airport known as the Airport Influence Area (AIA). The AIA is comprised of noise, safety, airspace protection, and overflight factors.

The ALUC has no jurisdiction over the operation of airports or over existing land uses, regardless of whether or not such uses are incompatible with airport activities. Once ALUCPs have been adopted by the ALUC, local agencies with land located within the AIA boundary for any of the airports must, by law, amend their planning documents to conform to the applicable ALUCP or make special findings in accordance with state law, to override the ALUCP policies with a two-thirds vote of the local agency's governing body.

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35 Additional information regarding implementation of the Southern California Metroplex Project as related to LAX and its impacts to surrounding areas is available at https://www.faa.gov/air_traffic/community_involvement/socal/.

36 California Department of Transportation, Division of Aeronautics, *California Airport Land Use Planning Handbook*, Section 4.2, Noise, October 2011. Available: https://dot.ca.gov/-/media/dot-media/programs/aeronautics/documents/californiaairportlanduseplanninghandbook-a11y.pdf.

37 California Public Utilities Code, Sections 21670 et. seq.

The Los Angeles County Airport Land Use Plan (ALUP) established a planning boundary for each commercial airport within Los Angeles County to delineate areas subject to noise impacts and safety hazards; specifically, the planning boundaries encompass the area within the airport's 65 CNEL noise contour and areas within the Runway Protection Zones (RPZs). Those noise and safety areas, together, determine the AIA specific to each airport. The ALUP is implemented by the applicable jurisdiction through its General Plan, Specific Plan(s), and zoning ordinance. Amendments to a specific plan or General Plan within an airport's AIA require review by the ALUC and a Consistency Determination with the ALUP.

The ALUP includes a Land Use Compatibility table (see **Table 4.7.1-3**), and policies that require new uses to adhere to the criteria set forth in the table and encourage the removal of incompatible land uses.

Table 4.7.1-3
Los Angeles County Airport Land Use Plan: Land Use Compatibility Table

Land Use	Community Noise Exposure (dB)					
	55	60	65	70	75	
Residential						
Educational Facilities						
Commercial						
Industrial						
Agriculture						
Recreation						

Source: Los Angeles County Airport Land Use Commission, *Los Angeles County Airport Land Use Plan*, December 1, 2004. Available: http://planning.lacounty.gov/assets/upl/data/pd_alup.pdf.

Note: Consider FAR Part 150 for commercial and recreational uses above the 75 CNEL.

Color Key:
- Satisfactory
- Caution. Review Noise Insulation Needs
- Avoid Land Use Unless Related to Airport Services

City of Los Angeles General Plan

The City of Los Angeles's General Plan contains eleven elements that provide guidance and policies to balance the needs of a growing City and the quality of life for its residents. The Noise Element of the General Plan provides goals and policies to guide compatible land uses and the incorporation of noise control (attenuation) measures for new uses to protect people living and working in the City from excessive noise levels. The Noise Element describes airport-related noise management programs and identifies noise sources and noise management measures. It also provides guidelines for noise management within Los Angeles. The Noise Element includes goals, objectives, and policies that facilitate consideration of noise and noise-mitigating measures when making land use planning decisions so as to minimize human exposure to excessive noise. The Noise Element also includes Guidelines for Noise Compatible Land Uses (see **Table 4.7.1-4**) to help guide determination of appropriate land use and mitigation measures based on existing or anticipated ambient noise levels.

Table 4.7.1-4
City of Los Angeles Guidelines for Noise Compatible Land Uses

Land Use Category	Day-Night Average Exterior Sound Level (CNEL dB)						
	50	55	60	65	70	75	80
Residential Single Family, Duplex, Mobile Home	A	C	C	C	N	U	U
Residential Multi-Family	A	A	C	C	N	U	U
Transient Lodging, Motel, Hotel	A	A	C	C	N	U	U
School, Library, Church, Hospital, Nursing Home	A	A	C	C	N	N	U
Auditorium, Concert Hall, Amphitheater	C	C	C	C/N	U	U	U
Sports Arena, Outdoor Spectator Sports	C	C	C	C	C/U	U	U
Playground, Neighborhood Park	A	A	A	A/N	N	N/U	U
Golf Course, Riding Stable, Water Recreation, Cemetery	A	A	A	A	N	A/N	U
Office Building, Business, Commercial, Professional	A	A	A	A/C	C	C/N	N
Agriculture, Industrial, Manufacturing, Utilities	A	A	A	A	A/C	C/N	N

Source: City of Los Angeles, Department of City Planning, *Noise Element of the Los Angeles City General Plan,* adopted February 3, 1999. Available: https://planning.lacity.org/odocument/b49a8631-19b2-4477-8c7f-08b48093cddd/Noise_Element.pdf.

Key:

A = Normally acceptable. Specified land use is satisfactory, based upon assumption buildings involved are conventional construction, without any special noise insulation.

C = Conditionally acceptable. New construction or development only after a detailed analysis of noise mitigation is made and needed noise insulation features are included in project design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning normally will suffice.

N = Normally unacceptable. New construction or development generally should be discouraged. A detailed analysis of noise reduction requirements must be made and noise insulation features included in the design of a project.

U = Clearly unacceptable. New construction or development generally should not be undertaken.

LAX Noise Abatement Procedures

LAWA has negotiated a series of preferred operating procedures for LAX that are designed to ease noise impacts over certain areas and during noise-sensitive hours. These procedures are generally followed; however, if weather conditions are hazardous or to address other safety considerations, the FAA may instruct pilots to deviate from these noise-abatement-preferred procedures and programs (the FAA has the final determination of where aircraft fly). Several of the preferred noise-reducing operating procedures are discussed below.[38]

Over-Ocean Operation Procedure

From midnight to 6:30 a.m., over-ocean procedures are in place that route both arrivals and departures over the ocean, unless FAA Air Traffic Control determines that weather or airport/air traffic operational conditions make it unsafe for such operations.[39] This procedure provides nearby communities to the east of the airport with some noise relief from arriving aircraft during the potentially noise-sensitive early morning hours.

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38 Los Angeles World Airports, *Efforts to Reduce or Limit Aircraft Noise at LAX*. Available: https://www.lawa.org/en/lawa-environment/noise-management/lawa-noise-management-lax/efforts-to-reduce-or-limit-aircraft-noise-at-lax, accessed August 11, 2020.

39 These procedures do not abrogate the authority and responsibility of the pilot in command with respect to the safe operation of the aircraft.

Preferential Runway Use Procedure

During the daytime and evening hours between 7:00 a.m. and 10:00 p.m., LAWA prefers that the outer runways (closer to neighboring communities) are reserved for arrivals, and that the inner runways (closer to the terminals) are used for departures. LAWA has established this preference because departures are generally louder than arrivals. During the potentially noise-sensitive hours between 10:00 p.m. and 7:00 a.m., FAA Air Traffic Control maximizes the use of the inner runways and taxiways for all operations to lessen community noise impacts.

Early Turn Notification Program

To minimize noise in residential communities along the north and south airport boundaries, pilots of all aircraft departing toward the west (over the ocean) must fly straight until past the shoreline and at a certain elevation before beginning any turns, unless specifically instructed otherwise by FAA Air Traffic Control.

Fly Quieter Program

The LAX Fly Quieter Program (FQP) is a new education and recognition program designed to encourage commercial airlines to take voluntary measures to reduce noise, including using quieter aircraft and complying with noise abatement procedures. Under the program, LAWA will evaluate airlines' current fleets and operating procedures as they relate to noise. LAWA has begun monitoring noise levels of the flights themselves, and will evaluate other voluntary procedures that could reduce aircraft noise impacts in adjacent communities. Once fully implemented, LAWA will engage with each airline regarding its noise reduction and/or stakeholder engagement efforts in order to finalize annual scores and publicly recognize the airlines that make the most substantial efforts to address aircraft noise.

LAX Sound Insulation Programs

Sound Insulation Programs associated with LAX were developed to ensure that residential communities adversely impacted by aircraft noise are made compatible with California Noise Standards and to provide additional sound insulation for noise-impacted schools. The goals of sound insulation programs, in general, are defined in FAA Order 5100.38D, *Airport Improvement Program Handbook.*[40] The programs include a Residential Sound Insulation Program for residences within the City of Los Angeles, Residential Sound Insulation Programs for surrounding jurisdictions, and a School Sound Insulation Program for the Lennox and Inglewood School Districts.

Within the City of Los Angeles, LAWA, working closely with local City Council offices, implemented a voluntary Residential Soundproofing Program for aircraft noise-impacted communities within the City's jurisdiction. The program offered sound insulation to residential building owners in areas of the City of Los Angeles that were in the 65 dB CNEL noise contour shown on the fourth quarter 1992 (4Q92) noise contour map. The Soundproofing Program, which began in 1997, implemented sound insulation projects within the highest noise-impacted areas of Westchester, Playa del Rey, and South Los Angeles. LAWA closed out the program in 2014. At program completion, LAWA had soundproofed over 7,300 residential dwelling units in the City of Los Angeles near LAX.

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[40] U.S. Department of Transportation, Federal Aviation Administration, *Order 5100.38D, Airport Improvement Program Handbook*, effective September 30, 2014, at Appx. R. Available: https://www.lawa.org/-/media/lawa-web/tenants411/file/airport_improvement_program_handbook.ashx.

Separately, LAWA established the Sound Insulation Grant Program to administer and monitor funding (airport and federal funds) for Residential Sound Insulation Programs implemented by the City of Inglewood; County of Los Angeles (in the unincorporated areas of Lennox, Del Aire, and Athens); and City of El Segundo, which terminated its program in July 2018.) In addition, the Program administers funding for the sound insulation of schools in the Lennox School District and the Inglewood Unified School District.

4.7.1.3.2 Environmental Setting

The existing baseline conditions reflect aircraft noise levels associated with the LAX airfield and operational parameters that existed in 2018. As described in the introduction to Chapter 4, 2018 was used for those analyses that required a full calendar year of aircraft operations data, including aircraft noise. A description of the data and assumptions used to develop the aircraft noise exposure contours, such as the average daily number of aircraft operations, the aircraft fleet mix and its distribution throughout the day, the utilization of the runways, and information about flight paths, is provided in **Appendix F.1**, *Aircraft Noise Analysis Technical Report*.

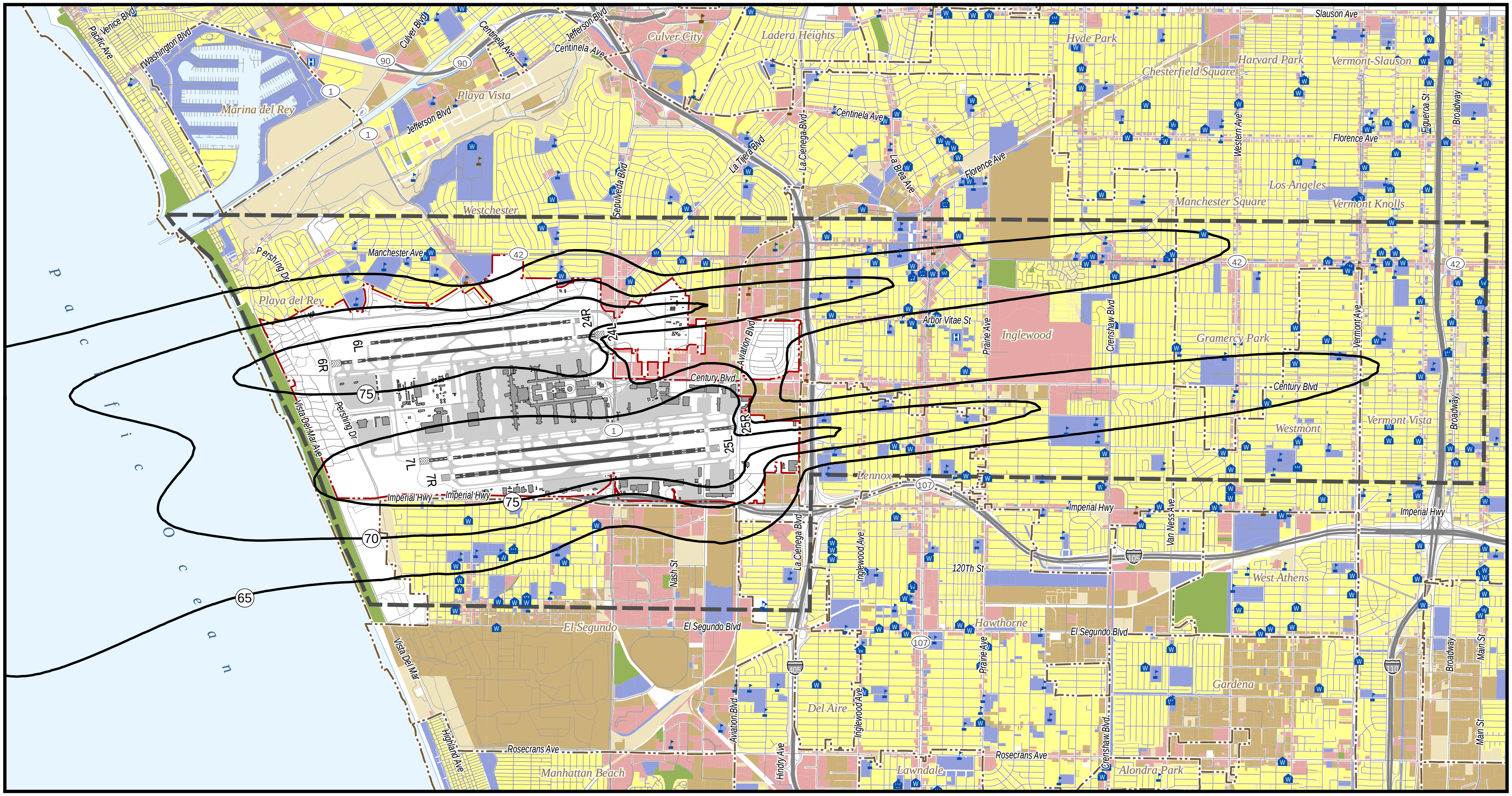
The boundaries of the study area for aircraft noise impacts are generally defined by the geographic extent of the 65 CNEL aircraft noise contour for future (2028) conditions. Land uses within the existing (2018) 65 CNEL contour include, but are not limited to, residential, commercial/office, park, educational, industrial, school, and church uses, and vacant land/open space (including former residential land acquired under FAA's grant program), with the predominant land use type being residential.

4.7.1.3.2.1 Existing Baseline Aircraft Noise Exposure

This section presents the CNEL noise exposure contours representing the existing baseline conditions.

LAX operates in west flow approximately 95 percent of the time. During west flow, aircraft arrive from the east (traveling to the west) and depart from the airport in a westerly direction. Therefore, in west flow, takeoffs are routed to the west of the airport, with the climb out portion of the takeoff occurring mostly over the ocean. For most aircraft, the climb phase, which utilizes higher engine thrust, is the noisiest phase of flight. Furthermore, during the late night and early morning hours (midnight to 6:30 a.m.) over-ocean procedures are in place that route both arrivals and departures over the ocean. These procedures have been in place since the early 1970s. Due to these operating procedures, aircraft noise levels are much higher west of the airport over the ocean than over the populated areas to the east.

Utilizing the FAA's AEDT Version 3b, CNEL contours were developed for noise levels associated with existing baseline aircraft operations at LAX**. Figure 4.7.1-6** delineates the 65, 70, and 75 CNEL aircraft noise contours for existing baseline conditions and also shows the underlying land use types. As shown, the 65 CNEL noise contour primarily extends east and west of the north and south airfields, along the aircraft approach and departure paths to and from Runways 6L-24R, 6R-24L, 7L-25R, and 7R-25L. To the east of the runways, the 65 CNEL contour extends for approximately 5 miles from the end of the runways. To the west of the runways, the 65 CNEL contour also extends for several miles, with most of the westerly contours over the ocean. The 65 CNEL noise contour also extends to the north and south of LAX for up to approximately 0.6 and 0.8 mile from the runways, respectively.



Legend

2018 Baseline CNEL Contours (65-75 dB)

Land Use Study Area
LAX Property Boundary
Municipal Boundary
Runway
Airport Buildings
Airport Pavement

Residential Use
Public Use
Recreational / Open Space
Commercial Use
Manufacturing and Production
Vacant / Undefined

School
College
Hospital
Place of Worship

0 4,000 8,000 Feet
Scale

Source: HMMH, June 2020
Prepared by: CDM Smith,October 2020

LAX Airfield and Terminal Modernization Project

Aircraft Noise Contours (65-75 CNEL): Baseline (2018) Conditions

Figure 4.7.1-6

Population, Housing, and Acreage

Table 4.7.1-5 provides the estimated population, housing units, and acreage within the 65-70 CNEL, 70-75 CNEL, and 75+ CNEL contours under existing baseline conditions.

Table 4.7.1-5
Estimated Population, Housing Units, and Acreage within the Aircraft Noise Contours under Existing Baseline Conditions

Population				Housing Units				Acreage			
65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total
56,632	16,499	780	73,911	20,938	4,819	303	26,060	7,616	3,462	2,259	13,338

Source: HMMH, 2020.

Other Noise-Sensitive Uses

Table 4.7.1-6 shows the number of other noise-sensitive uses, such as houses of worship, schools, libraries, hospitals, and colleges, within the 65-70 CNEL, 70-75 CNEL, and 75+ CNEL contours under existing baseline conditions (see Figure 4.7.1-6).

Table 4.7.1-6
Other Noise-Sensitive Uses within the Aircraft Noise Contours under Existing Baseline Conditions

	65-70 CNEL	70-75 CNEL	75+ CNEL	Total
House of Worship	24	1	0	25
School	24	4	0	28
Library	2	0	0	2
Hospital	0	0	0	0
College	0	1	0	1
Total	**50**	**6**	**0**	**56**

Source: HMMH, 2020.

Schools

Schools can be affected by both an overflight of a single aircraft, which can disrupt speech, and by the general intrusiveness of noise that elevates the ambient noise level within the school, which can disrupt classroom learning. These types of aircraft noise events are considered to pose the potential for significant impacts specific to schools, as further described below in Section 4.7.1.4. To establish existing baseline noise exposure conditions specific to those types of aircraft noise events and to define the geographic scope of the analysis, schools that were exposed to the following conditions were identified in this analysis:

- Interior single event maximum aircraft noise levels (L_{max}) of 55 dBA and 65 dBA lasting more than three seconds
- Peak hour average noise levels of 35 dBA L_{eq}(h) or greater

As noted in Section 4.7.1.2.3, in order to attain a level of below 55 dBA and 65 dBA inside the classroom, exterior noise levels would need to be less than 84 and 94 dBA, respectively**. Table 4.7.1-7** identifies the number of schools within the LAX environs that are exposed to the exterior noise under existing baseline conditions. There were no schools exposed to interior L_{max} noise levels above 65 dBA. The names and locations of the schools associated with interior single L_{max} noise levels of 55 dBA and peak hour average noise levels at or higher than 35 dBA L_{eq}(h) are provided in **Table 4.7.1-8** and **Table 4.7.1-9**, respectively. Table 4.7.1-8 presents the average daily minutes per school day that exceed an exterior noise level of 84 decibels L_{max} under baseline conditions, which equates to an interior noise level of 55 dBA L_{max} at the indicated school; the number of events to which each school is exposed on an average annual school day that exceed 84 dBA; and the average duration of each event. Table 4.7.1-9 identifies the hourly equivalent noise level at schools with exceedances of the ANSI 35 L_{eq}(h) standard during the average school day.

Table 4.7.1-7
School Exposure to Aircraft Noise under Existing Baseline Conditions

Impact Category	Number
Exposure to >= 55 dBA (L_{max})	
Number of Schools	7
Average Number of Events per School	13
Average Seconds per Event	4
Exposure to >= 65 dBA (L_{max})	
Number of Schools	0
Exposure to >= 35 dBA ($L_{eq[h]}$)	
Number of Schools	7

Source: HMMH, 2020.

Table 4.7.1-8
Schools Exposed to Noise Above Interior dBA Speech Interference Levels[1] During the Average School Day[2] under Existing Baseline Conditions

School	Existing Baseline Conditions		
	TA-84 (minutes)[3]	# Events above Threshold[4]	Avg. Duration (seconds)[5]
Spartan College of Aeronautics and Technology - Inglewood Campus	2.0	36.0	3.3
Dolores Huerta Elementary School	0.9	14.7	3.7
Felton Elementary School	0.7	11.3	3.7
ICEF Inglewood Middle School	0.1	1.5	3.9
Inglewood Continuation High School	0.2	3.1	3.9
Missionette Christian Academy	0.1	1.5	4.0
Oak Street Elementary School	1.0	23.3	2.6

Source: HMMH, 2020.

Notes:

1 Interior dBA speech interference level is 55 dBA $L_{max.}$

2 Average school day is assumed to be 8:00 a.m. to 4:00 p.m.

3 Total number of minutes (events multiplied by average durations) per school day that exceed an exterior noise level of 84 decibels L_{max}, which equates to an interior noise level of 55 dBA L_{max} at indicated school.

4 Number of events to which the school is exposed on an average annual school day that exceed 84 dBA.

5 Average duration of each event in seconds during the average annual school day that exceeds 84 dBA $L_{max.}$

Table 4.7.1-9
Schools Exposed to Exceedances of ANSI Steady-State Noise Level[1] During the Average School Day[2] under Existing Baseline Conditions

School	8-Hour L_{eq} Values[3]
Spartan College of Aeronautics and Technology - Inglewood Campus	38.1
Dolores Huerta Elementary School	36.7
Felton Elementary School	36.0
ICEF Inglewood Middle School	35.1
Inglewood Continuation High School	36.6
Missionette Christian Academy	35.0
Oak Street Elementary School	37.1

Source: HMMH, 2020.

Notes:

1 The ANSI interior hourly average noise standard was designed to keep interfering steady-state noise at or below an hourly L_{eq} of 35 dBA in the classroom during typical school hours.

2 Average school day is assumed to be 8:00 a.m. to 4:00 p.m.

3 Noise levels were computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels from exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

4.7.1.4 Thresholds of Significance

A significant impact would occur if the proposed Project would:

Threshold 4.7.1-1 Generate aircraft noise that would increase noise levels at exterior use areas of residences, schools, hospitals, or places of worship to 65 CNEL or above, as compared to baseline conditions.

Threshold 4.7.1-2 Cause ambient noise levels to increase by 1.5 dBA or more, as compared to baseline conditions, in noise-sensitive areas whose ambient noise levels attributable to airport operations exceed 65 CNEL or greater.[41]

Threshold 4.7.1-3 Cause a substantial increase in the amount of time that aircraft-induced noise would affect classroom learning, as compared to baseline conditions.

The above thresholds of significance are based on the L.A. CEQA Thresholds Guide[42] and Appendix G of the State CEQA Guidelines. The L.A. CEQA Thresholds Guide identifies categories of noise-sensitive uses in the City, which are reflected in Threshold 4.7.1-1, and defines a significant impact as a 1.5 dBA increase within the 65 CNEL contour due to exposure to airport noise, as reflected in Threshold 4.7.1-2.

The thresholds also reflect Appendix G of the State CEQA Guidelines, which requires lead agencies to consider if their project would generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise

41 The FAA's 1050.1F Desk Reference, Version 2, requires evaluation of an increase in noise by 1.5 dB or more for areas where existing noise levels are at or greater than 65.0 dB DNL (CNEL is used in California). Based on the FICON 1992 document entitled *Federal Interagency Review of Selected Airport Noise Analysis Issues*, the FAA considers a 1.5 dB increase in the 65 DNL or greater contour to be discernable.

42 City of Los Angeles, *L.A. CEQA Thresholds Guide, Your Resource for Preparing CEQA Analyses in Los Angeles*, 2006. Available: https://planning.lacity.org/odocument/cc8fb2f5-dc6c-47f1-bfc3-864b84621abb/CEQAThresholdsGuide.pdf.

ordinance, or applicable standards of other agencies; or expose people residing or working within an airport land use plan area to excessive noise levels.

For purposes of this analysis, the Appendix G consideration related to the exposure of people to excessive noise levels was extended to classroom learning. As a means of evaluating noise levels at schools, the FICON and ANSI standards described in Section 4.7.1.2 were employed. Specifically, the amount of time during which noise levels would exceed a specified range (i.e., TA levels) due to aircraft operations at LAX in 2028 was determined, and exceedances of acceptable interior hourly average noise levels during school hours were identified. These noise levels and durations were compared to existing baseline conditions to determine if there would be a substantial change from baseline conditions that would constitute a significant impact. As indicated in Section 4.7.1.2, speech interference in the classroom occurs when interior noise levels exceed 55 dBA and 65 dBA in large and small group settings, respectively. These noise levels equate to exterior noise levels of 84 dBA and 94 dBA, respectively. Therefore, for purposes of this EIR, 84 dBA is considered to be the sound level above which learning within a classroom setting could be adversely affected. Additionally, as described in Section 4.7.1.2, in order to address impacts from steady-state noise in the classroom, increases in classroom 8-hour $L_{eq}(h)$ are also considered to adversely affect classroom learning.

When considering the impacts of the proposed Project in 2028, Project impacts were compared to 2018 baseline conditions. However, the significance thresholds listed above were also used in evaluating operational aircraft noise impacts related to the temporary closure of each north runway during construction of the north airfield improvements. For the narrow purpose of analyzing noise impacts during these temporary runway closures, the baseline conditions used were those that would occur during each affected year, but without the closure (i.e., aircraft noise levels occurring in 2023 with the temporary closure of Runway 6L-24R were compared to noise levels projected to occur in 2023 without the runway closure; the same approach was used for 2024 relative to the temporary closure of Runway 6R-24L). By comparing impacts to 2023 and 2024 conditions, instead of 2018, the analysis accurately identifies temporary short-term noise impacts that would occur as a direct consequence of temporary runway closures during project construction. It would be misleading and of no informational value to use the 2018 baseline conditions for this analysis, as the difference in noise levels would be partially attributable to five to six years of growth in aircraft operations projected to occur at LAX rather than solely to the temporary runway closures.

4.7.1.5 Project Impacts

As described above in Section 4.7.1.2, to evaluate aircraft noise impacts, aircraft noise levels associated with the proposed Project in 2028 were compared to the aircraft noise levels associated with existing baseline conditions. As also described in that section, the change in future (2028) aircraft noise conditions compared to existing baseline conditions is attributable to growth in passenger activity and aircraft operations that is anticipated to occur at LAX by 2028 with or without the proposed Project (see **Appendix F.1**).[43] Specifically, passenger activity levels at LAX between 2018 and 2028 are forecast to increase from approximately 86.1 million annual passengers (MAP) to approximately 111 MAP, which would be accompanied by an increase in the number of daily flights at LAX, as well as an anticipated change in the fleet mix (i.e., size and types of aircraft), during that time. As shown in **Table 4.7.1-10**, the number of average annual daily aircraft operations is forecast to increase from 1,958 in 2018 to approximately 2,191 in 2028. Although the proposed Project would reconfigure some of the taxiways and

[43] **Appendix F.1** includes annual aircraft operations (see Table F.1-4), which applies to both the proposed Project and the No Project Alternative. See also **Appendix B.1**.

runway exits in the North Airfield, these improvements would not alter runway configurations or orientations, and would not result in changes to departure or approach noise.

Table 4.7.1-10
Average Annual Daily Aircraft Operations at LAX

2018	2023	2028
1,958	2,060	2,191

Source: Ricondo & Associates, Inc., 2020.

The following tables and figures describe the estimated changes in aircraft noise exposure levels associated with the proposed Project in 2028. These tables and figures serve as the basis for the impacts analysis that follows.

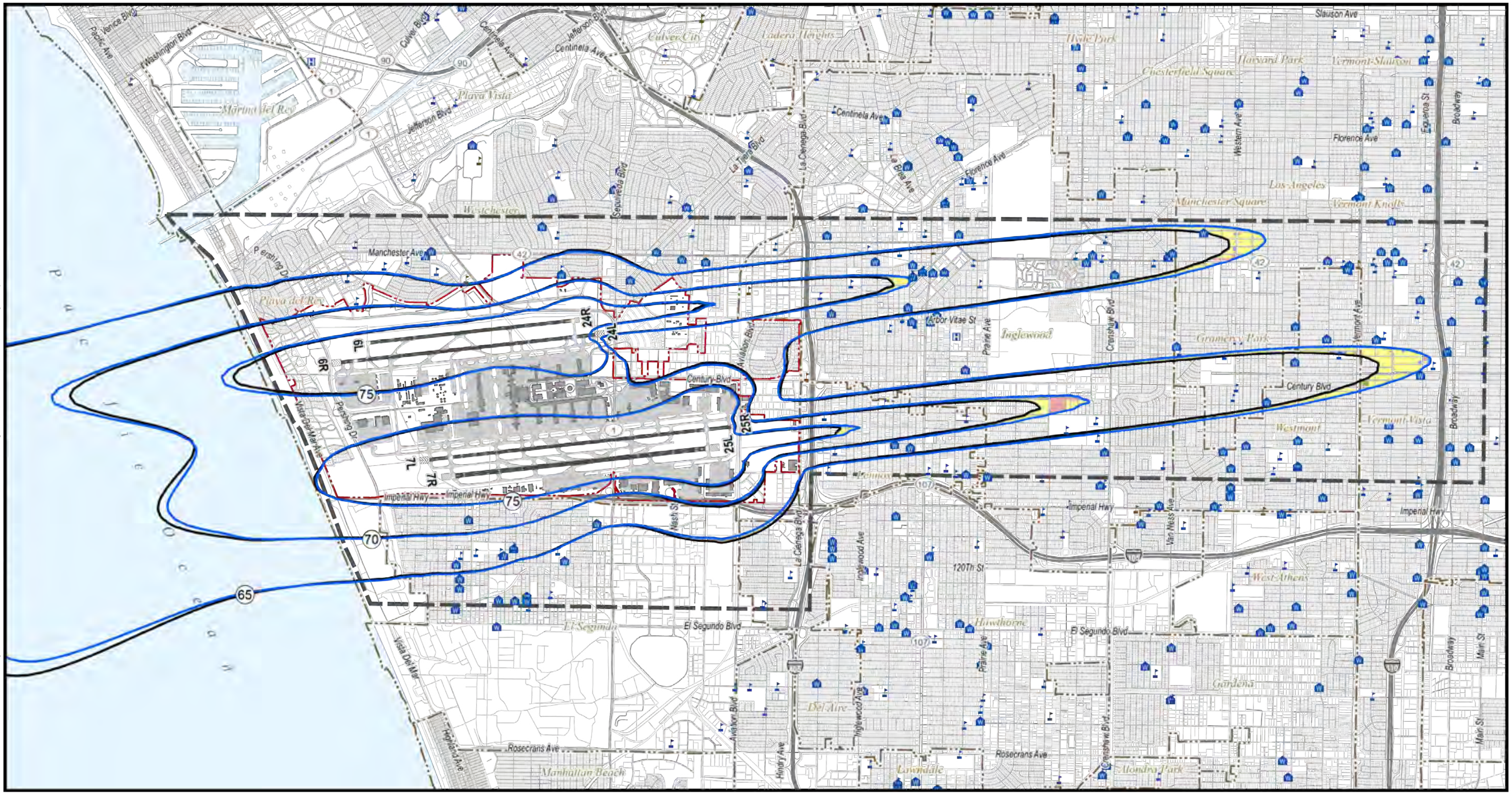
Figure 4.7.1-7 illustrates the aircraft noise contours (65, 70, and 75 CNEL) projected to occur in 2028 (the buildout year of the proposed Project) and identifies the land uses that would be newly exposed as compared to 2018 baseline conditions. **Figure 4.7.1-8** identifies the area that is projected to experience a 1.5 dBA increase in noise exposure levels within the 65 CNEL contour relative to 2018 baseline conditions.

Table 4.7.1-11 identifies the population, number of housing units, and acreage within the various CNEL - ranges that would be affected by the proposed Project in 2028, and provides a comparison to existing baseline conditions. **Table 4.7.1-12** provides similar information for other noise-sensitive uses, such as houses of worship, schools, libraries, hospitals, and colleges, with a comparison between 2028 and existing baseline conditions.

Two additional figures, **Figure 4.7.1-9** and **Figure 4.7.1-10**, are included for informational purposes. Figure 4.7.1-9 compares the 2028 65-75 CNEL noise contours with implementation of the proposed Project with the contours that would occur in the Future Without Project scenario in 2028 (2028 Without Project), as well as to 2018 baseline conditions. Figure 4.7.1-10 depicts the area that would experience a 1.5 dBA increase in noise exposure under the 2028 Without Project scenario as compared to baseline conditions. Table 4.7.1-11 and Table 4.7.1-12 provide the corresponding data associated with the 2028 Without Project scenario.

4.7.1.5.1 Impact 4.7.1-1

Summary Conclusion for Impact 4.7.1-1: Implementation of the proposed Project would generate operational aircraft noise that would increase noise levels at exterior use areas of residences, schools, hospitals, and places of worship to 65 CNEL or above during operations, as compared to existing baseline conditions; this would be a significant operational impact. In addition, the proposed Project would generate temporary construction-related increases in aircraft noise levels in 2023 and 2024 that would increase noise levels to 65 CNEL or above, as compared to conditions without the proposed Project; this would be a significant short-term, construction-related impact. Even with mitigation, the operational impact would remain *significant and unavoidable*. Similarly, the construction-related impact would remain *significant and unavoidable*, although this impact would only be short-term (i.e., approximately 4.5 months).



Legend

- 2018 Baseline CNEL Contours (65-75 dB)
- 2028 Forecast "Proposed Project" CNEL Contours (65-75 dB)
- Land Use Study Area
- LAX Property Boundary
- Municipal Boundary
- Runway
- Airport Buildings
- Airport Pavement
- Residential Use
- Public Use
- Recreational / Open Space
- Commercial Use
- Manufacturing and Production
- Vacant / Undefined
- School
- College
- Hospital
- Place of Worship

N

0 4,000 8,000 Feet

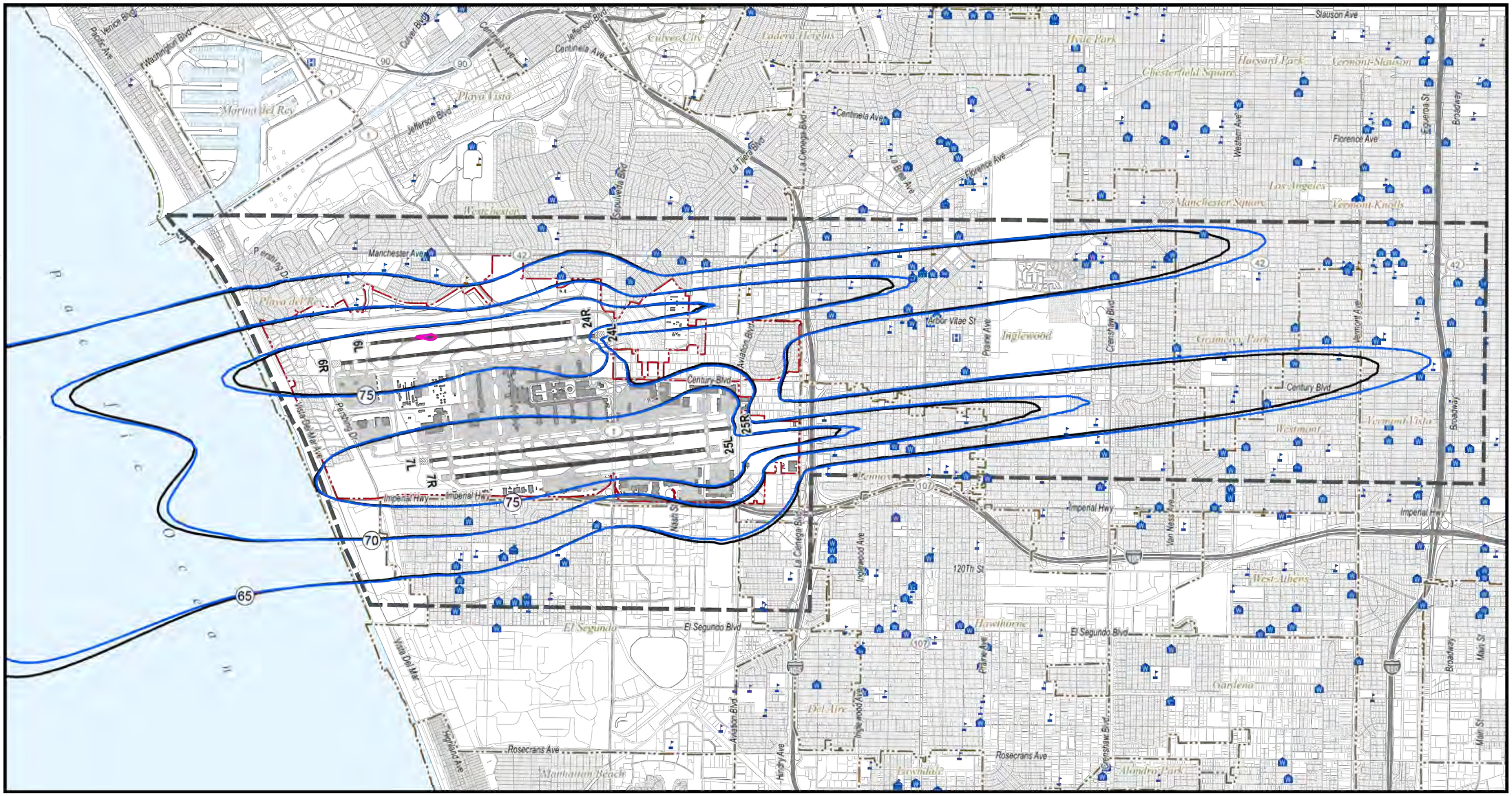
Scale

Source: HMMH, June 2020
Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Aircraft Noise Contours (65-75 CNEL): 2028 Proposed Project Compared to Baseline (2018) Conditions

Figure 4.7.1-7



Legend

- 2018 Baseline CNEL Contours (65-75 dB)
- 2028 Forecast "Proposed Project" CNEL Contours (65-75 dB)
- 1.5 dB or Greater Increase Contour
- Land Use Study Area
- LAX Property Boundary
- Municipal Boundary
- Runway
- Airport Buildings
- Airport Pavement
- School
- College
- Hospital
- Place of Worship

N

0 4,000 8,000 Feet

Scale

Source: HMMH, June 2020

Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

1.5 dBA Increase within the 65 CNEL Contour: Proposed Project (2028) Compared to Baseline (2018) Conditions

Figure

4.7.1-8

Table 4.7.1-11
Estimated Population, Housing Units, and Acreage within the Aircraft Noise Contours under Existing Baseline and Future Conditions

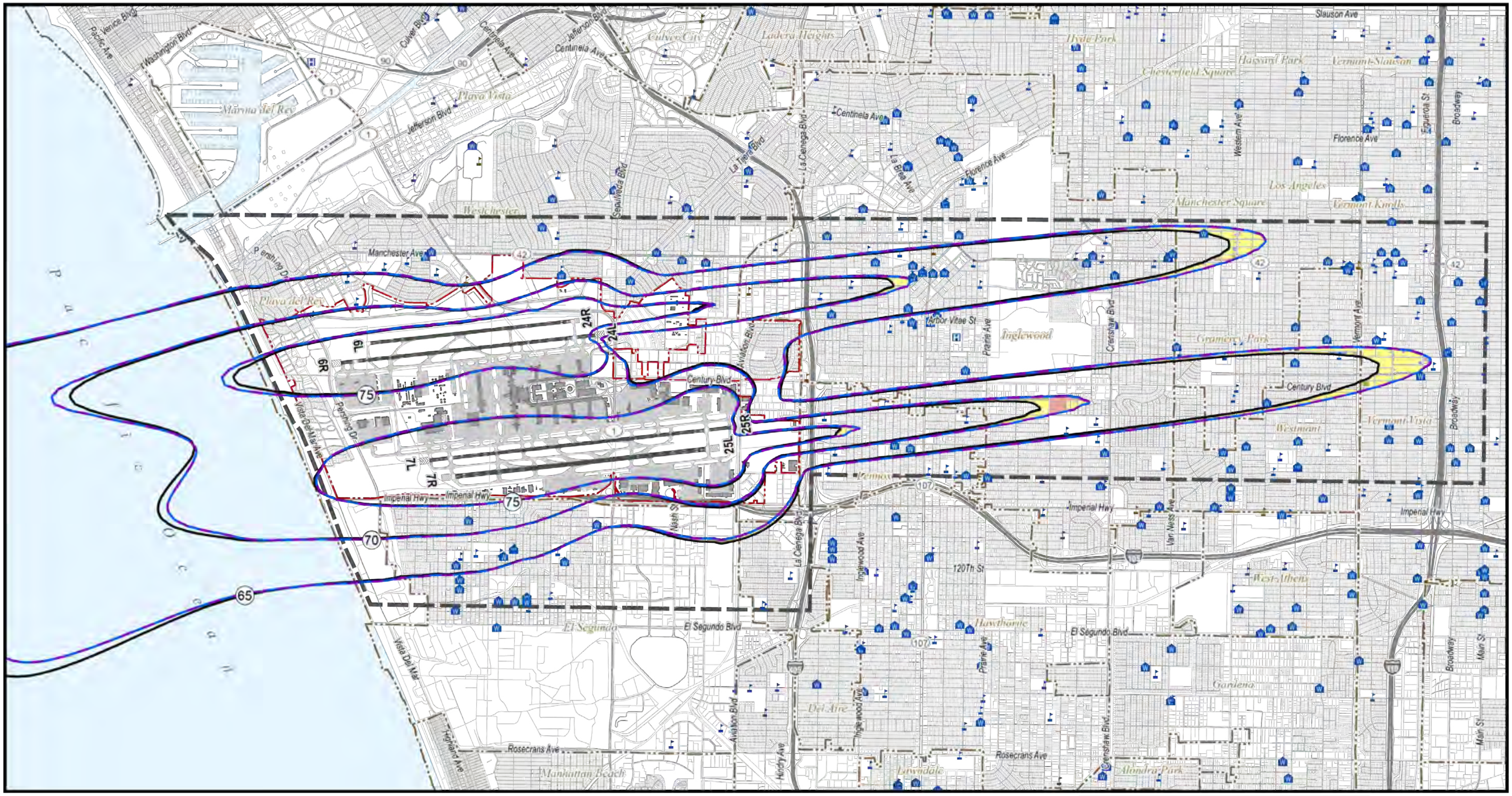
	Population				Housing Units				Acreage			
	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total
Existing Baseline Conditions (2018)	56,632	16,499	780	73,911	20,938	4,819	303	26,060	7,616	3,462	2,259	13,338
2028 Conditions												
2028 With Project Conditions												
2028 With Project	61,311	19,596	1,183	82,090	22,651	5,660	413	28,724	7,821	3,520	2,317	13,658
Difference between 2028 With Project and Existing Baseline Conditions	**4,679**	**3,097**	**403**	**8,179**	**1,713**	**841**	**110**	**2,664**	**205**	**58**	**58**	**320**
2028 Without Project Conditions												
2028 Without Project	61,311	19,596	1,183	82,090	22,651	5,660	413	28,724	7,820	3,520	2,317	13,658
Difference Between 2028 With Project and 2028 Without Project	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Source: HMMH, 2020.

Table 4.7.1-12
Other Noise-Sensitive Uses within the Aircraft Noise Contours under Existing Baseline (2018) and Future (2028) Conditions

	House of Worship				School				Library				Hospital				College				Total of All Uses			
	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total	65-70 CNEL	70-75 CNEL	>75 CNEL	Total
Existing Baseline Conditions	24	1	0	25	24	4	0	28	2	0	0	2	0	0	0	0	0	1	0	1	50	6	0	56
2028 Conditions																								
2028 With Project Conditions																								
2028 With Project	24	1	0	25	25	4	0	29	3	0	0	3	0	0	0	0	1	1	0	2	53	6	0	59
Difference between 2028 With Project and Existing Baseline Conditions	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**3**	**0**	**0**	**3**
2028 Without Project Conditions																								
2028 Without Project	24	1	0	25	25	4	0	29	3	0	0	3	0	0	0	0	1	1	0	2	53	6	0	59
Difference between 2028 With Project and 2028 Without Project	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Source: HMMH, 2020.



Legend

2018 Baseline CNEL Contours (65-75 dB)	Land Use Study Area	Residential Use	School
2028 Forecast “Without Project” CNEL Contours (65-75 dB)	LAX Property Boundary	Public Use	College
2028 Forecast “Proposed Project” CNEL Contours (65-75 dB)	Municipal Boundary	Recreational / Open Space	Hospital
	Runway	Commercial Use	Place of Worship
	Airport Buildings	Manufacturing and Production	
	Airport Pavement	Vacant / Undefined	

Note: There is no difference between “Without Project” and “Proposed Project” relative to 2028 Aircraft Noise Contours.

0 4,000 8,000 Feet

Scale

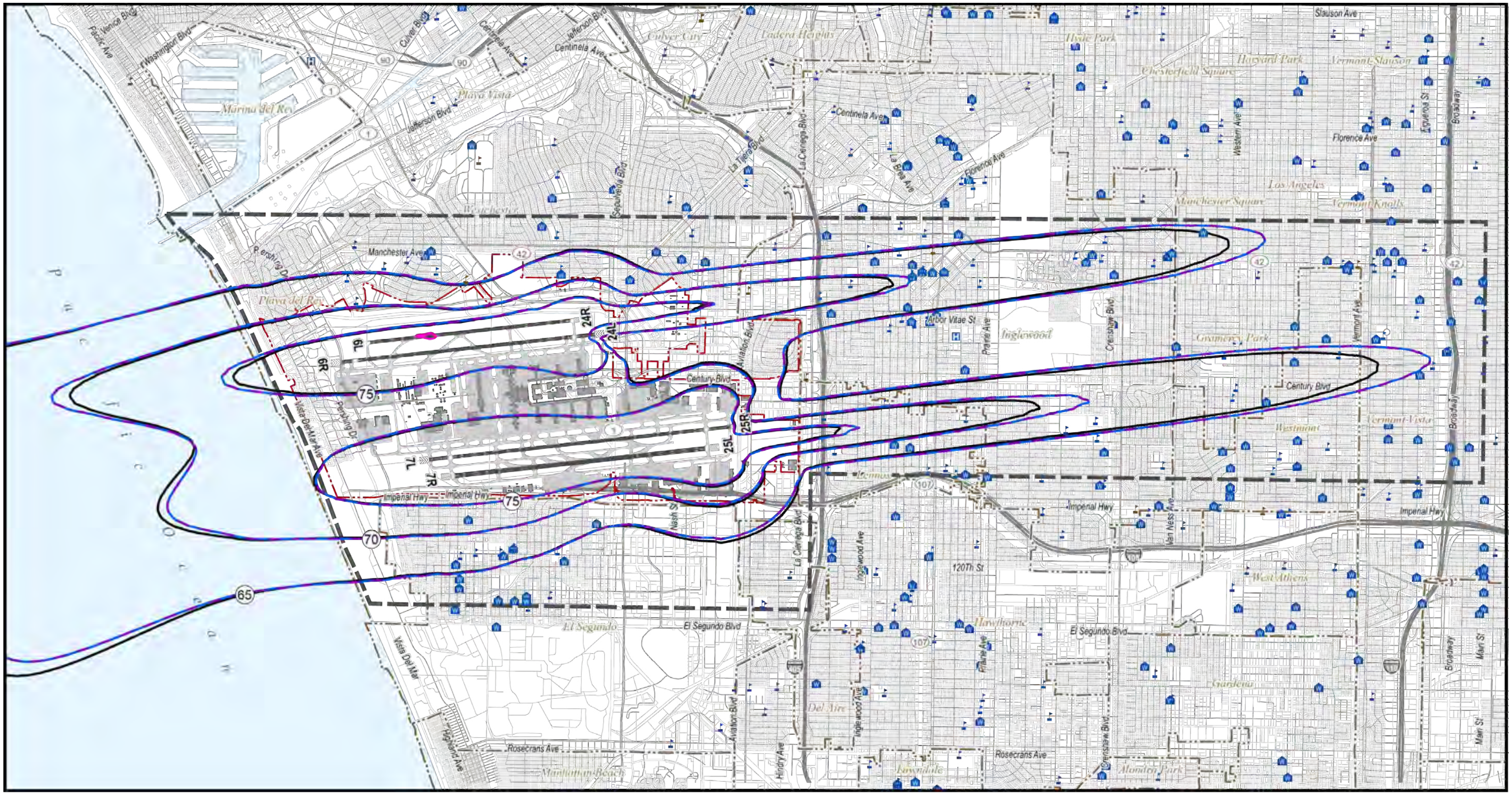
Source: HMMH, June 2020

Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

Aircraft Noise Contours (65-75 CNEL): 2028 Without Project Compared to 2028 Proposed Project and Baseline (2018) Conditions

Figure 4.7.1-9



Legend

- 2018 Baseline CNEL Contours (65-75 dB)
- 2028 Forecast "Without Project" CNEL Contours (65-75 dB)
- 2028 Forecast "Proposed Project" CNEL Contours (65-75 dB)
- 1.5 dB or Greater Increase Contour
- Land Use Study Area
- LAX Property Boundary
- Municipal Boundary
- Runway
- Airport Buildings
- Airport Pavement
- School
- College
- Hospital
- Place of Worship

Note: There is no difference between "Without Project" and "Proposed Project" relative to 1.5 dB or Greater Increase Contour.

0 4,000 8,000 Feet

Scale

Source: HMMH, June 2020

Prepared by: CDM Smith, October 2020

LAX Airfield and Terminal Modernization Project

1.5 dBA Increase within the 65 CNEL Contour: 2028 Without Project Compared to 2028 Proposed Project and Baseline (2018) Conditions

Figure **4.7.1-10**

4.7.1.5.1.1 Construction

Construction of the improvements in the north airfield (i.e., enabling projects, taxiway extensions, and reconfigured runway exits) would occur from approximately 2021 through 2025, with the runway exits constructed in 2023 and 2024. The construction of the runway exits would require the temporary closures of Runway 6L-24R (north airfield runway farthest from the Central Terminal Area [CTA]) and Runway 6R-24L (north airfield runway closest to the CTA) for approximately 4.5 months each in 2023 and 2024, respectively. During these runway closures, aircraft operations would be temporarily reassigned to the remaining three runways. This, in turn, would result in temporary changes in the aircraft noise contours. The temporary impacts of these short-term runway closures are evaluated below.

Temporary Closure of Runway 6L-24R in 2023

As described in Section 4.7.1.3.1.3, the utilization of runways at LAX is subject to the Preferential Runway Use Procedure whereby LAWA prefers that, during daytime and evening hours (7:00 a.m. to 10:00 p.m.), the outer runways are reserved for arrivals and the inner runways are used for departures. As such, Runway 6L-24R is normally used primarily for arrivals.

Runway 6L-24R would be temporarily closed (for approximately 4.5 months) in 2023 to construct runway exit improvements. With its temporary closure in 2023 for construction of airfield improvements, it is anticipated that arrivals would be reassigned to Runway 6R-24L and Runway 7R-25L. FAA would assign the runway to maintain a balanced airfield, similar to existing arrival use between north and south airfields. There would be situations, based on demand, when FAA would assign arrivals that would normally have been assigned Runway 6L-24R to Runway 7R-25L instead of to Runway 6R-24L. Similarly, although all types of departures (large and heavy for all destinations) can be accommodated on Runway 6R-24L, FAA may assign a departure that would normally have been assigned to Runway 6R-24L to Runway 7L-25R instead of Runway 6R-24L in order to provide a better balance between north and south airfields and to enable arrivals to be accommodated on Runway 6R-24L. The number of departures assigned to Runway 7L-25R would not necessarily be equivalent to what would be expected when Runway 6R-24L is closed. In general, the reassignment of arrivals to Runway 6R-24L and Runway 7R-25L would result in temporary aircraft noise increases in areas east of the airport along the aircraft approach route to these two runways. This is anticipated to include areas where noise-sensitive uses, primarily residential development, are already exposed to 65 CNEL and above (see Figure 4.7.1-6), as well as some areas with noise-sensitive uses that would be newly exposed, on a temporary basis, to 65 CNEL and above.

LAWA provides public notifications of upcoming temporary changes in aircraft operations, including those associated with temporary runway closures. Such notifications are intended to help promote public awareness and understanding of aircraft noise issues that may temporarily affect noise-sensitive uses such as residential areas in the communities around LAX, including noticeable changes in aircraft flight activity and associated noise. The notifications include the anticipated date(s) and time period(s) of upcoming planned runway closures, the affected runway, the reason for the closure, a description of the anticipated change in aircraft operations, and a hyperlink to more detailed information. Such notifications are currently provided on a monthly basis, with updates or changes to existing schedules provided if/as needed. Such notices would similarly promote public awareness of the temporary changes in aircraft flight activity and anticipated noise associated with temporary closure of Runway 6L-24R.

In summary, the temporary closure of Runway 6L-24R and resultant reassignment of arriving aircraft to other runways would result in temporary changes in aircraft noise exposure levels in nearby areas, including temporary increases in areas with noise-sensitive uses already exposed to 65 CNEL and above, as well as some areas with noise-sensitive uses that would be newly exposed, on a temporary basis, to 65 CNEL and above. As such, it is expected that the proposed Project would generate temporary, construction-related increases in operational aircraft noise levels in 2023 from the short-term closure of

Runway 6L-24R that would increase noise levels to 65 CNEL or above, as compared to conditions without the proposed Project. Such increases would be a short-term (i.e., 4.5-month) ***significant impact***. It should be noted that the aforementioned temporary changes in CNEL account for impacts related to sleep disturbance in that the CNEL metric includes penalties for noise events occurring in evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours (10:00 p.m. to 7:00 a.m.), as explained in Section 4.7.1.1.3.

Temporary Closure of Runway 6R-24L in 2024

As noted above, the utilization of runways at LAX is subject to the Preferential Runway Use Procedure whereby LAWA prefers that, during daytime and evening hours (7:00 a.m. to 10:00 p.m.), the outer runways are reserved for arrivals and the inner runways are used for departures. As such, Runway 6R-24L is normally used primarily for departures.

Once runway exit improvements have been made in the vicinity of Runway 6L-24R, Runway 6R-24L would be temporarily closed (for approximately 4.5 months) in 2024 to construct the remaining runway exit improvements. Although some departures may be temporarily reassigned to Runway 6L-24R (i.e., the outboard runway in the north airfield) during the closure of Runway 6R-24L, Runway 6L-24R is much shorter than Runway 6R-24L (i.e., approximately 8,900 feet compared to approximately 10,900 feet), which would limit the ability of certain aircraft (larger than ADG III traveling 3,000 nautical miles [NM] or more) to depart on Runway 6L-24R. Therefore, during the temporary closure of Runway 6R-24L, it is anticipated that departures of large aircraft that would normally use that runway would instead be reassigned to Runway 7L-25R, which is the primary departure runway in the south airfield. To the extent that the reassignment of some departing flights to Runway 6L-24R does occur, some arrivals that would normally occur on Runway 6L-24R could be assigned to Runway 7R-25L, which is the primary arrivals runway in the south airfield. The reason for this is that an aircraft departure on a runway takes more time to clear than an aircraft arrival on a runway. Therefore, in order to maintain the flow of arrivals at LAX during the temporary closure of Runway 6R-24L, not only would departures likely be reassigned, it is anticipated that some arrivals may also be reassigned.

Given that the vast majority (approximately 94 percent) of aircraft departures at LAX are towards the west, it is anticipated that the temporary changes in aircraft noise levels associated with reassignment of departures from Runway 6R-24L would largely occur in areas near the southwest edge of LAX as a result of the reassignment of most of the departures to Runway 7L-25R. Such temporary increases in aircraft noise exposure levels are anticipated to include areas with noise-sensitive uses, primarily residential development, already exposed to 65 CNEL and above (see Figure 4.7.1-6), as well as some areas with noise-sensitive uses that would be newly exposed, on a temporary basis, to 65 CNEL and above. Although, as noted above, some of the departures that normally use Runway 6R-24L would be reassigned to Runway 6L-24R, the potential for a temporary increase in aircraft noise levels in areas near the northwest edge of LAX would be offset by the fact that there would be no aircraft operations on Runway 6R-24L. In other words, areas to the northwest currently experience aircraft noise exposure levels associated with all of the arrivals that normally occur on Runway 6L-24R, as well as all of the departures that normally occur on Runway 6R-24L. Although some departures would be temporarily reassigned to Runway 6L-24R, which is closer to those areas, most of the departures would be reassigned to the south airfield, which is much farther away, and the total aircraft operations in the north airfield would be reduced.

The expected reassignment of some arrivals from Runway 6L-24R to Runway 7R-25L has the potential to result in temporary aircraft noise increases in areas east of the airport along the aircraft approach route to Runway 7R-25L. This is anticipated to include areas with noise-sensitive uses, primarily residential development, already exposed to 65 CNEL and above (see Figure 4.7.1-6), as well as some areas where noise-sensitive uses would be newly exposed, on a temporary basis, to 65 CNEL. In summary, the temporary closure of Runway 6R-24L and resultant reassignment of aircraft operations to other runways would result in temporary changes in aircraft noise exposure levels in nearby areas, including temporary increases in areas with noise-sensitive uses, primarily residential development, already exposed to 65 CNEL and above, as well as in some areas with noise-sensitive uses that would be newly exposed, on a temporary basis, to 65 CNEL and above. As such, it is expected that the proposed Project would generate temporary, construction-related increases in operational aircraft noise levels in 2024 from the short-term closure of Runway 6R-24L that would increase noise levels to 65 CNEL or above, as compared to conditions without the proposed Project. Such increases would be a short-term (i.e., 4.5-month) ***significant impact***. It should be noted that, as indicated earlier, the aforementioned temporary changes in CNEL account for impacts related to sleep disturbance in that the CNEL metric includes penalties for noise events occurring in evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours (10:00 p.m. to 7:00 a.m.), as explained in Section 4.7.1.1.3.

4.7.1.5.1.2 Operations

As shown in Figure 4.7.1-7, the 65 CNEL contours projected to occur in 2028 with implementation of the proposed Project[44] extend beyond the 65 CNEL contours under existing baseline conditions at the east end of the contours; there would be very little change along the sides of the contours or at the west end, which is over open ocean. As indicated in Table 4.7.1-11, an additional 4,679 people and 1,713 housing units are expected to be located within the 65-70 CNEL contour compared to existing baseline conditions. As noted above, changes in CNEL account for impacts related to sleep disturbance in that the CNEL metric includes penalties for noise events occurring in evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours (10:00 p.m. to 7:00 a.m.). As shown in Table 4.7.1-12, one additional school, library, and college would be located within the 65-70 CNEL contour with implementation of the proposed Project as compared to existing baseline conditions. There would be no increase in the number of houses of worship or hospitals within the 65-70 CNEL contour. These increases in population, housing units, and noise-sensitive uses newly exposed to 65 CNEL or greater would be a ***significant impact***.

As noted in the introductory text to Section 4.7.1.5, aircraft noise impacts in 2028 with implementation of the proposed Project were compared to aircraft noise impacts in the 2028 Without Project scenario for informational purposes. As illustrated in Figure 4.7.1-9, the 65, 70, and 75 CNEL contours for the 2028 Without Project scenario would be the same as for the proposed Project relative to existing baseline conditions. Further, as shown in Tables 4.7.1-11 and 4.7.1-12, the increases in population, housing units, and noise-sensitive uses newly exposed to 65 CNEL or greater would be the same in both scenarios (i.e., the aircraft noise impacts on population, housing units, and noise-sensitive uses attributed to the proposed Project would occur even if the proposed Project were not implemented).

4.7.1.5.1.3 Mitigation Measures

Construction

Mitigation of aircraft noise exposure impacts has been completed or is ongoing through sound attenuation of structures, as accomplished through the City of Los Angeles Residential Soundproofing Program or Residential Sound Insulation Programs of eligible surrounding jurisdictions and school districts, as funded through LAX's Sound Insulation Grant Program. It is likely that some of the noise-sensitive uses that would experience a temporary increase in aircraft noise levels during the short-term (4.5-month) closures of Runways 6R-24L and 6L-24R are already exposed to aircraft noise levels of 65 CNEL or greater and have been mitigated through sound insulation, are in the process of receiving sound insulation, or have declined to receive offered sound insulation. For noise-sensitive uses that would be newly exposed to 65 CNEL during the short-term runway closures and that have not previously received mitigation, it is not practical or feasible to implement sound attenuation

44 If projected aircraft operations for 2028 do not fully materialize as a result of reduced demand for air travel, impacts in 2028 would be less than described herein.

improvements for a temporary, specifically a 4.5-month, period. Federal regulations (49 U.S.C. § 47107) restrict use of airport revenues to capital or operating cost of the airport or airport system, and the FAA does not permit the use of airport revenue to implement sound insulation for interim noise impacts, or to insulate homes outside of the 65 DNL contour.[45] In addition, standard noise mitigation such as shielding or noise barriers, which are placed between noise receptors and noise sources to attenuate sound waves by physically blocking them, cannot effectively attenuate moving airborne noise sources. As such, there are no feasible mitigation measures for interim aircraft noise impacts that would occur during runway exit construction.

Operations

As noted above, when comparing impacts of the proposed Project to baseline conditions, the proposed Project is anticipated to generate aircraft noise that would result in significant impacts at housing units and at other noise-sensitive uses, including a school, a library, and a college. These impacts would occur as a result of growth in passenger activity and aircraft operations that is anticipated to occur at LAX by 2028[46] with or without the proposed Project. Mitigation proposed to reduce significant impacts related to aircraft noise is provided below.

- **MM-AN (ATMP)-1. Sound Insulation Programs.**

  To mitigate significant impacts to noise-sensitive uses that are newly exposed to 65 dBA CNEL or greater from airport operations in future years of the proposed Project, LAWA will update the Noise Exposure Maps (NEM) for LAX in accordance with Title 14 CFR Part 150, prior to project completion. The NEM is the legal document required by FAA to identify noise-sensitive land uses potentially eligible for noise mitigation funding through the FAA's Airport Improvement Program. LAWA will complete the NEM Report and coordinate with FAA to identify any noise-sensitive land uses eligible for noise mitigation and, in accordance with FAA regulations and guidance, apply for noise mitigation funding for eligible noise-sensitive uses. LAWA will work with the appropriate jurisdiction(s) to determine/establish an appropriate implementation program for any eligible noise mitigation. Property owners' eligibility for noise mitigation will be based upon FAA requirements and the LAX Part 150 NEM in effect at the time of operation or completion of the Project.

4.7.1.5.1.4 Significance of Impact After Mitigation

Construction

As indicated above, there are no feasible mitigation measures available for the temporary aircraft noise impacts associated with the 4.5-month closure of each of the north runways during construction of the proposed airfield improvements. As such, the short-term impact associated with aircraft noise exposure during construction would be ***significant and unavoidable***.

Operations

Expansion of the LAX Sound Insulation Programs, as set forth in Mitigation Measure MM-AN (ATMP)-1, provides the basis for eligible dwellings and non-residential noise-sensitive facilities that are newly exposed to noise levels 65 CNEL or higher to undergo sound attenuation. To the extent that sound insulation of individual eligible structures is not in place by the time the expanded 65 CNEL aircraft noise levels occur, there could be ***significant and unavoidable interim noise impacts*** experienced over an indeterminate period of time. In addition, certain residential uses with outdoor private habitable areas

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45 U.S. Department of Transportation, Federal Aviation Administration, *Memorandum: Program Guidance Letter 12-09 AIP Eligibility and Justification Requirements for Noise Insulation Projects*, August 17, 2012.

46 If projected aircraft operations for 2028 do not fully materialize as a result of reduced demand for air travel, impacts in 2028 would be less than described herein.

could experience exterior noise levels of 65 CNEL or greater even though interior noise levels may be mitigated through the sound insulation occurring through MM-AN (ATMP)-1. These outdoor noise impacts would also be ***significant and unavoidable***. In addition, standard noise mitigation such as shielding or noise barriers, which are placed between noise receptors and noise sources to attenuate sound waves by physically blocking them, cannot effectively attenuate moving airborne noise sources. As such, these measures are not feasible mitigation measures for operational aircraft noise impacts.

4.7.1.5.2 Impact 4.7.1-2

Summary Conclusion for Impact 4.7.1-2: (1) Operations: Operation of the proposed Project in 2028 would not cause ambient noise levels to increase by 1.5 dBA or more, as compared to existing baseline conditions.[47] This would be a *less than significant* impact for operations. (2) Construction: The proposed Project could cause a temporary construction-related increase in aircraft noise levels of 1.5 dBA or more in 2023 and 2024, as compared to conditions without the proposed Project. This would be a *significant and unavoidable impact* for construction, although the construction-related impact would only be short-term (i.e., approximately 4.5 months in each year).

4.7.1.5.2.1 Construction

As discussed in Section 4.7.1.5.1.1, the short-term closure of Runway 6L-24R and resultant reassignment of arrivals to other runways is anticipated to result in temporary increases in aircraft noise levels in areas east of LAX. The short-term closure of Runway 6R-24L is anticipated to result in temporary increases in aircraft noise levels, including increases near the southwestern edge of LAX, and increases in areas east of the airport, due to temporary aircraft reassignments. The temporary increases in aircraft noise exposure levels associated with short-term closures of Runway 6L-24R and Runway 6R-24L are anticipated to include noise-sensitive areas whose ambient noise levels attributable to airport operations already exceed 65 CNEL or greater. The increases in noise levels associated with the runway closures may cause ambient noise levels in these areas to temporarily increase by 1.5 dBA or more. LAWA public notifications of the temporary runway closure would promote public awareness of the temporary changes in aircraft flight activity and anticipated noise associated with temporary closures of Runway 6L-24R and Runway 6R-24L. The possible temporary 1.5 dBA or more increase in ambient noise levels in noise-sensitive areas within the 65 CNEL contour as a result of each temporary runway closure would be a ***significant impact***.

4.7.1.5.2.2 Operations

Figure 4.7.1-8 identifies a small area where there would be a 1.5 dBA increase in the noise level within the 65 CNEL or greater noise contour in 2028 with implementation of the proposed Project as compared to existing baseline conditions. As shown in the figure, the 1.5 dBA increase contour would be confined to the immediate vicinity of Runway 6L-24R in the north airfield, and would not extend into the 65 CNEL contour or beyond the LAX boundary. There are no noise-sensitive uses in the 2028 1.5 dBA increase contour. Therefore, aircraft noise impacts to noise-sensitive areas related to a 1.5 dBA increase within the 65 CNEL contour as a result of operation of the proposed Project would be ***less than significant***.

As noted in the introductory text to Section 4.7.1.5, aircraft noise impacts in 2028 with implementation of the proposed Project were compared to aircraft noise impacts in the 2028 Without Project scenario for informational purposes. As illustrated in Figure 4.7.1-10, the 1.5 dBA increase contour for the 2028 Without Project scenario would be the same as for the proposed Project relative to baseline (2018) conditions. As shown, the 1.5 dBA increase contour would not extend into the 65 CNEL contour or beyond the LAX boundary, and no noise-sensitive uses would be affected.

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[47] Per the significance threshold, impacts related to ambient noise level increases of 1.5 dBA or more are only considered to be significant if they occur in noise-sensitive areas whose ambient noise levels attributable to airport operations exceed 65 CNEL or greater.

4.7.1.5.2.3 Mitigation Measures

Construction

As discussed in Section 4.7.1.5.1.3, it is likely that some of the noise-sensitive uses that may experience a temporary 1.5 dBA increase in ambient noise levels during the short-term (4.5 month) closures of Runways 6L-24R and 6R-24L are already exposed to aircraft noise levels of 65 CNEL or greater and have been mitigated through sound insulation, are in the process of receiving sound insulation, or have declined to receive offered sound insulation. For uses that would experience a 1.5 dBA increase in aircraft noise levels during the temporary runway closures and have not previously received mitigation, it is not practical or feasible to implement sound attenuation improvements for a temporary, specifically a 4.5-month, impact. For the same reasons as discussed above in Section 4.7.1.5.1.3, there are no feasible mitigation measures for interim aircraft noise impacts that would occur during runway exit construction.

Operations

The proposed Project would result in a ***less than significant impact*** from operations related to a 1.5 dBA increase within the 65 CNEL contour; no mitigation is required.

4.7.1.5.2.4 Significance of Impact After Mitigation

Construction

As indicated above, there are no feasible mitigation measures available for the temporary aircraft noise impacts associated with short-term runway closures during construction. As such, the short-term impact associated with exposure of noise-sensitive uses to a 1.5 dBA increase or greater within the 65 CNEL contour would be ***significant and unavoidable***.

Operations

Impacts related to exposure of noise-sensitive uses to a 1.5 dBA increase within the 65 CNEL contour relative to baseline conditions would be ***less than significant*** for operations.

4.7.1.5.3 Impact 4.7.1-3

Summary Conclusion for Impact 4.7.1-3: Implementation of the proposed Project would not affect classroom learning during construction or operations, which is defined as a substantial increase in aircraft-induced noise as compared to existing baseline conditions. This would be a *less than significant impact* for construction and operations.

4.7.1.5.3.1 Construction

As discussed in Section 4.7.1.5.1.1, the temporary runway closures are anticipated to result in temporary increases in aircraft noise in the area at the southwest edge of LAX and in the areas to the east of LAX. The resultant temporary changes in the aircraft noise contours could result in some schools being exposed to increased noise levels.

As can be seen in Figure 4.7.1-6, there are no schools located at the immediate southwest edge of LAX, but there are several schools located farther to the south; there are also several schools to the east of LAX, along the approach path. There is a potential that some of the schools could experience increased noise levels associated with the reassignment of flights during the temporary runway closures. However, given the short duration of such increased noise levels, if any, (i.e., 4.5 months), the temporary runway closures would not cause a substantial increase in the amount of time that increased aircraft-induced noise would affect classroom learning, as compared to conditions without the runway closures. As such, the temporary construction-related impact to classroom learning would be ***less than significant.***

4.7.1.5.3.2 Operations

As illustrated in Figure 4.7.1-7, the 65 CNEL contours projected to occur in 2028 with implementation of the proposed Project extend beyond the 65 CNEL contours under existing baseline conditions at the east end of the contours; there would be very little change along the sides of the contours or at the west end, which is over open ocean. As shown in Table 4.7.1-12, there are 24 schools located within the 65-70 CNEL contour under existing baseline conditions; this would increase to 25 schools with implementation of the proposed Project in 2028.

Table 4.7.1-13 identifies changes in school exposure to aircraft noise with implementation of the proposed Project in 2028 as compared to existing baseline conditions. As shown in the table, under the proposed Project, the same number of schools is projected to be exposed to interior single event noise levels greater than 55 dBA (L_{max}), which is the level at which momentary disruption of speech intelligibility occurs in large group settings (i.e., at a distance of 20 feet). The overall number of individual noise events at schools would remain the same as existing baseline conditions and the average duration per event would decrease by 1 second compared to existing baseline conditions. No schools would be exposed to interior single event noise levels greater than 65 dBA (L_{max}), which is the level at which momentary disruption of speech intelligibility occurs in small group settings (i.e., at a distance of 6 feet), under either existing baseline conditions or with implementation of the proposed Project.

Table 4.7.1-13
School Exposure to Aircraft Noise - Proposed Project Compared to Existing Baseline Conditions

Impact Category	Existing Baseline Conditions	Proposed Project	Newly Exposed
Exposure to >= 55 dBA (L_{max})			
Number of Schools	7	7[1]	0
Average Number of Events per School	13	13	N/A
Average Seconds per Event	4	3	N/A
Exposure to >= 65 dBA (L_{max})			
Number of Schools	0	0	0
Exposure to >= 35 dBA ($L_{eq[h]}$)			
Number of Schools	7	7	0

Source: HMMH, 2020.

Note:

1 Although AEDT indicates a very minor decrease in exposure (0.1 minute or 6 seconds) at one school, a conservative approach is being taken to identify that school as exposed.

Table 4.7.1-14 identifies the names and locations of the schools that would be exposed to interior single event noise levels above 55 dBA (L_{max}). As shown in the table, although two schools would experience an increase in the number of events that would result in elevated interior noise levels, the average duration of the events at these schools would be lower than existing baseline conditions, and the total amount of time that the schools would be exposed to elevated interior noise levels would be the same as, or lower than, existing baseline conditions.[48] Single events at one school would be of longer duration as compared to existing baseline conditions, but the number of events would be lower; the total amount of time that

48 The main factor in this result is the aircraft fleet and the changes in fleet mix between 2018 and the 2028. Given that this is a single event noise metric and is measured in terms of duration above a certain threshold, aircraft types and associated fleet mix in the future are quieter; hence, the result would be less duration above the threshold level.

the school would be exposed to elevated interior noise levels would be the same as existing baseline conditions.

Table 4.7.1-14
Schools Exposed to Noise Above Interior dBA Speech Interference Levels[1]
During the Average School Day[2] – Proposed Project Compared to Existing Baseline Conditions

School	TA-84 (minutes)[3]		# Events above Threshold[4]		Avg. Duration (seconds)[5]	
	Baseline (2018)	Proposed Project	Baseline (2018)	Proposed Project	Baseline (2018)	Proposed Project
Spartan College of Aeronautics and Technology - Inglewood Campus	2.0	1.9	36.0	**39.3**	3.3	2.9
Dolores Huerta Elementary School	0.9	0.6	14.7	11.8	3.7	3.0
Felton Elementary School	0.7	0.5	11.3	9.4	3.7	3.2
ICEF Inglewood Middle School	0.1	0.1	1.5	1.0	3.9	**5.9**
Inglewood Continuation High School	0.2	0.1	3.1	2.5	3.9	2.4
Missionette Christian Academy	0.1	0.0	1.5	1.0	4.0	0.0
Oak Street Elementary School	1.0	1.0	23.3	**23.7**	2.6	2.5

Source: HMMH, 2020.

Notes:
Items in **Bold** identify conditions under the proposed Project that would be greater than existing baseline conditions.

1 Interior dBA speech interference level is 55 dBA L_{max}.
2 Average school day is assumed to be 8:00 a.m. to 4:00 p.m.
3 Total number of minutes (events multiplied by average durations) per school day that exceed an exterior noise level of 84 decibels Lmax, which equates to an interior noise level of 55 dBA L_{max} at indicated school.
4 Number of events to which the site is exposed on an average annual school day that exceed 84 dBA.
5 Average duration of each event in seconds during the average annual school day that exceeds 84 dBA L_{max}.

Table 4.7.1-15 identifies schools that would be exposed to steady-state (i.e., 8-hour average) noise levels exceeding 35 L_{eq}(h). As shown in the table, implementation of the proposed Project in 2028 would not result in additional schools being newly exposed to 35 L_{eq}(h) as compared to existing baseline conditions. However, as also shown in the table, the steady-state noise level would increase by a small margin (0.2 to 0.4 dBA L_{eq}) at every affected school.

Table 4.7.1-15
Schools Exposed to Exceedances of ANSI Steady-State Noise Level[1]
During the Average School Day[2] – Proposed Project Compared to Existing Baseline Conditions

School	8-Hour dBA L_{eq} Values[3] (2018)		
	Existing Baseline	Proposed Project	Change
Spartan College of Aeronautics and Technology - Inglewood Campus	38.1	38.4	0.3
Dolores Huerta Elementary School	36.7	37.1	0.4
Felton Elementary School	36.0	36.4	0.4
ICEF Inglewood Middle School	35.1	35.4	0.3
Inglewood Continuation High School	36.6	36.8	0.2
Missionette Christian Academy	35.0	35.3	0.3
Oak Street Elementary School	37.1	37.4	0.3

Source: HMMH, 2020.

Notes:

1 The ANSI interior hourly average noise standard was designed to keep interfering steady-state noise at or below an hourly L_{eq} of 35 dBA in the classroom during typical school hours.

2 Average school day is assumed to be 8:00 a.m. to 4:00 p.m.

3 Noise levels were computed by converting 24-hour exterior L_{eq} data to 8-hour exterior L_{eq} data by adding 4.8 L_{eq} to the computed 24-hour level, and then subtracting 28.8 decibels from exterior to interior attenuation produced by average construction techniques at area schools (as measured by LAWA), to result in interior hourly L_{eq} values.

In summary, although the number of single events that would exceed interior noise levels of 55 dBA (i.e., as measures by TA-84) would increase at two schools, and the average duration of single events would increase at a third school, the total amount of time that any school would be exposed to interior noise levels that exceed the 55 dBA metric would decrease at all seven of the affected schools. Moreover, no new schools would be exposed to steady-state noise levels exceeding 35 dBA L_{eq}(h), and the seven schools that are already exposed to noise levels in excess of this metric would experience small imperceptible increases in average daily noise levels. Therefore, implementation of the proposed Project in 2028 would not cause a substantial increase in the amount of time that aircraft-induced noise would affect classroom learning, as compared to baseline conditions. The impact of the proposed Project on classroom learning would be ***less than significant***.

As noted in the introductory text to Section 4.7.1.5, aircraft noise impacts in 2028 with implementation of the proposed Project were compared to aircraft noise impacts in the 2028 Without Project scenario for informational purposes. With respect to classroom learning, changes in exposure to noise levels that would affect classroom learning would be the same as for the proposed Project relative to existing baseline conditions because the same projected future aircraft operations would occur even if the proposed Project is not implemented. As with the proposed Project, no impacts to classroom learning would occur under the 2028 Without Project scenario.

4.7.1.5.3.3 Mitigation Measures

Because construction and operation of the proposed Project would result in a ***less than significant impact*** relative to classroom learning, no mitigation is required.

4.7.1.5.3.4 Significance of Impact After Mitigation

As indicated above, no mitigation is required to address construction or operational impacts relative to classroom learning. The proposed Project would result in a ***less than significant impact***.

4.7.1.6 Cumulative Impacts

The potential for cumulative aircraft noise impacts is defined primarily by current and reasonably foreseeable future operations at LAX. As a result, the geographic area of the cumulative analysis of aircraft noise is the area that lies beneath the LAX flight path, including the area that is within the LAX 65 dBA CNEL noise contours and beyond.

The aircraft noise analysis presented in Section 4.7.1.5 accounts for present operations at LAX during the baseline period (2018) and reasonably foreseeable future operations at LAX (future with Project conditions) in 2028. As concluded in that analysis, implementation of the proposed Project would result in significant aircraft noise impacts in 2028 compared to existing baseline conditions. These impacts include increases in the population, housing units, and noise-sensitive uses newly exposed to 65 CNEL or greater during construction (as a result of temporary changes in aircraft operations during the closure of two runways) and operations, and an increase of 1.5 dBA in in ambient noise levels in noise-sensitive areas within the 65 CNEL contour during construction (also resulting from the runway closures). Although Mitigation Measure MM-AN (ATMP)-1 would provide mitigation for permanent aircraft noise impacts in the form of sound attenuation of eligible structures, the proposed Project would result in significant and unavoidable impacts during the period following noise exposure and before sound insulation is completed, as well as significant and unavoidable impacts to outdoor private habitable areas. As it is not practical or feasible to implement sound attenuation improvements for the temporary impacts that would occur during construction, these short-term project-level impacts would also be significant and unavoidable.

With respect to cumulative impacts, none of the development projects identified in Table 3-1 of this EIR would have aircraft operations that could contribute to cumulative aircraft noise impacts. Therefore, cumulative impacts from aircraft noise would be ***less than significant***.

4.7.1.7 Summary of Impact Determinations

Table 4.7.1-16 summarizes the impact determinations of the proposed Project related to aircraft noise, as described above in Sections 4.7.1.5 and 4.7.1.6. Impact determinations are based on the significance criteria presented in Section 4.7.1.4, and the information and data sources cited throughout Section 4.7.1.

Table 4.7.1-16
Summary of Impacts and Mitigation Measures Associated with the Proposed Project Related to Aircraft Noise

Environmental Impacts	Impact Determination	Mitigation Measures	Level of Significance After Mitigation
Impact 4.7.1-1 (65 CNEL Contours): Implementation of the proposed Project would generate aircraft noise that would increase noise levels at exterior use areas of noise-sensitive uses to 65 CNEL or above during construction (for a 4.5-month period) and operations, as compared to baseline conditions. This would be a ***significant impact*** for construction and operations.	Construction: Significant (short term – approx. 4.5 months)[1] Operations: Significant	Construction: No feasible mitigation is available. Operations: MM-AN (ATMP)-1. Sound Insulation Programs.	Construction: Significant and unavoidable (short term – approx. 4.5 months)[1] Operations: Significant and unavoidable
Impact 4.7.1-2 (1.5 dBA Increase in 65 CNEL Contours): Implementation of the proposed Project could cause a temporary construction-related increase in aircraft noise levels of 1.5 dBA or more within the 65 CNEL contour compared to baseline conditions. Project implementation would not result in a 1.5 dBA increase within the 65 CNEL contour during operations. This would be a ***significant impact*** for construction and a ***less than significant impact*** for operations.	Construction: Significant (short term – approx. 4.5 months)[1] Operations: Less than Significant	Construction: No feasible mitigation is available. Operations: No mitigation is required	Construction: Significant and unavoidable(short term – approx. 4.5 months)[1] Operations: Less than Significant
Impact 4.7.1-3 (Classroom Learning): Implementation of the proposed Project would not cause a substantial increase in the amount of time that aircraft-induced noise would affect classroom learning, as compared baseline conditions, during construction or operations. This would be a ***less than significant impact*** for construction and operations.	Construction: Less than Significant Operations: Less than Significant	Construction: No mitigation is required Operations: No mitigation is required	Construction: Less than Significant Operations: Less than Significant

Note:

1 Short-term impacts would result from temporary runway closures during construction.

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