# 3.13 NOISE

This section of the 2024 PEIR describes the ambient noise characteristics in the SCAG region, sets forth the regulatory framework that affects noise, and evaluates and discusses the potential impacts of Connect SoCal 2024. In addition, this 2024 PEIR provides regional-scale mitigation measures as well as project-level mitigation measures that can and should be considered and implemented by lead agencies for subsequent, site-specific environmental review to reduce identified impacts as appropriate and feasible.

## 3.13.1 ENVIRONMENTAL SETTING

### DEFINITIONS

Definitions of terms used in the regulatory framework, characterization of baseline conditions, and impact analysis for noise follow:

- *A-weighting:* This is the method commonly used to quantify environmental noise that involves evaluation of all frequencies of sound, with an adjustment to reflect the constraints of human hearing. Because the human ear is less sensitive to low and high frequencies than to midrange frequencies, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process called A-weighting (dBA).
- *Ambient:* Ambient is the total noise in the environment, excluding noise from the source of interest.
- *Community noise equivalent level (CNEL):* CNEL represents the average daytime noise level during a 24-hour day, adjusted to an equivalent level to account for people's lower tolerance of noise during the evening and nighttime hours. Because community receptors are more sensitive to unwanted noise intrusion during the evening and night, an artificial decibel increment is added to quiet-time noise levels. Sound levels are increased by 5 dBA during the evening, from 7 p.m. to 10 p.m. and by 10 dBA during the nighttime, from 10 p.m. to 7 a.m. during this quiet time period.
- *Day-night equivalent level ($L_{dn}$):* $L_{dn}$ is a measure of the 24-hour average noise level at a given location. It is based on a measure of the $L_{eq}$ noise level over a given time period. The $L_{dn}$ is calculated by averaging the $L_{eq}$ for each hour of the day at a given location after penalizing the "sleeping hours" (defined as 10 p.m. to 7 a.m.), by 10 dBA to account for the increased sensitivity of people to noises that occur at night. $L_{dn}$ is also referred to as day-night average (DNL) sound level in some cases.
- *Decibel (dB):* dB is a unitless measure of sound on a logarithmic scale that indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals.
- *Effective perceived noise level (EPNL):* The basic element for aircraft noise certification criteria is the noise evaluation measure known as effective perceived noise level, EPNL, in units of EPNdB, which is a single number evaluator of the subjective effects of airplane noise on human beings. EPNL consists of instantaneous perceived noise level, PNL, corrected for spectral irregularities, and for duration. The spectral irregularity correction, called "tone correction factor", is made at each time increment for only the maximum tone.
- *Equivalent sound level ($L_{eq}$):* $L_{eq}$ is a term typically used to express time averages. It is a steady-state energy level that is equivalent to the energy content of a varying sound level over a stated period of time, which means that the $L_{eq}$ represents the noise level experienced over a stated period of time averaged as a single noise level.

- *Frequency:* Frequency is the number of cycles per unit of time (seconds), expressed in hertz (Hz).
- *Noise:* Noise is any sound that annoys or disturbs humans or that causes or tends to cause an adverse psychological or physiological effect on humans. Any unwanted sound.
- *Noise level (LN):* Another measure used to characterize noise exposure, LN is the variation in sound levels over time, measured by the percentage exceedance level. L10 is the A-weighted sound level that is exceeded for 10 percent of the measurement period, and L90 is the level that is exceeded for 90 percent of the measurement period. L50 is the median sound level. Additional statistical measures include $L_{min}$ and $L_{max}$, the minimum and maximum sound levels, respectively, measured during a stated measurement period.
- *Peak Particle Velocity (PPV):* Defined as the maximum instantaneous positive or negative peak of the vibration signal, usually measured in inches per second (in/sec).
- *Sound:* A vibratory disturbance created by vibrating objects, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- *Sound Exposure Level (SEL):* This metric represents all the acoustic energy (a.k.a. sound pressure) of an individual noise event as if that event had occurred within a one-second time period. SEL captures both the level (magnitude) and the duration of a sound event in a single numerical quantity, by "squeezing" all the noise energy from an event into one second. This provides a uniform way to make comparisons among noise events of various durations.
- *Vibration:* Vibration is the mechanical motion of earth or ground, building, or other type of structure, induced by the operation of any mechanical device or equipment located upon or affixed thereto. For purposes of this report, the magnitude of the vibration shall be stated as the acceleration in "g" units (1 g is equal to 32.2 feet/second$^2$, or 9.81 meters/second$^2$).

## Noise Fundamentals

Noise is defined as unexpected and unwanted sound. Unlike other linear measures, such as weight and time, noise levels are measured in decibels (dB) on a logarithmic scale. Thus, doubling a noise source, such as traffic volumes, does not double the noise level, but instead increases the resultant noise level by 3 dB (FTA 2018; Caltrans 2020a). Conversely, reducing a noise source in half results in a 3 dB decrease (Caltrans 2013). Thus, due to the logarithmic scale of the decibel unit, sound levels are not added or subtracted arithmetically. Moreover, in cases where existing ambient noise levels are already relatively high, there will be a small change in overall noise levels when a newer and lesser noise source is added. For example, when 70 dB ambient noise levels are combined with a 60 dB noise source, the resulting noise level equals 70.4 dB (Caltrans 2013).

A significant challenge in managing and mitigating noise is that not every person or community perceives and responds to noise in the same way. From an individual to the neighborhood level, there are different thresholds and tolerances for sound. Furthermore, one community (e.g., urban environment) may deem a land use (e.g., airport expansion) acceptable within a certain noise level, while another (e.g., suburban) might not. Moreover, sensitive receptors, such as residential areas, convalescent homes, schools, auditoriums, and other similar land uses, may be affected to a greater degree by increased noise levels than industrial, manufacturing, or commercial facilities. The effects of noise can range from interference with sleep, concentration, and communication, to the causation of physiological and psychological stress, and at the highest intensity levels, hearing loss (USEPA 1978).

The method commonly used to quantify environmental noise involves evaluation of all frequencies of sound, with an adjustment to reflect the constraints of human hearing. Since the human ear is less sensitive to low and high frequencies than to midrange frequencies, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process called "A-weighting," written as dBA (Caltrans 2013). In practice, environmental noise is measured using a sound level meter that includes an electronic filter corresponding to the A-weighted frequency spectrum. Typical examples can be used to illustrate sound sources that correlate to measure A-weighted sound levels and the subjective loudness to a person (**Table 3.13-1, Common Sound Levels and Loudness**).

TABLE 3.13-1 **Common Sound Levels and Loudness**

| Decibel (dB) | Subjective Loudness | Source of Sound |
|---|---|---|
| 130 | Threshold of pain | Military jet aircraft take-off from aircraft carrier with afterburner at 50 feet |
| 120 | Uncomfortably loud | Turbo-fan aircraft at takeoff power at 200 feet; rock band |
| 110 | | |
| 100 | Very loud | Boeing 707 or DC-8 aircraft at 1 nautical mile (6,080 feet) before landing; jet flyover at 1,000 feet; Bell J-2A helicopter at 100 feet |
| 90 | | Boeing 737 or DC-9 aircraft at 1 nautical mile before landing; power mower; motorcycle at 25 feet; car wash at 20 feet |
| 80 | | High urban ambient sound; diesel truck at 40 miles per hour (mph) at 50 feet; diesel train at 45 mph at 100 feet; passenger car at 65 mph at 25 feet; food blender; garbage disposal |
| 70 | Moderately loud | Living room music; radio or TV audio; vacuum cleaner |
| 60 | | Air conditioning unit at 100 feet; dishwasher (rinse) at 10 feet; conversation |
| 50 | Quiet | Large transformers at 100 feet |
| 40 | | Bird calls; lowest limit of urban ambient sound |
| 30 | | |
| 20 | | Quiet living room |
| 10 | Just audible | Average whisper |

*Sources: Adapted from: Federal Interagency Committee on Noise 1992, Table B.1; Cowan 1993*

## Vibration Measurement

Vibration is an oscillatory motion in terms of displacement, velocity, or acceleration. Vibration is typically measured as peak particle velocity (PPV) in inches per second. In this context, vibration refers to the minimum groundborne or structure-borne motion that causes a normal person to be aware of the vibration by means such as, but not limited to, sensation by touch or visual observation of moving objects. The effects of groundborne vibration include movements of the building floors that can be felt, rattling of windows, and shaking of items on shelves or hangings on the walls. In extreme cases, vibration can cause damage to buildings. The noise radiated from the motion of the room surfaces is called groundborne noise (**Table 3.13-2, Typical Levels of Groundborne Vibration**). The vibration motion normally does not provoke the same adverse human reactions as the noise unless there is an effect associated with the shaking of the building. In addition, the vibration noise can only occur inside buildings. Similar to the propagation of noise, vibration propagated from the source to the receptor depends on the receiving building (i.e., the weight of the building), soil conditions, layering of the soils, the depth of groundwater table, and so forth.

TABLE 3.13-2 **Typical Levels of Groundborne Vibration**

| Response | Velocity Level* | Typical Sources (at 50 feet) |
|---|---|---|
| Minor cosmetic damage of fragile buildings | 100 | Blasting from construction projects |
| | | |
| Difficulty with tasks such as reading a video display terminal (VDT) screen | 90 | Bulldozers and other heavy tracked construction equipment |
| | | |
| | 80 | Rapid transit, upper range |
| Residential annoyance, infrequent events | | |
| Residential annoyance, frequent events | 70 | High speed rail, typical |
| | | |
| Approximate threshold for human perception | 60 | Bus or truck, typical |
| | | |
| | 50 | Typical background vibration |

*Source:* *FTA 2018.*

Table Note:

* Root mean square (RMS) vibration velocity level in VdB relative to $10^{-6}$ inches/second

## Ambient Noise Level

The 38,000-square-mile SCAG region includes six counties and 191 cities. It covers a diverse array of land uses that range from quiet, undeveloped rural areas to loud, dense, urban areas. Ambient noise levels for areas where sensitive receptors may be located can range from 46 dBA for a small town or quiet suburban area to greater than 87 dBA for an urban area next to a freeway (USEPA 1974). This 2024 PEIR presents a discussion of noise levels associated with different noise sources, thereby allowing the reader to infer the noise level at different locations depending on the proximity of a location to a noise source. Since the range of ambient noise levels is so vast, a variety of land uses and locations were sampled in order to characterize a selection of representative ambient noise levels. Six locations were selected within the SCAG region to represent the range of ambient noise conditions by land use types (**Table 3.13-3, Ambient Noise Sampling Data**).

The most common noise source within the SCAG region is traffic on highways and on arterial roadways. Higher levels of noise from traffic are generally due to higher traffic volumes and faster travel speeds. Aircraft noise is also present in many areas of the SCAG region, with higher noise levels generated during takeoff and landing. Rail traffic and industrial and commercial activities also contribute to the noise level. Other contributors may also include construction, garbage collecting trucks, helicopters (news, police activity and tourism) and sporting/special events.

TABLE 3.13-3 **Ambient Noise Sampling Data**

| LOCATION | LAND USE | PEAK HOUR NOISE LEVEL (DBA, LEQ) |
|---|---|---|
| City of Los Angeles (Mission Hills) | Cemetery | 62 |
| City of Los Angeles (Baldwin Hills) | Residential (Multi-Family/Industrial Adjacent) | 60 |
| City of Riverside | Institutional (University) | 56 |
| City of Pasadena | Mixed-Use (Multi-Family Residential and Retail) | 63 |
| City of Los Angeles (Del Rey) | Residential (Single Family) | 63 |
| City of Moorpark | Recreational (City Park) | 48 |
| City of Los Angeles (Boyle Heights) | Institutional (High School/Middle School Adjacent) | 57 |

*Source: SCAG 2019.*

## TRANSPORTATION

Many principal noise generators within the SCAG region are associated with transportation (i.e., airports, freeways, arterial roadways, seaports, and railroads). However, local collector streets are not considered to be a significant source of noise since traffic volumes and travel speeds are generally much lower than for freeways and arterial roadways.

### AIRPORTS AND AVIATION

The six-county SCAG region is home to an expansive multiple airport system that includes eight commercial airports with scheduled passenger service, seven government/military airfields, and more than 30 reliever and general aviation airports. The eight commercial service airports in the region with scheduled passenger service are: Hollywood-Burbank (BUR), Imperial (IPL), Long Beach (LGB), Los Angeles (LAX), Ontario (ONT), Palm Springs (PSP), Santa Ana (SNA), and San Bernardino (SBD)[1]. Sixteen of the airports in the region are designated by the Federal Aviation Administration (FAA) as reliever airports, which means that those airports could provide congestion relief for any of the commercial service airports in the region if needed. With such a large and versatile transportation system, the SCAG region airports support a significant amount of passenger and goods movement, and the subsequent volume of air traffic. See **Table 3.13-4, Major Commercial Airports within the SCAG Region** (SCAG 2023).

Noise associated with aviation arise primarily from aircraft operations. Specifically, aircraft operations can generate substantial levels of noise exposure when one is in the immediate vicinity of airport runways, or when one is near the flight path of an aircraft departure or approach at lower altitudes. In addition to proximity to runways and departure/approach flight paths, other contributing factors to noise impacts include duration of noise exposure, the type of aircraft operated, number of aircraft operations (e.g., take-offs, landings, flyovers), altitude of the aircraft, and atmospheric conditions, which may influence the direction of aircraft operations and affect noise propagation.

1 The passenger service at SBD only started in August 2022.

TABLE 3.13-4 **Major Commercial Airports within the SCAG Region**

| AIRPORT | LOCATION | ASSOCIATED PLAN | CURRENT NOISE CONTOUR AVAILABLE? |
|---|---|---|---|
| Ontario International Airport | Ontario | LA/Ontario International Airport Land Use Compatibility Plan | Yes |
| Los Angeles International Airport | Los Angeles | Los Angeles County Airport Land Use Plan | Yes |
| Long Beach Airport | Long Beach | Los Angeles County Airport Land Use Plan | No |
| Palm Springs International Airport | Palm Springs | Riverside County Airport Land Use Compatibility Plan | No |
| John Wayne Airport | Santa Ana | Airport Environs Land Use Plan for John Wayne Airport | Yes |
| Imperial County Airport | Imperial | Airport Land Use Compatibility Plan for Imperial County Airports | No |
| Bob Hope Airport | Burbank | Los Angeles County Airport Land Use Plan | Yes |

*Source: SCAG 2023 (Appendix F of this 2024 PEIR)*

*Table Note: SBD does not have noise contour available as its passenger service began in August 2022, and thus available data is limited.*

Typically, most major public airports will have an airport land use plan that provides guidance on noise levels and land use in adjacent areas. The FAA measures airport-related noise in communities in terms of overall exposure rather than single events such as takeoffs and landings since overall exposure would account for the overall number of noise events and the time when these events occur. The day night average sound level ($L_{dn}$) is the standard federal (FAA and U.S. Environmental Protection Agency [USEPA]) metric for this measurement; however, the FAA also accepts the CNEL when a state requires that metric to assess noise effects. The State of California Department of Transportation Division of Aeronautics adopted the CNEL as their methodology for describing airport noise exposure (Caltrans 2019). Noise levels computed by these two methods typically differ by less than 1 dBA. The resulting noise contour map identifies geographic areas that are exposed to various levels of impacts from airport noise. Areas that are within the noise contours of 65 dBA CNEL and above, associated with airport activities, are considered to be incompatible with certain land uses, including residences, schools, hospitals, and childcare facilities (FAA 2007).

The FAA regulates the maximum noise level that an individual civil aircraft can emit by requiring certain noise certification standards, which designates a "stage" classification to certain maximum noise level requirements. Currently, the FAA has aircraft standards up to Stage 5 for jet aircraft—Stage 1 being the loudest and Stage 5 being the quietest (FAA 2023). In 1999, the Naples Airport Authority (NAA) was the first to successfully ban Stage 1 aircraft and in 2001, they became the first and only airport in the country to successfully complete a FAA Part 161 study, *Notice and Approval of Airport Noise and Access Restrictions*, to ban Stage 2 jet aircraft. The Airport Noise and Capacity Act (see discussion below under Regulatory Framework) led to the ban of Stage 1 and 2 jet aircraft in the US in 1985 and 2015, respectively, unless modified to meet Stage 3 standards. The international community established and recently approved the Stage 5 standard which went into effect December 31, 2020.

### FREEWAYS, HIGHWAYS, AND ARTERIAL ROADWAYS

The SCAG region has more than 73,000 roadway lane miles (SCAG 2023). Regionally significant arterials provide access to the freeway system and often serve as parallel alternate routes; in some cases, they are the only major system of transportation available to travelers. Typical arterial roadways have one or two lanes of traffic in each direction, with some containing as many as four lanes in each direction. Traffic noise is generated primarily from vehicles and dominated by trucks. In general, higher traffic volumes, higher speeds, and greater numbers of trucks will increase the noise level. Vehicle noise comes from noises generated by the engine, exhaust, and tires, and is often exacerbated by vehicles in a state of disrepair, such as defective mufflers or struts.

There are also environmental factors that affect noise from highway and roads. The level of traffic noise can be reduced by distance, terrain, vegetation, and intervening obstructions. However, unlike construction noise, traffic noise is a line source, not a point source. Therefore, the attenuation with distance is not as great as for traffic noise. In comparison, a point source such as stationary construction equipment attenuates by 6 dB with every doubling of the distance, whereas a line source such as traffic attenuates only by 3 dB with every doubling of the distance.

Traffic noise can therefore be a significant environmental concern where buffers (e.g., buildings, landscaping, etc.) are inadequate or where the distance to sensitive receptors is relatively short. Given typical daily traffic volumes of 10,000 to 40,000 vehicle trips, noise levels along arterial roadways typically range from $L_{dn}$ 65 to 70 dB at a distance of 50 feet from the roadway centerlines.

In addition to distance, the line of sight also affects the extent to which traffic noise can affect sensitive receptors. Line of sight can be interrupted by roadways that are elevated above grade or depressed below grade; by intervening structures such as buildings, landscaping, and sound walls; or by terrain such as hills. For example, measurements show that depressing a freeway by approximately 12 feet yields a reduction in traffic noise relative to an at-grade freeway of 7 to 10 dB at all distances from the freeway due to the interrupted line of sight. Traffic noise from an elevated freeway is typically 2 to 10 dB less than the noise from an equivalent at-grade facility within 300 feet of the freeway, but beyond 300 feet, the noise radiated by an elevated and at-grade freeway (assuming equal traffic volumes, fleet mix, and vehicle speed) is the same because at short distances, the elevated structure of the freeway itself interrupts the line of sight between the traffic and the sensitive receptor, but that line of sight is reestablished at greater distances (Caltrans 2013). Caltrans also has an extensive sound wall program for areas with residential property built prior to the freeway or prior to a major widening and has hourly noise levels that exceed the 67-dB ($L_{eq}$) threshold, and where the wall would be able to achieve at least a 5-dB reduction and the cost would not exceed $35,000 per residential unit (for the 1996 and 1997 calendar years) (Caltrans 2009). A typical wall that interrupts the line of sight is capable of reducing noise levels by 10 to 15 dB.

## RAILROAD OPERATIONS

Railroad operations generate high, relatively brief, intermittent noise events. These noise events are an environmental concern for sensitive receptors located along rail lines and in the vicinities of switching yards. Locomotive engines; the interaction of steel wheels and rails from rolling noise, impact noise when a wheel encounters a rail joint, turnout, or crossover, and squeal generated by friction on tight curves; and warning devices such as air horns and crossing bell gates are the primary sources of rail noise. Noise levels vary widely for different types of rail operations (**Table 3.13-5, Reference Noise Levels for Various Rail Operations**).

TABLE 3.13-5 **Reference Noise Levels for Various Rail Operations**

| Source/Type | | Reference Condition | Reference Noise Level (SEL, dBA) |
|---|---|---|---|
| Commuter rail, at-grade | Locomotives | Diesel-electric, 3,000 horsepower | 92 |
| | | Electric | 90 |
| | Diesel multiple unit | Diesel-powered, 1,200 horsepower | 85 |
| | Horns | Within 0.25 miles of grade crossing | 110 |
| | Cars | Ballast, welded rail | 82 |
| Rail transit | | At-grade, ballast, welded rail | 82 |
| Transit whistles/warning devices | | Within 0.125 miles of grade crossing | 93 |
| Automated guideway transit | Steel wheel | Aerial, concrete, welded rail | 80 |
| | Rubber tire | Aerial, concrete, guideway | 78 |
| Monorail | | Aerial, straddle beam | 82 |
| Maglev | | Aerial, open guideway | 72 |

*Source: FTA 2018.*

## Freight Trains

Locomotive engine noise and wheel-to-rail interactions are the primary source of noise generated by freight train pass-by events. Engine noise increases when the train is being pulled uphill. Wheel noise increases approximately 6 dB for each doubling of train velocity. A rail line supporting 40 freight trains per day generates approximately $L_{dn}$ 75 dB at 200 feet from the tracks. Freight trains also generate substantial amounts of groundborne noise and vibration in the vicinity of the tracks. Groundborne noise and vibration is a function of both the quality of the track and the operating speed of the train.

The SCAG region is served by two Class I railroads: Union Pacific Railroad (UP) and Burlington Northern/Santa Fe Railway (BNSF) (SCAG 2012). BNSF rail lines extend south from switching yards in eastern Los Angeles to the Los Angeles and Long Beach ports complex and east to Arizona and points beyond via San Bernardino County. In addition, there are three Class III railroads (short lines) serving the region, the Pacific Harbor Line (which handles all rail coordination in the Ports of Los Angeles and Long Beach), the Los Angeles Junction Railway (which provides switching service in the Vernon area for the two main line railroads), and the Ventura County Railroad (which serves the Port of Hueneme).

Completed in 2002, the Alameda Corridor provides a substantial long-term reduction in noise and vibration associated with rail operations in the vicinities of the Ports of Long Beach and Los Angeles by eliminating over 200 grade-level street/rail crossings (Alameda Corridor Transportation Authority 2019). The Alameda Corridor consolidates the operations of UP and BNSF on 90 miles of existing branch line tracks into one 20-mile corridor along Alameda Street. This corridor provides a direct connection between the ports of Long Beach and Los Angeles and the UP and BSNF switching yards in eastern Los Angeles. The project includes four overpasses and three underpasses at intersections south of SR-91 that allow vehicles to pass above the trains. North of SR-91, trains pass through a 10-mile, 33-foot-deep trench (Alameda Corridor Transportation Authority 2019). The construction of tracks in a below-grade trench, track construction on new base materials, and the use of continuous welded track reduce noise impacts on adjacent uses from trains associated with the ports. The project also includes sound walls in certain locations to mitigate vehicle noise along Alameda Street in residential neighborhoods and other sensitive areas.

### Commuter Rail

In general, the noise generated by commuter rail facilities (powered by either diesel or electric locomotives) is from the locomotives themselves. In the SCAG region, there are two commuter and intercity passenger train operators: Amtrak and the Southern California Regional Rail Authority (SCRRA).

Amtrak operates five routes that travel through the SCAG region: Texas Eagle, Coast Starlight, Pacific Surfliner, Southwest Chief, and Sunset Limited. These routes serve Chicago, St. Louis, Dallas, San Antonio, Los Angeles, Portland, Seattle, San Luis Obispo, Santa Barbara, San Diego, Albuquerque, and New Orleans (Amtrak 2019). A typical Amtrak pass-by event generates SEL 107 dB at 50 feet; two such events during the daytime or evening periods generate approximately $L_{dn}$ 61 dB at 50 feet and approximately $L_{dn}$ 52 dB at 200 feet. Nine such events generate approximately $L_{dn}$ 67 dB at 50 feet and $L_{dn}$ 58 dB at 200 feet.

The SCRRA operates the Metrolink commuter rail system. This system currently includes 59 stations and 7 rail lines: Antelope Valley, Inland Empire–Orange County, Orange County, Riverside, San Bernardino, Ventura, and 91 (Metrolink 2019). Noise levels generated by Metrolink are similar to those associated with Amtrak.

### Urban Rail Transit

This category includes both heavy and light-rail transit. Heavy rail is generally defined as electrified rapid transit trains with dedicated guideways, and light rail as electrified transit trains that do not require dedicated guideways. In general, noise increases with speed and train length. Sensitivity to rail noise generally arises when there is less than 50 feet between the rail and sensitive receptors. Individual urban rail transit pass-by events generate substantially less noise than commuter rail events, but the aggregate noise impact for sensitive uses along the line can be similar or greater due to the much higher frequency of pass-by events. Complaints about groundborne vibration from surface track are more common than complaints about groundborne noise. A significant percentage of complaints about noise can be attributed to the proximity of switches, rough or corrugated track, or wheel flats.

In the SCAG region, the Los Angeles County Metropolitan Transportation Authority (Metro) provides urban rail transit for their 1,447-square-mile service area. Metro operates 109 miles of rail service on two subway lines (B Line and D Line) and four light-rail lines (A Line, C line, E Line, and K Line) (Metro 2023). The D Line extends from downtown Los Angeles west to the Koreatown neighborhood with 8 existing stations. The B Line extends from downtown Los Angeles west to the Koreatown neighborhood and then north to North Hollywood with 14 existing stations. The A Line extends from Long Beach to Azusa via the regional connector with 44 existing stations. The E Line extends from Santa Monica to East Los Angeles with 29 existing stations. The Gold Line extends from East Los Angeles to Azusa with 27 existing stations. The K Line extends from Norwalk west to El Segundo and south to Redondo Beach with 14 existing stations. In addition, Metro has two (G Line and J Line) bus rapid transitways (BRTs). The G Line extends from North Hollywood, travels west to Woodland Hills, and then north to Chatsworth, with 17 existing stations. The J Line extends from El Monte west to downtown Los Angeles and then south to San Pedro with 12 existing stations.

## Port Operations

The three major ports in the SCAG region, Port of Los Angeles, Port of Long Beach, and Port of Hueneme in Ventura County, provide a major link between the United States and the Pacific Rim countries. Noise associated with port operations is typically generated from three sources: ships using the port facilities, equipment associated with cargo activity within the port, and truck and rail traffic that move cargo to and from the ports. These sources affect the ambient noise levels in the port areas. Residential areas in San Pedro, Wilmington, and West Long Beach are affected most by truck and rail traffic related to the ports.

Since 2000, the Port of Los Angeles has handled more container volume of cargo than any other port in the Western Hemisphere. In fiscal year 2019, the Port of Los Angeles handled 178 million metric revenue tons (MMRT) of cargo (Port of Los Angeles 2019), Port of Long Beach handled 173 MMRT (The Harbor Department 2019), and Port of Hueneme handled 1.65 MMRT (Port of Hueneme 2019). When combined together, the Port of Los Angeles and the Port of Long Beach rank ninth in the world for container volume (Port of Los Angeles 2019). The Ports of Los Angeles, Long Beach, and Hueneme are major regional economic development centers. The San Pedro Bay Ports, which include the Los Angeles and Long Beach Ports, currently handle approximately 30 percent of the cargo volume in the country (Port of Los Angeles 2019); the Port of Hueneme in Ventura County is a major shipping point for automobiles, non-automotive roll-on roll off cargo, project cargo, fresh produce, and liquid bulk (Port of Hueneme 2019).

## Industrial and Manufacturing Noise

Noise from industrial complexes and manufacturing plants are characterized as stationary point sources of noise even though they may include mobile sources such as forklifts. Local governments typically regulate noise from industrial and manufacturing equipment and activities through enforcement of noise ordinance standards and implementation of general plan policies. Industrial complexes and manufacturing plants are generally located away from sensitive land uses, and, as such, noise generated from these sources generally has less effect on the local community.

## Construction Noise

Noise from construction sites is characterized as stationary point sources of even though they may include mobile sources, such as graders, they generally move slowly. Local governments typically regulate noise from construction equipment and activities through enforcement of noise ordinance standards and imposition of conditions of approval for building or grading permits.

Construction noise related to transportation projects is typically addressed in each project's noise analysis report and related environmental document. Most projects will not require modeling or any form of analysis associated with construction-related noise. Some projects may require basic noise calculations. For projects that require compliance with local ordinances, more-detailed analysis techniques may be required.

Construction-related noise levels generally fluctuate depending on the construction phase, equipment type and duration of use, distance between noise source and receptor, and line of sight between the noise source and the receptor (temporary barriers can block the line of sight to reduce noise levels). The Federal Transit Administration (FTA) has established typical noise levels associated with various types of construction-related machinery (**Table 3.13-6, Construction Equipment Noise Levels**). In contrast to industrial and manufacturing plants, construction sites are located throughout the region and are often located within, or adjacent to, residential districts and other sensitive receptors. While individual construction sites come and go (as buildings are constructed and completed), there is generally ongoing construction activity in the region.

TABLE 3.13-6 **Construction Equipment Noise Levels**

| EQUIPMENT | TYPICAL NOISE LEVEL (DBA) AT 50 FEET FROM SOURCE |
|---|---|
| Air Compressor | 80 |
| Backhoe | 80 |
| Ballast Equalizer | 82 |
| Ballast Tamper | 83 |
| Compactor | 82 |
| Concrete Mixer | 85 |
| Concrete Pump | 82 |
| Concrete Vibrator | 76 |
| Crane, Derrick | 88 |
| Crane, Mobile | 83 |
| Dozer | 85 |
| Generator | 82 |
| Grader | 85 |
| Impact Wrench | 85 |
| Jack Hammer | 88 |
| Loader | 80 |
| Paver | 85 |
| Pile-driver (Impact) | 101 |
| Pile-driver (Sonic) | 95 |
| Pneumatic Tool | 85 |
| Pump | 77 |
| Rail Saw | 90 |
| Rock Drill | 95 |
| Roller | 85 |
| Saw | 76 |
| Scarifier | 83 |
| Scraper | 85 |
| Shovel | 82 |
| Spike Driver | 77 |
| Tie Cutter | 84 |
| Tie Handler | 80 |
| Tie Inserter | 85 |
| Truck | 84 |

*Source: FTA 2018*

In general, construction activities generate high noise levels intermittently on and adjacent to the construction sites, and the related noise impacts are short-term in nature for individual sites but ongoing throughout the region. The dominant source of noise from most construction equipment is the engine, usually a diesel engine, with inadequate muffling. In a few cases, however, such as impact pile driving or pavement breaking, noise generated by the process dominates. Construction equipment can be considered to operate in two modes, stationary and mobile. Stationary equipment operates in one location for one or more days at a time, with either a fixed-power operation (pumps, generators, compressors) or a variable noise operation (pile drivers, pavement breakers). Mobile equipment moves around the construction site with power applied in cyclic fashion (bulldozers, loaders), or movement to and from the site (trucks). The noise levels of these point sources decrease by approximately 6 dB with each doubling of distance from the noise source (e.g., noise levels from excavation might be approximately 83 dB at 100 feet from the site, and about 77 dB at 200 feet from the site). Interior noise levels from construction are approximately 10 dB (open windows) to 20 dB (closed windows) less than exterior noise levels due to the attenuation provided by building walls.

Construction projects often create activities that extend beyond project limits. These can include activities such as trucks supplying material (stone, concrete, steel, etc.) to a project, trucks hauling soil and/or demolition materials from a project site, activity associated with off-site operations such as materials storage areas, and effects of detoured or rerouted traffic due to construction activities. Haul routes may be specifically designated for use by construction-related traffic when supplying and hauling excess material from the project site, potentially creating a high source of noise depending on the number and frequency of trucks utilizing the route.

## Construction Vibration

Typically, groundborne vibration generated by man-made activities (i.e., rail and roadway traffic, operation of mechanical equipment and typical construction equipment) diminishes rapidly with distance from the vibration source. Construction activities, such as the use of bulldozers, would have the greatest effect on vibration-sensitive land uses. Energy is lost during the transfer of energy from one particle to another, and, as a result, vibration becomes less perceptible with increasing distance from the source.

Construction-related vibration has the potential to damage structures and be a source of annoyance to individuals who live or work near these construction activities. Pile drivers can generate vibrations in excess of 0.5 PPV at a distance of 25 feet, see **Table 3.13-7, Construction Equipment Vibration Levels**, which can result in damage to reinforced concrete. Vibration levels generated by pile driving vary depending on soil conditions, construction methods, and equipment used. Depending on the proximity of existing structures to the pile driving, the structural condition of the existing structures, and the methods of construction used, vibration levels caused by pile driving or other foundation work with a substantial impact component such as blasting, rock or caisson drilling, and site excavation or compaction may be high enough to damage existing structures. A vibration analysis completed by Caltrans indicated that "extreme care must be taken when sustained pile driving occurs within 7.5 meters (25 feet) of any building, and 15 to 30 meters (50 to 100 feet) of a historical building or building in poor condition." (Caltrans 2002)

TABLE 3.13-7 **Construction Equipment Vibration Levels**

| Equipment | | PPV at 25 Feet |
|---|---|---|
| Pile Driver (impact) | Upper Range | 1.518 |
| | Typical | 0.644 |
| Pile Driver (Sonic) | Upper Range | 0.734 |
| | Typical | 0.170 |
| Vibratory Roller | | 0.210 |
| Clam Shovel | | 0.202 |
| Hydrol Mill | In Soil | 0.008 |
| | In Rock | 0.017 |
| Large Bulldozer | | 0.089 |
| Caisson Drilling | | 0.089 |
| Loaded Trucks | | 0.076 |
| Jackhammer | | 0.035 |
| Small Bulldozer | | 0.003 |

*Source: Adapted from FTA 2018*

## Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others due to noise exposure (in terms of both exposure time and "insulation" from noise) and the types of activities typically involved. Residences, motels, and hotels; daycares; schools; libraries; churches; hospitals; nursing homes and senior centers; and natural areas, parks, and outdoor recreation areas are generally more sensitive to noise than are commercial and industrial land uses. The 38,000-square-mile SCAG region contains a large number of these sensitive land uses. The noise-sensitive areas of residences, schools, libraries, churches, hospitals, nursing homes, natural areas, and parks are generally more sensitive to noise than are commercial and industrial land uses. Increases in noise near these sensitive receptors are more likely to cause an adverse community response.

As such, the noise standards for sensitive land uses are more stringent than those for less sensitive uses. To protect various human activities and sensitive land uses (e.g., residences, schools, and hospitals) lower noise levels are needed. An exterior noise level of $L_{dn}$ 55 to 60 dB is the upper limit for intelligible speech communication inside a typical home. In addition, social surveys and case studies have shown that complaints and community annoyance in residential areas begin to occur at $L_{dn}$ 55 dB. Sporadic complaints associated with the $L_{dn}$ 55 to 60 dB range give way to widespread complaints and individual threats of legal action within the $L_{dn}$ 60 to 70 dB range. At $L_{dn}$ 70 dB and above, residential community reaction typically involves threats of legal action and strong appeals to local officials to stop the noise.

Sensitive receptors for vibration are the same as for noise, with one exception. Historic structures are potentially sensitive to excessive vibration because ground vibration will excite building structures, and if the vibration levels are high, there is a potential for structural damage. The Caltrans Transportation and Construction Vibration Guidance Manual provides a summary of construction vibration effects on buildings, including historic buildings (Caltrans 2020a). Using the most conservative values in the report, residential buildings with plastered walls or masonry may be damaged when a single vibration event exceed 0.50 PPV or frequent vibration events exceed 0.2 PPV, whereas fragile historic buildings, objects of historic interest, ruins, or ancient monuments may be damaged when a single vibration event exceeds 0.12 PPV or frequent vibration events exceed 0.08 PPV (Caltrans 2020a).

## 3.13.2 Regulatory Framework

The federal government sets noise standards for transportation-related noise sources that are closely linked to interstate commerce, such as aircraft, locomotives, and trucks; and, for those noise sources, the state government is preempted from establishing more stringent standards. The state sets noise standards for those transportation noise sources that are not preempted from regulation, such as automobiles, light trucks, and motorcycles. Noise sources associated with industrial, commercial, and construction activities are generally subject to local control through noise ordinances and general plan policies.

### Federal

#### Noise Control Act of 1972

The Noise Control Act of 1972, as codified in 42 U.S. Code Section 4901 et seq., establishes a means for effective coordination of federal research and activities in noise control, authorizes the establishment of federal noise emission standards for products distributed in commerce, and provides information to the public with respect to the noise emission and noise reduction characteristics of such products (USEPA 2022).

#### Noise Standards for Interstate Rail and Motor Carriers, Construction Equipment, and Trucks (Title 40 Code of Federal Regulations)

The Federal Highway Administration (FHWA) sets federal regulations related to noise limits for locomotives, and medium and heavy trucks, and standards for noise studies and studies for federal and federal-aid highway projects.

##### Part 201

Federal regulations for railroad noise are contained in Title 40 Code of Federal Regulations (CFR) Parts 201 and 49 CFR Part 210. The regulations set noise limits for locomotives and are implemented through regulatory controls on locomotive manufacturers.

##### Part 202

Federal regulations regarding motor carriers engaged in interstate commerce are contained in 40 CFR Part 202. The regulations set noise limits for motor carriers engaged in interstate commerce, including setting standards for highway operations.

##### Part 204

Title 40 CFR Part 204 sets noise emission standards for construction equipment. The regulations set noise standards and requirements as well as testing, for construction equipment including air compressors.

#### PART 205

Federal regulations also establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under 40 CFR Part 205, Subpart B. The federal truck pass-by noise standard is 80 dB at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers. FHWA regulations for noise abatement must be considered for federal or federally funded projects involving the construction of a new highway or significant modification of an existing freeway when the project would result in a substantial noise increase or when the predicted noise levels approach or exceed the Noise Abatement Criteria (NAC).

### Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772)

Title 23 CFR Section 772.1 et seq. provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23 CFR Section 772.7, projects are categorized as Type I or Type II projects. FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location, or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes. A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment.

Type I projects include those that create a completely new noise source, as well as those that increase the volume or speed of traffic or move the traffic closer to a receiver. Type I projects include the addition of an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or the widening of an existing ramp by a full lane width for its entire length. Projects unrelated to increased noise levels such as striping, lighting, signing, and landscaping projects are not considered Type I projects.

Under 23 CFR Section 772.11, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR Section 772 requires that the project sponsor consider noise abatement before adoption of the environmental document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR Section 772.5, occur when the predicted noise level in the design year approaches or exceeds the NAC specified in 23 CFR Section 772, or a predicted noise level substantially exceeds the existing noise level (a substantial noise increase). Under these regulations, an impact could result unrelated to the plan if existing noise levels already exceed the NAC. A substantial increase is defined as when an increase in $L_{eq}$ of 12 dB during the peak hour of traffic noise occurs. For sensitive uses, such as residences, schools, churches, parks, and playgrounds, the NAC for interior and exterior spaces is $L_{eq}$ 57 and 66 dB, respectively, during the peak hour of traffic noise.

### Aircraft Noise Standards (14 CFR Part 36)

The FAA has federal regulatory authority over noise emissions levels by aircraft operated in the United States. These requirements are set forth in 14 CFR Part 36. Part 36 establishes maximum acceptable noise levels for specific aircraft types, taking into account the model year, aircraft weight, and number of engines. Pursuant to the federal Airport Noise and Capacity Act of 1990, the FAA established a schedule for complete transition to Part 36 “Stage 3” standards by year 2000. This transition schedule applies to jet aircraft with a maximum takeoff weight in excess of 75,000 pounds, and thus applies to passenger and cargo airlines, but not to operators of business jets or other general aviation aircraft. The FAA adopted Stage 4 noise standards for all jet aircraft manufactured on or after January 1, 2006 (FAA 2005). Stage 5 noise standards have since been adopted for all new jet aircraft effective December 2017 for aircraft with maximum certificated takeoff weight of 121,254 pounds or more and December 2020 where maximum certificated takeoff weight of less than 121,254 pounds (FAA 2017).

### Airport Noise and Capacity Act

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 enactments (October 1990).

### Airport Noise Compatibility Planning (14 CFR Part 150)

Part 150 applies to airport noise compatibility planning and provides the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps and airport noise compatibility programs, including the process for evaluating and approving or disapproving those programs. It provides guidance for measuring noise at airports and surrounding areas and for determining exposure of individuals to noise from the operations of an airport. Part 150 also identifies land uses that are normally compatible with various levels of exposure to noise by individuals. It provides guidance on the preparation and execution of noise compatibility planning and implementation programs.

### Aviation Safety and Noise Abatement Act

The Aviation Safety Act of 1979 establishes funder 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. Since California already had a well-established airport community noise metric in CNEL, and because CNEL and DNL are so similar, the FAA expressly allows CNEL to be used in lieu of DNL in noise assessments performed for California airports (FAA 2020).

### Noise Abatement and Control (24 CFR Part 51, Subpart B)

The mission of the Department of Housing and Urban Development (HUD) includes fostering "a decent, safe, and sanitary home and suitable living environment for every American." Accounting for acoustics is intrinsic to this mission, as an environment's safety and comfort can be compromised by excessive noise. In order to facilitate the creation of suitable living environments, HUD has developed a standard for noise criteria. The basic foundation of the HUD noise program is set out in the noise regulation 24 CFR Part 51 Subpart B, Noise Abatement and Control.

HUD's noise policy clearly requires noise attenuation measures be provided when proposed projects are located in high noise areas. Within the HUD Noise Assessment Guidelines, potential noise sources are examined for projects located within 15 miles of a military or civilian airport, 1,000 feet from a road, or 3,000 feet from a railroad.

HUD exterior noise regulations state that 65 dBA DNL noise levels or less are acceptable for residential land uses and noise levels exceeding 75 dBA DNL are unacceptable. HUD's regulations do not contain standards for interior noise levels. Rather, a goal of 45 dBA is set forth, and the attenuation requirements are geared toward achieving that goal. It is assumed that, with standard construction, any building will provide sufficient attenuation so that if the exterior level is 65 dBA DNL or less, the interior level will be 45 dBA DNL or less.

## FEDERAL TRANSIT ADMINISTRATION NOISE AND VIBRATION GUIDANCE

The FTA has published the Transit Noise and Vibration Impact Assessment Manual to provide guidance on procedures for assessing impacts at different stages of transit project development (FTA 2018). The report covers both construction and operational noise impacts and describes a range of measures for controlling excessive noise and vibration. The specified noise criteria are an earlier version of the criteria provided by the Federal Railroad Administration's High-Speed Ground Transportation Noise and Vibration Impact Assessment (**Table 3.13-8, Construction Vibration Damage Criteria**). In general, the primary concern regarding vibration relates to potential damage from construction. The guidance document establishes criteria for evaluating the potential for damage for various structural categories from vibration (Table 3.13-8).

TABLE 3.13-8 **Construction Vibration Damage Criteria**

| BUILDING CATEGORY | PPV (IN/SEC) |
|---|---|
| I. Reinforced-concrete, steel, or timber (no plaster) | 0.5 |
| II. Engineered concrete and masonry (no plaster) | 0.3 |
| III. Non-engineered timber and masonry buildings | 0.2 |
| IV. Buildings extremely susceptible to vibration damage | 0.12 |

*Source: FTA 2018*

The FTA has also adopted standards associated with human annoyance for determining the groundborne vibration and noise impacts from ground-borne noise on the following three off-site land-use categories: Vibration Category 1 – High Sensitivity, Vibration Category 2 – Residential, and Vibration Category 3 – Institutional (FTA 2018). The FTA defines Category 1 as buildings where vibration would interfere with operations within the building, including vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and university research operations. Vibration-sensitive equipment includes, but is not limited to, electron microscopes, high-resolution lithographic equipment, and normal optical microscopes. Category 2 refers to all residential land uses and any buildings where people sleep, such as hotels and hospitals. Category 3 refers to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment but that still potentially involve activities that could be disturbed by vibration. The vibration thresholds associated with human annoyance for these three land use categories are shown in **Table 3.13-9, Construction Vibration Human Annoyance Criteria**. No thresholds have been adopted or recommended for commercial or office uses.

TABLE 3.13-9 **Construction Vibration Human Annoyance Criteria**

| LAND USE CATEGORY | FREQUENT EVENTS[A] | OCCASIONAL EVENTS[B] | INFREQUENT EVENTS[C] |
|---|---|---|---|
| Category 1: Buildings where vibration would interfere with interior operations. | 65 VdB[d] | 65 VdB[d] | 65 VdB[d] |
| Category 2: Residences and buildings where people normally sleep. | 72 VdB | 75 VdB | 80 VdB |
| Category 3: Institutional land uses with primarily daytime use. | 75 VdB | 78 VdB | 83 VdB |

*Source: FTA 2018*

Table Notes:

a “Frequent Events” is defined as more than 70 vibration events of the same source per day.

b “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day.

c “Infrequent Events” is defined as fewer than 30 vibration events of the same kind per day.

d This criterion is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes.

## RAILROAD NOISE GUIDANCE

The Federal Railroad Administration provides implementation procedures for predicting and assessing noise and vibration impacts of high-speed trains within their High-Speed Ground Transportation Noise and Vibration Impact Assessment (FTA 2012). The document provides three levels of analysis, including a preliminary impact screening, a general assessment, and a detailed analysis, as well as a range of mitigation measures for dealing with adverse noise and vibration impacts. The report also includes noise criteria for potential impacts (**Table 3.13-10, Noise Levels Defining Impact for High-Speed Train Projects**, and **Table 3.13-11, Land Use Categories and Metrics for High-Speed Train Noise Impact Criteria**).

TABLE 3.13-10 **Noise Levels Defining Impact for High-Speed Train Projects**

| EXISTING NOISE EXPOSURE,* $L_{eq(h)}$ OR $L_{dn}$ (DBA) | PROJECT NOISE IMPACT EXPOSURE,* $L_{eq(h)}$ OR $L_{dn}$ (DBA) | | | | | |
|---|---|---|---|---|---|---|
| | CATEGORY 1 OR 2 SITES | | | CATEGORY 3 SITES | | |
| | NO IMPACT | MODERATE IMPACT | SEVERE IMPACT | NO IMPACT | MODERATE IMPACT | SEVERE IMPACT |
| <43 | < Ambient+10 | Ambient + 10 to 15 | >Ambient+15 | <Ambient+15 | Ambient + 15 to 20 | >Ambient+20 |
| 43 | <51.6 | 51.6–57.6 | >57.6 | <56.6 | 56.6–62.6 | >62.6 |
| 44 | <51.8 | 51.8–58.6 | >58.6 | <56.8 | 56.8–63.6 | >63.6 |
| 45 | <52.0 | 52.0–58.6 | >58.6 | <57.0 | 57.0–63.6 | >63.6 |
| 46 | <52.2 | 52.2–58.7 | >58.7 | <57.2 | 57.2–63.7 | >63.7 |
| 47 | <52.5 | 52.5–58.9 | >58.9 | <57.5 | 57.5–63.9 | >63.9 |
| 48 | <52.7 | 52.7–59.1 | >59.1 | <57.7 | 57.7–64.1 | >64.1 |
| 49 | <53.0 | 53.0–59.3 | >59.3 | <58.0 | 58.0–64.3 | >64.3 |
| 50 | <53.4 | 53.4–59.5 | >59.5 | <58.4 | 58.4–64.5 | >64.5 |
| 51 | <53.7 | 53.7–59.7 | >59.7 | <58.7 | 58.7–64.7 | >64.7 |
| 52 | <54.1 | 54.1–60.0 | >60.0 | <59.1 | 59.1–65.0 | >65.0 |
| 53 | <54.4 | 54.4–60.4 | >60.4 | <59.4 | 59.4–65.4 | >65.4 |
| 54 | <54.9 | 54.9–60.7 | >60.7 | <59.9 | 59.9–65.7 | >65.7 |

| Existing Noise Exposure,* $L_{eq(h)}$ or $L_{dn}$ (dBA) | Project Noise Impact Exposure,* $L_{eq(h)}$ or $L_{dn}$ (dBA) | | | | | |
|---|---|---|---|---|---|---|
| | Category 1 or 2 Sites | | | Category 3 Sites | | |
| | No Impact | Moderate Impact | Severe Impact | No Impact | Moderate Impact | Severe Impact |
| 55 | <55.3 | 55.3–61.1 | >61.1 | <60.3 | 60.3–66.1 | >66.1 |
| 56 | <55.7 | 55.7–61.5 | >61.5 | <60.7 | 60.7–66.5 | >66.5 |
| 57 | <56.2 | 56.2–61.9 | >61.9 | <61.2 | 61.2–66.9 | >66.9 |
| 58 | <56.7 | 56.7–62.3 | >62.3 | <61.7 | 61.7–67.3 | >67.3 |
| 59 | <57.2 | 57.2–62.8 | >62.8 | <62.2 | 62.2–67.8 | >67.8 |
| 60 | <57.8 | 57.8–63.3 | >63.3 | <62.8 | 62.8–68.3 | >68.3 |
| 61 | <58.4 | 58.4–63.8 | >63.8 | <63.4 | 63.4–68.8 | >68.8 |
| 62 | <58.9 | 58.9–64.4 | >64.4 | <63.9 | 63.9–69.4 | >69.4 |
| 63 | <59.6 | 59.6–64.9 | >64.9 | <64.6 | 64.6–69.9 | >69.9 |
| 64 | <60.2 | 60.2–65.5 | >65.5 | <65.2 | 65.2–70.5 | >70.5 |
| 65 | <60.8 | 60.8–66.1 | >66.1 | <65.8 | 65.8–71.1 | >71.1 |
| 66 | <61.5 | 61.5–66.7 | >66.7 | <66.5 | 66.5–71.7 | >71.7 |
| 67 | <62.2 | 62.2–67.4 | >67.4 | <67.2 | 67.2–72.4 | >72.4 |
| 68 | <62.9 | 62.9–68.0 | >68.0 | <67.9 | 67.9–73.0 | >73.0 |
| 69 | <63.6 | 63.6–68.7 | >68.7 | <68.6 | 68.6–73.7 | >73.7 |
| 70 | <64.4 | 64.4–69.4 | >69.4 | <69.4 | 69.4–74.4 | >74.4 |
| 71 | <65.0 | 65.0–70.1 | >70.1 | <70.0 | 70.0–75.1 | >75.1 |
| 72 | <65.0 | 65.0–70.8 | >70.8 | <70.0 | 70.0–75.8 | >75.8 |
| 73 | <65.0 | 65.0–71.6 | >71.6 | <70.0 | 70.0–76.6 | >76.6 |
| 74 | <65.0 | 65.0–72.3 | >72.3 | <70.0 | 70.0–77.3 | >77.3 |
| 75 | <65.0 | 65.0–73.1 | >73.1 | <70.0 | 70.0–78.1 | >78.1 |
| 76 | <65.0 | 65.0–73.9 | >73.9 | <70.0 | 70.0–78.9 | >78.9 |
| 77 | <65.0 | 65.0–74.7 | >74.7 | <70.0 | 70.0–79.7 | >79.7 |
| >77 | <65.0 | 65.0–75.0 | >75.0 | <70.0 | 70.0–80.0 | >80.0 |

*Source: Federal Railroad Administration 2012, Table 3-1*

Table Note:

* $L_{dn}$ is used for land use where nighttime sensitivity is a factor; $L_{eq}$ during the hour of maximum transit noise exposure is used for land use involving only daytime activities.

TABLE 3.13-11 **Land Use Categories and Metrics for High-Speed Train Noise Impact Criteria**

| LAND USE CATEGORY | NOISE METRIC (DBA) | DESCRIPTION OF LAND-USE CATEGORY |
|---|---|---|
| 1 | Outdoor $L_{eq(h)}$* | Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as national historic landmarks with significant outdoor use. Also included are recording studios and concert halls. |
| 2 | Outdoor $L_{dn}$ | Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance. |
| 3 | Outdoor $L_{eq(h)}$* | Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, and museums can also be considered to be in this category. Certain historical sites, parks, campgrounds, and recreational facilities are also included. |

*Source: Federal Railroad Administration 2012, Table 3-2*

Table Note:

* $L_{eq}$ for the noisiest hour of transit-related activity during hours of noise sensitivity.

## STATE

### CALIFORNIA GOVERNMENT CODE SECTION 65302

California Government Code Section 65302 provides a framework for general plans and their content. It requires that the noise element include implementation measures and possible solutions that address existing and foreseeable noise problems, if any. The adopted noise element shall serve as a guideline for compliance with the state's noise insulation standards. The noise element shall also identify and appraise noise problems in the community, analyze and quantify current and projected noise levels for (a) highways and freeways; (b) primary arterials and major local streets; (c) passenger and freight online railroad operations and ground rapid transit systems; (d) commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation; I local industrial plants, including, but not limited to, railroad classification yards; and (f) other ground stationary noise sources, including, but not limited to, military installations, identified by local agencies as contributing to the community noise environment.

Section 65302 also specifies that noise contours be shown for all of the above listed sources and be stated in terms of CNEL or day-night average level ($L_{dn}$). The noise contours shall be prepared on the basis of noise monitoring or following generally accepted noise modeling techniques for the various sources identified above. The noise contours shall be used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of community residents to excessive noise (California Legislative Information, Article 5).

### CALIFORNIA NOISE CONTROL ACT

The California Noise Control Act of 1973 (California Health and Safety Code Division 28, Section 46000 et seq), as found in the California Health and Safety Code Division 28, Section 46000 et seq., declares that excessive noise is a serious hazard to public health and welfare, and establishes the Office of Noise Control with responsibility to set standards for noise exposure in cooperation with local governments or the state legislature (California Legislative Information, Division 28).

### Airport Noise Standards (Title 21 California Code of Regulations Section 5000 et seq.)

The State of California has the authority to establish regulations requiring airports to address aircraft noise impacts on land uses in their vicinities. The State of California's Airport Noise Standards, found in California Code of Regulations (CCR) Title 21, identify a noise exposure level of CNEL 65 dB as the noise impact boundary around airports. Within the noise impact boundary, airport proprietors are required to ensure that all land uses are compatible with the aircraft noise environment, or the airport proprietor must secure a variance from the California Department of Transportation (Caltrans).

### Noise Insulation Standards (Health & Safety Code Section 17922.6)

California Health and Safety Code Section 17922.6 requires noise insulation standards for new multi-family residential units, hotels, and motels that may be subject to relatively high levels of transportation-related noise. For exterior noise, the noise insulation standard is DNL 45 dB in any habitable room and requires an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard where such units are proposed in areas subject to noise levels greater than DNL 60 dB (California Legislative Information, Chapter 2).

### Toxic Air Contaminant Identification and Control Act

The Toxic Air Contaminant Identification and Control Act is primarily meant to limit heavy-duty diesel motor vehicle idling in order to reduce public exposure to diesel PM and other TACs. However, the regulation has the co-benefit of reducing noise levels associated with engine idling. For more information, refer to Section 3.3, *Air Quality*.

### Freeway Noise Attenuation (Streets and Highways Code, Article 6 and Vehicle Code, Article 2.5)

The State of California establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the state pass-by standard is consistent with the federal limit of 80 dB (California Legislative Information, Article 2.5). The state pass-by standard for light trucks and passenger cars (less than 4.5 tons gross vehicle rating) is also 80 dB at 15 meters from the centerline (Government Publishing Office 2019). Additionally, for a motor vehicle weighing more than 5 tons the pass-by standard is 88dB at 15 feet from the centerline of the vehicle (California Legislative Information, Article 2.5). For new roadway projects, Caltrans employs the NAC, promulgated by Code of Federal Regulations (CFR) Title 40, as administered by the FHWA (Government Publishing Office 2019).

California Streets and Highways Code Section 216 relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA $L_{eq}$ in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA $L_{eq}$. If the noise levels generated from freeway and non-freeway sources exceed 52 dBA $L_{eq}$ prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project (California Legislative Information, Article 6).

Streets and Highways Code Section 215.5 implements a priority system to determine the need for the installation of noise attenuation barriers (i.e., soundwalls) along freeways and expressways. The highest consideration is given to residential areas developed prior to the opening of the freeway or where alterations have been made to the freeway that result in a significant increase in ambient noise levels. Other criteria for determining priorities includes the existing and future sound intensity generated by the freeway, the increase in traffic flow since the freeway originally opened, the cost of constructing a soundwall related to expected noise reduction, and the number of nearby residents included whether they lived there prior to the opening of the freeway (California Legislative Information, Article 6). Pursuant to Section 215.6, a city or county can accelerate the priority of a noise attenuation project by contributing at least 33 percent of the estimated cost of a soundwall project (California Legislative Information, Article 6).

### Assembly Bill 1307

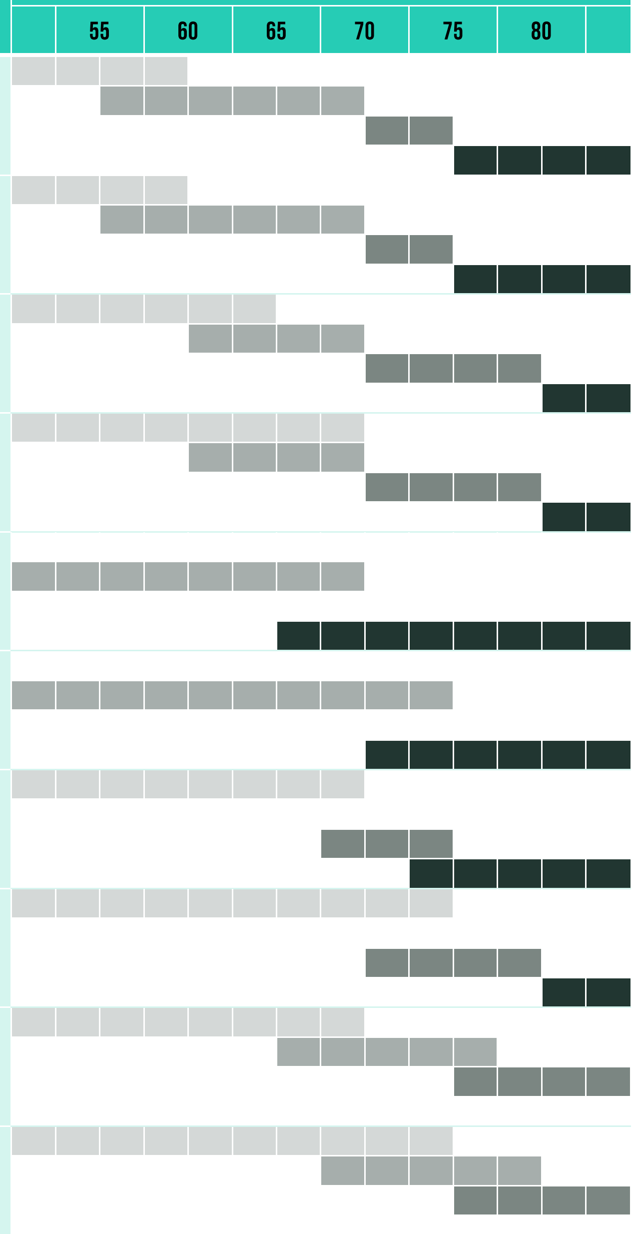
On September 7, 2023, Governor Newsom signed into law AB 1307, urgency legislation which took effect immediately and added to the Public Resources Code a new section (Section 21085), which reads: "For purposes of this division, for residential projects, the effects of noise generated by project occupants and their guests on human beings is not a significant effect on the environment" (California Legislative Information 2023).

### California Department of Health Services Land Use Guidelines for Community Noise Exposure

The state has published guidance for locating land uses in areas compatible with the existing noise environment (**Table 3.13-12, Community Noise Exposure**) (Governor's Office of Planning and Research 2017). For example, it would normally be acceptable for a single-family residence to be located in an area with an existing noise level of 60 dBA CNEL or less.

TABLE 3.13-12 **Community Noise Exposure**

| LAND USE CATEGORY | COMMUNITY NOISE EXPOSURE (DB, LDN OR CNEL) |
|---|---|
| Residential – Low Density Single-Family, Duplex, Mobile Homes | |
| Residential – Multi-Family | |
| Transient Lodging – Motels Hotels | |
| Schools, Libraries, Churches, Hospitals, Nursing Homes | |
| Auditoriums, Concert Halls, Amphitheaters | |
| Sports Arena, Outdoor Spectator Sports | |
| Playgrounds, Neighborhood Parks | |
| Golf Courses, Riding Stables, Water Recreation, Cemeteries | |
| Office Buildings, Business Commercial and Professional | |
| Industrial, Manufacturing, Utilities, Agriculture | |




Source: *California Office of Planning and Research 2017, Appendix D, Noise Element Guidelines*

*Normally Acceptable* – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

*Conditionally Acceptable* – New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply system or air conditioning will normally suffice.

*Normally Unacceptable* – New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

*Clearly Unacceptable* – New construction or development should generally not be undertaken.

## CALTRANS GUIDANCE

**Traffic Noise.** Caltrans Project Development Procedures Manual Chapter 30 offers guidance on highway traffic noise abatement criteria (NAC), corresponding to various land use activity categories (Caltrans 2009). However, the NAC in Chapter 30 has been superseded by the Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (**Table 3.13-13, Activity Categories and Noise Abatement Criteria**) (Caltrans 2020b). Activity categories and related traffic noise impacts are determined based on the actual land use in a given area. The Caltrans Technical Noise Supplement to the Traffic Noise Analysis Protocol provides additional details on noise analysis procedures, practices, and other useful technical background information related to the analysis and reporting of highway and construction noise impacts and abatement (Caltrans 2013). It supplements and expands on concepts and procedures referred to in the Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects.

TABLE 3.13-13 **Activity Categories and Noise Abatement Criteria**

| Activity Category | Hourly A-Weighted Sound Level, $L_{eq(h)}$* | Evaluation Location | Description of Activities |
|---|---|---|---|
| A | 57 | Exterior | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. |
| B** | 67 | Exterior | Residential. |
| C** | 67 | Exterior | Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. |
| D | 52 | Interior | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios. |
| E | 72 | Exterior | Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F. |
| F | | | Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing. |
| G | | | Undeveloped lands that are not permitted. |

*Source: Caltrans 2020b, Table 1*

Table Notes:

* The $L_{eq(h)}$ activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).

** Includes undeveloped lands permitted for this activity category.

**Airport Noise.** The Caltrans Division of Aeronautics California Airport Land Use Planning Handbook offers guidance on airport planning and developing compatible land use policies (Caltrans 2011). It also provides suggested criteria for the CNEL values commonly used as the limit for acceptable residential noise exposure (**Table 3.13-14, Noise Compatibility Criteria**).

TABLE 3.13-14 **Noise Compatibility Criteria**

| CNEL (DB) | CRITERIA | SUGGESTED APPLICABILITY |
|---|---|---|
| 65 | Set by the FAA and other federal agencies as the level above which residential land uses may be incompatible if not acoustically treated. Established by California state regulations as the maximum normally acceptable noise level for residential and certain other land uses at county-designated noise-problem airports. | Generally not appropriate for most new development.<br>May be acceptable in noisy urban locations and/or in hot climates where most buildings are air conditioned. |
| 60 | The contour within which California Building Code (Section 1207.11) requires an acoustical analysis of proposed residential structures, other than detached single-family dwellings.<br>Suggested by the California Governor's Office of Planning and Research General Plan Guidelines as the maximum "normally acceptable" noise exposure for residential areas. [Note: Individual noise events will occasionally cause significant interference with residential land use activities, particularly outdoor activities, in quiet suburban/rural communities.] | Suitable for new development around most airports.<br>Particularly appropriate in mild climates where windows are often open. |
| 55 | Identified by USEPA as the level below which "undue interference with activity and annoyance" will not occur. [Note: Individual noise events will seldom significantly interfere with residential land use activities (e.g., interference with speech). In urban areas, aircraft contribution to this noise level may be less than that of other noise sources.] | Suitable for airports in quiet, rural locations. |

*Source: Caltrans 2011, Table 4B*

Table Note: When setting criteria for a specific airport, other characteristics of the airport and its environs also need to be considered.

**Construction Noise.** Section 14-8.02, Noise Control, of Caltrans standard specifications provides guidance on preventing construction noise impacts. The specification states:

- Do not exceed 86 dBA at 50 feet from the job site activities from 9 p.m. to 6 a.m.
- Equip an internal combustion engine with the manufacturer recommended muffler. Do not operate an internal combustion engine on the job site without the appropriate muffler.
- If adverse construction noise impacts are anticipated (after compliance with the local applicable noise ordinance), additional abatement measures that would minimize adverse construction noise impacts on the community may be needed. Construction in urban and suburban areas is common (and necessary) and contractors now routinely incorporate Best Management Practices (BMPs) to reduce the temporary noise associated with equipment use including sound walls, mufflers, avoiding simultaneous use of especially noisy equipment, noise dampening shields, enclosure of stationary work as well as proper equipment maintenance. BMPs would be expected to reduce noise levels by 15 dBA or more.

**Construction Vibration.** The Transportation and Construction Vibration Guidance Manual presents a variety of criteria for vibration impacts based on previously completed studies (Caltrans 2020a). Caltrans recommends that extreme care be taken when sustained pile driving occurs within 7.5 meters (25 feet) of any building and 15 to 30 meters (50 to 100 feet) of a historic building or a building in poor condition.

## LOCAL

To identify, appraise, and remedy noise problems in local jurisdictions, each county and city in the SCAG region is required to adopt a noise element as part of its General Plan. Each noise element is required to analyze and quantify current and projected noise levels associated with local noise sources, including, but not limited to, highways and freeways, primary arterials and major local streets, rail operations, air traffic associated with the airports, local industrial plants, and other ground stationary sources that contribute to the community noise environment. Beyond statutory requirements, local jurisdictions are free to adopt their own goals and policies in their noise elements, although most jurisdictions have chosen to adopt noise/land use compatibility guidelines that are similar to those recommended by the state. The overlapping DNL ranges indicate that local conditions (existing noise levels and community attitudes toward dominant noise sources) should be considered in evaluating land use compatibility at specific locations.

In addition to regulating noise through noise element policies, local jurisdictions regulate noise through enforcement of local ordinance standards. These standards generally relate to noisy activities (e.g., use of loudspeakers and construction) and stationary noise sources and facilities (e.g., air conditioning units and industrial activities). Three cities in the SCAG region, Los Angeles, Long Beach, and Port Hueneme, operate port facilities. Noise from the Ports of Los Angeles, Long Beach, and Hueneme are regulated by the noise ordinances and noise elements of the Los Angeles, Long Beach, and Port Hueneme General Plans.

In terms of airport noise, airport operators have addressed local community noise concerns through a variety of methods changes including runway use and flight routing changes, aircraft operational procedure changes, and engine run-up restrictions. These actions generally are subject to approval by the FAA, which has the authority and responsibility to control aircraft noise sources, implement and enforce flight operational procedures, and manage the air traffic control system. Airport operators also consider limitations on airport use, but such restrictions can be overridden by the FAA if it is determined that they unjustly discriminate against any user, impede the federal interest in safety and management of the air navigation system, or unreasonably interfere with interstate commerce. In addition, airport operators have addressed community concerns by retrofitting homes under flight paths to provide additional noise insulation.

Some local jurisdictions regulate vibration through enforcement of local ordinance standards. These standards generally relate to preventing perceptible vibration from being generated past the property line of the source location.

# 3.13.3 ENVIRONMENTAL IMPACTS

## THRESHOLDS OF SIGNIFICANCE

For the purposes of this 2024 PEIR, SCAG has determined that implementation of Connect SoCal 2024 could result in significant impacts related to noise if the Plan would exceed the following significance criteria, in accordance with California Environmental Quality Act (CEQA) Guidelines Appendix G:

- Generation of 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 ordinance, or applicable standards of other agencies;
- Generation or excessive groundborne vibration or groundborne noise levels;

- For a project within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

## METHODOLOGY

Chapter 2, *Project Description*, describes the Plan's vision, goals, policies, forecasted regional development pattern, policies and strategies, and individual transportation projects and investments. The Plan aims to increase mobility, promote sustainability, and improve the regional economy. Although land use development is anticipated to occur within the region even without the Plan, the Plan could influence growth, including distribution patterns. To address this, the 2024 PEIR includes an analysis on the implementation of policies and strategies as well as potential projects and evaluates how conditions in 2050 under the Plan would differ from existing conditions.

This section evaluates the potential impacts of the proposed Plan on ambient noise levels, identifies mitigation measures for the impacts, and evaluates the residual impacts in accordance with 2023 CEQA Guidelines Appendix G. Noise within the SCAG region was evaluated at the programmatic level of detail, with reference to applicable federal and state noise and vibration impacts guidelines as appropriate, and a review of related literature germane to the SCAG region, as well as a review of the Plan.

Ambient noise levels in the SCAG region vary widely as a function of the physical environment, land use, and density of people. Noise levels for various areas are identified according to the use of the area. Maximum allowable noise levels associated with various sensitive land uses are provided. Exposure of people to noise levels and ground borne vibration from transportation and transit infrastructure varies in relation to noise level at the source, density of the source, distance from the source, and sound modulating or attenuating structures between the source and the receptor.

The methodology for determining the significance of noise and vibration impacts compares the existing conditions (2022) to the conditions in 2050 under the Plan, including implementation of transportation projects and potential development projects for a more compact land use development pattern.

Temporary changes in noise are associated with different phases of construction for projects typically extending over several years. Noise levels vary with construction phase and adjacent sensitive receptors may be affected differently at different times. As noted above, construction noise in urban and suburban areas is common and increasingly necessary to achieve the compact growth pattern identified in Connect SoCal 2024 as well as state and other local plans. For this reason, many communities are moving away from identifying construction noise as significant and instead are tightening their General Plans and noise ordinances and requiring generally applicable environmental protection measures. The analysis in this PEIR considers typical noise levels from different phases of typical construction activities and how such temporary noise levels could affect nearby sensitive receptors.

Permanent increases in operational noise associated with highway traffic is dependent on several variables:

- Traffic volume (the greater the number of vehicles passing through an area within a specified period result in greater noise)
- Vehicle speed (greater speed results in greater noise from tire and aerodynamic noise)
- Vehicle types such as cars, trucks, and motorcycles (different engine and exhaust combinations, different tires, and different aerodynamic profiles result in different noise levels)

- Location of the roadway with respect to sensitive receptors (distance and intervening objects or topography will reduce noise levels).

The noise impacts analysis was based on the Project List for Connect SoCal 2024 (see Project List Technical Report in the Plan) which includes transportation projects and programs, as well as land use development projects consistent with the Forecasted Regional Development Pattern under the Plan. Project types range from projects with substantial ground disturbance such as rail projects, mixed flow lane projects, and grade separation projects, to operations and maintenance projects with minimal ground disturbance such as traffic signal synchronization or lane-restriping projects. The noise impacts analysis also considers impacts from potential development projects constructed to implement the Plan's land use development pattern throughout the six counties and 38,000 square miles of the SCAG region.

As discussed in Chapter 2, *Project Description*, and Section 3.0, *Introduction to the Analysis*, Connect SoCal 2024 includes Regional Planning Policies and Implementation Strategies some of which will effectively reduce impacts in the various resource areas. Furthermore, compliance with all applicable laws and regulations (as set forth in the Regulatory Framework) would be reasonably expected to reduce impacts of the Plan (see CEQA Guidelines Section 15126.4(a)(1)(B)). As discussed in Section 3.0, *Introduction to the Analysis*, where remaining potentially significant impacts are identified, SCAG mitigation measures are incorporated to reduce these impacts. If SCAG cannot mitigate impacts of the Plan to less than significant, project-level mitigation measures are identified which can and should be considered and implemented by lead agencies as applicable and feasible.

## IMPACTS AND MITIGATION MEASURES

**Impact NOI-1 Generation of 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 ordinance, or applicable standards of other agencies.**

***Significant and Unavoidable Impact – Mitigation Required***

Implementation of the Plan would likely result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies, constituting a significant impact. Grading and construction activities would generate temporary increases in noise levels, and operational activities would generate permanent increases in noise levels in excess of standards established in the local general plan or noise ordinance, constituting a significant impact, requiring the consideration of mitigation measures.

As noted above, noise impacts are experienced locally and cannot be quantified at a regional level. Land uses support various noise environments depending on multiple factors. For example, urban environments tend to be louder than suburban environments due to denser, multi-use land use patterns. Urban environments also typically support higher volumes of traffic as well as other transportation modes that generate sound such as trains, light rail, and buses. Suburban environments, where land uses are often more segregated, have more moderate noise levels. Agricultural areas also have a unique noise environment as compared to urban and suburban environments. Agricultural operations require the use of heavy-duty equipment (e.g., mechanized plows, tractors) that produce high noise levels. However, because agricultural areas are sparsely populated, noise generally does not have the same adverse effect on surrounding land uses and may be protected by right-to-farm regulations or other local land use policies.

### Construction

Impacts to sensitive receptors from the construction of projects implemented under the Plan depend on several factors, such as the type of project, adjacent land use, and duration and intensity of the construction activity. Construction noise levels would fluctuate depending on how the construction is phased, the equipment mix, the distance between the construction and the nearest sensitive receptor, and the presence of intervening objects. Furthermore, anticipated development to accommodate the forecast population, household, and employment would take a variety of forms, with a substantial number of housing and jobs focused in PDAs. Because development would be focused in PDAs, residents in and around those areas would be subject to increased frequency of construction noise.

### Operations

Impacts to sensitive receptors resulting from increases in traffic due to implementation of the Plan would depend on several factors, such as the type of project and adjacent land use. Operational noise levels would fluctuate depending on traffic volume, vehicle speed, vehicle mix, location, and distance of the roadway with respect to sensitive receptors, and the presence of intervening objects. A doubling of traffic generally corresponds to a 3 dB increase in noise level, which is only just perceptible to the human ear. Most major facilities do not have the capacity to allow a doubling of traffic; therefore, this increase is generally not expected.

Similar to construction impacts, anticipated development projects would take a variety of forms, with the majority focused in and around PDAs. As traffic volumes increase, the duration of the peak hour noise levels would extend. Operation of transportation and transit projects in these PDAs would have the potential to increase noise levels in excess of standards established in county and city general plans and noise ordinances.

Heavy rail would increase the number of passenger and freight trains in the region. Because of the number of existing passenger and freight trains that use the existing heavy rail tracks, additional trains are not expected to increase daily noise (CNEL) along any given track by more than 3 dB relative to baseline conditions. Light-rail improvements will include increasing frequency on and making improvements to existing corridors and adding new corridors. In general, the proposed transit improvements along existing corridors would occur in developed urban areas where noise levels are already high from existing sources. In areas that do not currently have light-rail operations, implementation of the Plan could increase noise levels above 65 dB CNEL and increase CNEL by more than 3 dB relative to baseline conditions. Increases in operational mobile source noise from the projected land use pattern and planned transportation improvements would result in new vehicles trips on existing roadways generating increases in noise. In locations where noise would exceed the CNEL threshold of 65 dB following the implementation of the Plan, a significant noise impact would occur.

Land use strategies in the Plan would encourage development in PDAs and other urbanized areas. Urban and suburban areas experience noise from a number of sources associated with living in proximity to other people and among different land uses. Typical community noise sources include small mechanical devices (e.g., lawn mowers, leaf blowers), parks and playgrounds, restaurants and bars, commercial uses, events, and industrial plants. Outdoor spaces such as patios, balconies, yards, and common areas associated with housing projects can also be sources of substantial temporary noise when large groups of people congregate in these areas or when residents engage in activities that produce high noise levels; however, as noted above in Regulatory Framework, pursuant to AB

1307, which was signed by Governor Newsom on September 7, 2023, "for residential projects, the effects of noise generated by project occupants and their guests on human beings is not a significant effect on the environment" (California Legislative Information 2023). Traffic and other transportation-related noise is also a dominant noise source in urban areas. Light rails, passenger trains, and other forms of public transit generate noise from the contact of wheels on railways as well as loud bells that signal to cars, cyclists, and pedestrians of their arrival. Implementation of the Plan is likely to increase the amount of noise experienced in PDAs because of the increased density in these areas as well as from improved transportation infrastructure.

In suburban and rural areas, noise sources are fewer and the addition of new stationary or mobile noise sources could result in an increase in ambient noise. According to SPM data, future 2050 conditions with the Plan would still result in the conversion agricultural and natural lands into developed uses when compared to existing conditions, which has the potential for increased ambient noise in suburban and rural areas.

Because of the nature of noise impacts (noise dissipates with distance), new sources of noise could result in noise levels exceeding applicable noise thresholds for determining significance within a localized area, but those impacts cannot be quantified at a regional level. Therefore, it is determined that implementation of the Plan could result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. As such, this impact is considered significant and mitigation measures are required.

## Mitigation Measures

### SCAG Mitigation Measures

See **SMM-LU-1** through **SMM-LU-3**, **SMM-POP-1**, and **SMM-POP-2**.

### Project-Level Mitigation Measures

**PMM-NOI-1** In accordance with provisions of Sections 15091(a)(2) and 15126.4(a)(1)(B) of the CEQA Guidelines, a Lead Agency for a project can and should consider mitigation measures to reduce ambient noise levels in the vicinity of the project, as applicable and feasible. Such measures may include the following or other comparable measures identified by the Lead Agency:

a. Install temporary noise barriers during construction between noise sources and noise-sensitive land uses and species.

b. Include permanent noise barriers and sound-attenuating features as part of the project design between noise sources and noise-sensitive land uses and species. Barriers could be in the form of outdoor barriers, sound walls, buildings, landscaped berms, dense planting, or earth berms to attenuate noise at adjacent sensitive uses. Sound-attenuating features could be in the form of grade separation, buffer zones, reduced-noise paving materials, and traffic calming measures.

c. Schedule construction activities consistent with the allowable hours pursuant to applicable general plan noise element or noise ordinance

d. Post procedures and phone numbers at the construction site for notifying the Lead Agency staff, local Police Department, and construction contractor (during regular construction hours and off-hours), along with permitted construction days and hours, complaint procedures, and who to notify in the event of a problem.

e. Notify neighbors and occupants within 300 feet of the project construction area at least 30 days in advance of anticipated times when noise levels are expected to exceed limits established in the noise element of the general plan or noise ordinance.

f. Designate an on-site construction complaint and enforcement manager for the project.

g. Ensure that construction equipment is properly maintained per manufacturers' specifications and fitted with the best available noise suppression devices (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds silencers, wraps). All intake and exhaust ports on power equipment shall be muffled or shielded.

h. Use hydraulically or electrically powered tools (e.g., jack hammers, pavement breakers, and rock drills) for project construction to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust should be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves should be used, if such jackets are commercially available, and this could achieve a further reduction of 5 dBA. Quieter procedures should be used, such as drills rather than impact equipment, whenever such procedures are available and consistent with construction procedures.

i. Where feasible, design projects so that they are depressed below the grade of the existing noise-sensitive receptor, creating an effective barrier between the roadway and sensitive receptors.

j. Where feasible, improve the acoustical insulation of dwelling units where setbacks and sound barriers do not provide sufficient noise reduction.

k. Using rubberized asphalt or "quiet pavement" to reduce road noise for new roadway segments, roadways in which widening or other modifications require re-pavement, or normal reconstruction of roadways where re-pavement is planned

l. Projects that require pile driving or other construction noise above 90 dBA in proximity to sensitive receptors, should reduce potential pier drilling, pile driving and/or other extreme noise generating construction impacts greater than 90 dBA; a set of site-specific noise attenuation measures should be completed under the supervision of a qualified acoustical consultant.

m. Monitor the effectiveness of noise reduction measures by taking noise measurements and installing adaptive mitigation measures to achieve the standards for ambient noise levels established by the noise element of the general plan or noise ordinance.

n. Use equipment and trucks with the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds, wherever feasible) for project construction.

o. Stationary noise sources can and should be located as far from adjacent sensitive receptors and species to the maximum extent feasible and they should be muffled and enclosed within temporary sheds, incorporate insulation barriers, or use other measures as determined by the Lead Agency (or other appropriate government agency) to provide equivalent noise reduction.

p. Use of portable barriers in the vicinity of sensitive receptors during construction.

q. Implement noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings (for instance by the use of sound blankets), and implement if such measures are feasible and would noticeably reduce noise impacts.

r. Monitor the effectiveness of noise attenuation measures by taking noise measurements.

s. Maximize the distance between noise-sensitive land uses and new roadway lanes, roadways, rail lines, transit centers, park-and-ride lots, and other new noise-generating facilities.

### LEVEL OF SIGNIFICANCE AFTER MITIGATION

As previously discussed, the Plan's Regional Planning Policies and Implementation Strategies (see Chapter 2, *Project Description*, and Section 3.0, *Introduction to the Analysis*), compliance with existing laws and regulations would reduce impacts, but given the regional scale of the analysis in this 2024 PEIR, it is not possible or feasible to determine if all impacts would be fully mitigated. Therefore, this 2024 PEIR identifies SCAG and project-level mitigation measures. At the project-level, lead agencies can and should consider the identified project-level mitigation measures during subsequent review of transportation and land use projects as appropriate and feasible. While the mitigation measures will reduce the impacts related to generation of substantial noise increases, due to the regional nature of the analysis, unknown site conditions and project-specific details, and SCAG's lack of land use authority over individual projects, SCAG finds that the impact could be ***significant and unavoidable*** even with mitigation.

IMPACT NOI-2 **Generation of excessive groundborne vibration or groundborne noise levels.**

***Significant and Unavoidable Impact – Mitigation Required***

Implementation of the Plan would generate varying levels of vibration and groundborne noise. As noted above, urban environments tend to be louder than suburban environments due to denser, multi-use land use patterns. Urban environments also typically support higher volumes of traffic as well as other transportation modes that generate groundborne vibration and sound such as trains, light rail, and buses. Suburban environments, where land uses are often more segregated, have more moderate groundborne vibration and noise levels. Agricultural operations require the use of heavy-duty equipment (e.g., mechanized plows, tractors) that produce high groundborne vibration and noise levels. However, because agricultural areas are sparsely populated, noise generally does not have the same adverse effect on surrounding land uses and may be protected by right-to-farm regulations or other local land use policies.

Traffic, especially heavy truck traffic, can be a source of vibration and groundborne noise. Rail operations, including freight and light-rail trains, can also be a source of vibration.

### CONSTRUCTION

Implementation of the Plan could result in temporary noise and vibration impacts from grading, paving, clearing, landscaping, staging, excavation, earthmoving, and other related construction activities. Such construction activities would require the use of heavy construction equipment (e.g., pile drivers, back hoes, jackhammers) and vehicles that generate significant amounts of noise and vibration in the immediate vicinity of the source, often resulting in noise and vibration levels substantially higher than existing conditions. Table 3.13-6 and Table 3.13-7 summarize typical construction noise and vibration levels, respectively, for various construction activities.

Noise and vibration impacts from construction activities depend on several factors including the types of surrounding land uses, duration and type of construction activities, distance between source and receptor, and the presence or absence of barriers between source and receptor. Construction impacts are considered temporary and localized in nature, as they are limited to the time during which the project is being constructed and confined to areas adjacent to the construction site. After construction is completed, all construction equipment and vehicles are removed. In urban areas, where most of the development takes place, construction is a frequent occurrence, and although construction can be a nuisance, it may not result in a significant impact. In rural and suburban areas, where ambient noise levels are lower, noise may rise to the level of an impact. However, land uses are also further apart, thereby reducing the potential for conflicts. Further, many local jurisdictions have policies specifically dealing with construction noise including restrictions on hauling and hours of construction.

Implementation of the Plan have the potential to result in construction-related vibration impacts that increase vibration levels above the thresholds identified in Table 3.13-8 and Table 3.13-9; as well as the potential to result in excessive levels of vibration and groundborne noise from increased traffic and congestion, at the local level (see Section 3.17, *Transportation*, for further discussion of how the Plan affects the transportation network). Although construction activities are short-term for individual project sites, they can nonetheless result in substantial increases in ambient noise and vibration levels in the immediate vicinity of each construction site. Construction activities would occur in accordance with applicable city or county standards. Most such standards address acceptable hours of operation, while some standards address allowable noise levels. If sensitive receptors are in the immediate vicinity of construction activities, they could be temporarily adversely affected. Land use strategies that would encourage more dense development near sensitive receptors would result in increased temporary construction noise and vibration for those receptors. Construction activity, and associated groundborne vibration or noise levels, is a routine part of the urban environment. While construction of individual projects is generally considered to have a less-than-significant impact, construction activities are likely to be ongoing throughout the region; therefore, impacts are considered significant, and mitigation is required.

As previously discussed, there are various sensitive receptors such as residences, daycares, schools, libraries, churches, hospitals, nursing homes, natural areas, and parks in the SCAG region that could be affected by construction or operation of Plan projects. As such, impacts are considered significant.

## Operation

Normal operation of residential, office and commercial, and mixed-use buildings are unlikely to generate substantial vibration or groundborne noise. Industrial and public buildings could generate vibration and groundborne noise during operations that involve the use of machinery or other vibration-inducing equipment. However, the amount of vibration produced is not anticipated to be excessive, as workplace vibration is typically addressed from an occupational health and safety perspective. As with noise, vibration dissipates with distance from the source; therefore, surrounding land uses would likely not be affected. Table 3.13-7 indicates that, even at close distances, vibration levels for most heavy-duty equipment are below 0.1 in/sec.

Traffic, especially heavy truck traffic, can be a source of vibration and groundborne noise. However, such vibration is rarely high enough to cause annoyance to surrounding uses, as vehicles are supported on spring suspensions and pneumatic tires, which reduce the amount of vibration and groundborne noise generated from vehicular traffic. Rail operations, including freight and light-rail trains, can also be a source of vibration. Under the Plan there would be increases in both heavy rail and light rail. Existing and future growth and development near existing or planned light-rail or heavy-rail lines could result in excessive levels of vibration and groundborne noise as compared to existing conditions.

Impacts associated with transportation strategies such as complete streets and Transportation System Management and Operations (TSMO) would be minimal and they would generally improve overall traffic flow and would not be expected to increase noise or vibration. Land use strategies would encourage compact development which would encourage more people in urbanized areas where vibration impacts would occur. Operation-related vibration would be a source of annoyance to individuals who live or work near new infrastructure associated with heavy duty truck and bus traffic along roadways and train traffic along rail lines. The amplitude of vibration generated by heavy trucks, buses, or trains has the potential to result in structural or cosmetic damage if the route is adjacent or in close proximity to fragile older buildings.

Based on vibration measurements throughout California, Caltrans determined the maximum traffic vibration levels from truck traffic drop below the threshold of perception at a distance of 42.5 meters (140 feet) from the source and that vibration level from truck traffic are unlikely to cause architectural damage to fragile historic buildings unless the building was adjacent or within 5 meters or 17 feet from the source (Caltrans 2002). It is anticipated that operational activities for some projects would result in a significant impact related to the exposure of people to excess groundborne vibration or groundborne noise levels.

Furthermore, Caltrans measured a peak train vibration level of 0.36 in/sec PPV at 3 meters (10 feet) (Caltrans 2002). A vibration level of 0.36 in/sec PPV at 3 meters or 10 feet would fall below the threshold of perception at a distance of 80 meters (263 feet) from the source. It is anticipated that operational activities for some projects would result in a significant impact related to the exposure of people in excess groundborne vibration or groundborne noise levels.

In conclusion, implementation of the Plan could result in the exposure of persons to excessive groundborne vibration or groundborne noise levels. Therefore, this impact is considered significant and mitigation measures are required.

## Mitigation Measures

### SCAG Mitigation Measure

See **SMM-LU-1** through **SMM-LU-3**, **SMM-POP-1**, and **SMM-POP-2**.

### Project-Level Mitigation Measures

See **PMM-NOI-1**.

**PMM-NOI-2** In accordance with provisions of Sections 15091(a)(2) and 15126.4(a)(1)(B) of the CEQA Guidelines, a Lead Agency for a project can and should consider mitigation measures to reduce substantial adverse effects related to groundborne vibration. Such measures may include the following or other comparable measures identified by the Lead Agency:

a. For projects that require pile driving or other construction techniques that result in excessive vibration, such as blasting, determine the potential vibration impacts to the structural integrity of the adjacent buildings within 50 feet of pile driving locations.

b. For projects that require pile driving or other construction techniques that result in excessive vibration, such as blasting, determine the threshold levels of vibration and cracking that could damage adjacent historic or other structure, and design means and construction methods to not exceed the thresholds.

c. For projects where pile driving would be necessary for construction due to geological conditions, utilize quiet pile driving techniques such as predrilling the piles to the maximum feasible depth, where feasible. Predrilling pile holes will reduce the number of blows required to completely seat the pile and will concentrate the pile driving activity closer to the ground where pile driving noise can be shielded more effectively by a noise barrier/curtain and reduce the vibration occurrences and magnitude.

d. Perform construction activities within permitted hours in accordance with local jurisdiction regulation.

e. Properly maintain construction equipment and outfit construction equipment with the best available noise suppression devices (e.g., mufflers, silences, wraps).

### LEVEL OF SIGNIFICANCE AFTER MITIGATION

As previously discussed, the Plan's Regional Planning Policies and Implementation Strategies (see Chapter 2, *Project Description*, and Section 3.0, *Introduction to the Analysis*) and compliance with existing laws and regulations would reduce impacts; however, given the regional scale of the analysis in this 2024 PEIR, it is not possible or feasible to determine if all impacts would be fully mitigated. Therefore, this 2024 PEIR identifies SCAG and project-level mitigation measures. At the project-level, lead agencies can and should consider the identified project-level mitigation measures during subsequent review of transportation and land use projects as appropriate and feasible. While the mitigation measures will reduce the impacts related to generation of groundborne vibration and noise, due to the regional nature of the analysis, unknown site conditions and project-specific details, and SCAG's lack of land use authority over individual projects, SCAG finds that the impact could be ***significant and unavoidable*** even with mitigation.

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IMPACT NOI-3 **For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.**

***Significant and Unavoidable Impact – Mitigation Required***

Implementation of the Plan could result in exposure of persons to or generation of significant noise levels from aircrafts and other airport activity (including ground transportation) constituting a significant impact.

The SCAG region contains an expansive multiple airport system with eight commercial airports, seven government/military fields, and more than 30 reliever and general aviation airports. California's Airport Noise Standards identify a noise exposure level of CNEL 65 dB as the noise impact boundary around airports. Airport proprietors are required to ensure all land uses are compatible with the aircraft noise environment or secure a variance from the California Department of Transportation.

SCAG has no authority over airport development but prepares an Aviation and Airport Ground Access Technical Report as part of development of the Plan each cycle which includes aviation planning information to facilitate ground transportation access planning. Development authority of airports rests with each airport (i.e., airport sponsors retain authority over planning and development decisions) and the FAA, which makes airport funding decisions based on national priorities. Moreover, airports are not required to incorporate metropolitan planning organization (MPO) planning recommendations into their capital plans, and FAA funding decisions are not necessarily tied to MPO RTP recommendations.

Despite some downturns, air passenger traffic in the region has increased at a steady rate over the past two decades, with a particularly vigorous growth rate in recent years up until the COVID-19 pandemic. According to the Connect SoCal 2024 Aviation and Ground Access Technical Report, while the air passenger growth from 88.5 million annual passengers (MAP) in 2000 to 116.53 MAP in 2019 appears relatively modest at 1.7 percent annual growth, the overall growth during this nineteen-year period reflects downturns that occurred following 9/11 and the Great Recession. After starting off the century at 88.5 MAP, air passenger travel experienced a decline following 9/11 going from 81.9 MAP in 2001 to 77.9 MAP in 2002. Air travel increased again until the Great Recession in 2006, which saw air travel demand go down as low as 79.1 MAP in 2009. However, following the dips in 2002 and 2009, air travel in the region has grown at a steady rate, with a noticeable increase following 2012. Post-Great Recession, the increase in air passenger traffic had been robust until the COVID-19 pandemic. The region saw an increase from 85.8 MAP in 2012 to 116.53 MAP in 2019, an increase of 36 percent or 5.12 percent per year growth, making the SCAG region one of the fastest growing for passenger traffic when compared to other metropolitan regions, such as New York/New Jersey and Washington DC. Overall, the SCAG region has been one of the most active in terms of air passenger traffic, as well as annual air passenger demand growth. After hitting a historic low in passenger demand of 39.4 MAP in 2020 due to the COVID-19 pandemic, the SCAG region recovered dramatically by 2020 at 95.15 MAP (SCAG 2023).

As noted above, SCAG does not have any regulatory, developmental, operational, or planning authority over the airports and airport operations. Rather, SCAG is primarily a regional surface transportation planning agency that maintains a list of airport ground access projects and a consultative relationship with the airports. Therefore, SCAG is focused on air and passenger cargo activity from the perspective of how transportation access in the vicinity of airports affects the region's roads, highways, and transit system.

The Connect SoCal 2024 Aviation and Airport Ground Access Technical Report references a comprehensive review of various forecasts for aviation growth in the SCAG region (SCAG 2023), including the FAA Terminal Area Forecast (TAF), FAA Aerospace Forecast, and passenger and cargo forecasts provided to SCAG by the airports:

- Regional air passenger transportation is anticipated to grow by an average of 1.9 percent annually; from 116.53 MAP in 2019 to 182.44 MAP in 2050, according to the passenger forecasts provided to SCAG by the airports.
- Regional air cargo transportation is anticipated to grow by an average of 3.2 percent annually, from 3.53 million tons in 2019 to 11.41 million tons in 2050, according to the cargo forecasts provided to SCAG by the airports.
- Total regional aircraft operations are not anticipated to grow as fast as passenger and/or cargo growth. Regional aircraft operations are anticipated to grow by an average of 0.47 percent annually, from 3.79 million operations in 2019 to 4.76 million operations in 2050, according to the FAA TAF.

LAX is the only regional large-hub primary airport, and the operational data listed for each regional airport indicates most regional commercial air carrier operations are associated with LAX. Recent statistics show that while passenger traffic increased by approximately 3.5 percent in 2019 from the prior year, aircraft operations decreased by approximately 2.3 percent. The Los Angeles World Airports department of the City of Los Angeles is currently constructing an automated people mover (APM) electric train to reduce ground traffic congestion, accommodate future operational growth, and provide a direct rail connection to Los Angeles and adjacent cities (Los Angeles World Airports 2023). The APM is planned to open for passenger services in 2023, and APM operation will reduce ground traffic and could incrementally reduce associated ground traffic noise.

An Aviation Noise Technical Report was also prepared as part of this 2024 PEIR to specifically assess impacts from aviation noise. The full report is provided in **Appendix F**, *Aviation Noise Technical Report*, of this 2024 PEIR.

As noted above, the aircraft operations growth forecast is significantly smaller than the air passenger and air cargo percentages. This is anticipated because newer aircraft carry a higher volume of passengers and carriers are running at a higher load factor than in the past. When the airlines carry more passengers per flight, the flights are more profitable and fewer flights are needed to carry the same volume of passengers to a specific location. This allows the airlines to schedule some of these flights to other locations and/or reduce their airport operations.

The noise from airports is directly related to the number of aircraft operations as well as the size, aircraft type, and number and type of engines, with additional contributions from other airport activities and ground transportation (noise from ground transportation is considered as part of the overall transportation projects in the Plan).

In general, if the mix of aircraft remains constant, the aviation noise contours grow larger or shrink smaller as the operations increase or decrease. Noise levels do not increase algebraically as the noise sources increase but increase in a logarithmic fashion. For example, two noise sources each emitting a noise level of 60 dB add together to produce noise of 63 dB, not 120 dB. Doubling the number of noise sources increases the overall noise level by 3 dB and doubling the number of aircraft operations would also increase the overall airport noise level by 3 dB and expand the area inside the noise contours, assuming all other factors such as aircraft type, engines, flight tracks, etc., remain the same.

Considering the growth in airport operations from 3.79 million operations in 2019 to 4.76 million operations in 2050, if all aircraft types and operational characteristics were to remain equal, the forecasted increase in noise would equate to 1.0 dB. However, this average increase in aircraft operations would not occur at all airports, as different airports will experience different changes and noise contours may grow or shrink independently. Airport noise levels are expected to increase at the busiest airports such as LAX, ONT, PSP, and BUR, while noise levels at airports with noise and/or operations constraints would not be expected to increase as much. The details needed to model airport noise level changes over the forecast period are not available to provide specific changes. Additionally, airports across the nation have received an increase in noise complaints since implementation in 2015 of FAA's NextGen program to modernize the nation's air transportation system (FAA 2019a). One aspect of NextGen utilizes satellite navigation that precisely direct aircraft flight tracks for more efficient performance, reducing fuel costs and associated carbon emissions, and to increase overall flight capacity (FAA 2019b). Aircraft flight track changes in some cases moved flights over areas that previously did not experience overflights or concentrated aircraft over areas that already experienced overflights, and airport noise complaints increased (Aratani 2016). As the FAA and airports such as LAX and BUR (Carpio 2019) wrestle with the contending issues of an efficient airspace and noise complaints, it is unclear whether aircraft flight tracks will remain constant, further complicating the details needed for forecasting airport noise level changes over the lifetime of the Plan.

Technological changes also play a role in understanding airport noise impacts. The aircraft industry continues to develop aircraft with higher capacity, lower fuel consumption, and lower carbon emissions, but as it does, the industry must also comply with FAA and international aircraft compliance requirements regarding noise. There are currently two major airline industry trends that will affect the future fleet operated at the region's airports. The first is the phase out of some regional jet aircraft in favor of larger mainline narrowbody aircraft flying shorter routes at a higher load factor. The second is the transition from older, louder narrowbody aircraft to quieter, more fuel-efficient aircraft. Aircraft are classified into various Stages with respect to noise controls, with current Stage 3 and 4 aircraft operating quieter than previously used Stage 2 aircraft. Stage 3 aircraft measure between 7 and 20 effective perceived noise level, in decibels (EPNdB) quieter than Stage 2 aircraft, while Stage 4 aircraft are an additional 10 EPNdB quieter than Stage 3 aircraft. Stage 2 aircraft no longer fly in the U.S., with some exceptions for lighter weight aircraft, taking the noisiest aircraft out of service. As airlines replace older and noisier Stage 3 aircraft with quieter Stage 4 aircraft, the aircraft fleet becomes quieter. As a recent example, American Airlines retired the last of its Stage 3 compliant McDonnell Douglas MD-80 aircraft in September 2019 and looks to replace the aircraft with more fuel-efficient aircraft with lower maintenance costs (Biggar 2019). Even as newer aircraft have more powerful engines, the requirements to comply with the quieter Stage 4 noise levels will result in a quieter fleet overall. In 2018, the FAA adopted regulations requiring newly designed aircraft to meet even quieter Stage 5 requirements with a reduction of 7 EPNdB (FAA 2017). Stage 5 is the current FAA requirement for new jet and large turboprop aircraft, which took effect December 31, 2020 (FAA 2023). Therefore, newly developed commercial aircraft entering service in future years will be generally quieter than aircraft currently in service today.

It is possible that in the long term, as aircraft operations grow over the next 25 years, the lower noise levels of aircraft will offset the increased operations to maintain or even reduce the aircraft noise contour footprints around airports, as this has been the general trend in aviation noise over the previous 40 years. It may also be possible that the growth in operations at some airports may overtake the trend toward a quieter aircraft fleet and cause aircraft noise and the noise contours to increase.

In addition, most major public airports have an airport land use plan that provides guidance on safety and land use in adjacent areas. State law mandates the creation of an Airport Land Use Compatibility Plan. The Airport Land Use Commission (ALUC) coordinates planning for areas that surround public use airports. The ALUC is tasked with preparing airport land use plans to protect the public by minimizing their exposure to excessive noise and safety hazards within these areas.

Furthermore, the development of airport land use plans is guided by three federal regulations and two state codes:

- Title 14 CFR Part 36 establishes maximum acceptable noise levels for specific aircraft types.
- Title 14 CFR Part 150, provides guidance for measuring noise at airports and surrounding areas, determining exposure of individuals to noise from the operations of an airport, identifying land uses that are normally compatible, and preparing and executing noise compatibility planning and implementation programs.
- As part of Title 24 CFR Part 51, Subpart B, the HUD exterior noise regulations state that noise levels of 65 dBA DNL or less are acceptable for residential land uses and noise levels exceeding 75 dBA DNL are unacceptable.
- California Government Code Section 65302 specifies that noise contours be shown for all facilities related to airport operations and be stated in terms of CNEL or $L_{dn}$. These noise contours are intended to guide how patterns of land uses are established in the land use element in order to minimize the exposure of community residents to excessive noise.

- Title 21 CCR Section 5000 et seq., identifies a noise exposure level of CNEL 65 dB as the noise impact boundary around airports. Within this noise impact boundary, airport proprietors are required to ensure that all land uses are compatible with the aircraft noise environment or the airport proprietor must secure a variance from Caltrans.

Additionally, each county and city in the SCAG region is required to adopt safety and noise elements as part of their General Plans. It is expected that local jurisdictions would conduct environmental review for projects that are within or near sensitive airport zones and are expected to implement best management practices and mitigation measures on a project-by-project basis, to minimize potential noise risks associated with air traffic.

Nevertheless, due to the regional scale of aviation operations and because the noise profiles of future aircraft types and their engines are unknown, as is the timeframe for phasing out older aircraft and replacing them with newer aircraft, impacts cannot be accurately determined at this time. Conservatively, it is assumed sensitive receptors may experience greater noise impacts than at present in the vicinity of airports. As a result, implementation of the Plan has the potential to expose people to excessive aviation-related noise; therefore, this impact is considered significant, and mitigation measures are required.

### MITIGATION MEASURES

#### SCAG MITIGATION MEASURES

See **SMM-HAZ-2**.

#### PROJECT-LEVEL MITIGATION MEASURES

See **PMM-NOI-1**.

#### LEVEL OF SIGNIFICANCE AFTER MITIGATION

As previously discussed, the Plan's Regional Planning Policies and Implementation Strategies (see Chapter 2, *Project Description*, and Section 3.0, *Introduction to the Analysis*) and compliance with existing laws and regulations would reduce impacts; however, given the regional scale of the analysis in this 2024 PEIR, it is not possible or feasible to determine if all impacts would be fully mitigated. Therefore, this 2024 PEIR identifies SCAG and project-level mitigation measures. At the project-level, lead agencies can and should consider the identified project-level mitigation measures during subsequent review of transportation and land use projects as appropriate and feasible. While the mitigation measures will reduce the impacts related to aircraft noise, unknown site conditions and project-specific details, and SCAG's lack of land use authority over individual projects, SCAG finds that the impact could be ***significant and unavoidable*** even with mitigation.

## CUMULATIVE IMPACTS

Connect SoCal 2024 is a regional-scale Plan comprising policies and strategies, a regional growth forecast and land use pattern, and individual transportation projects and investments. At this regional-scale, a cumulative or related project to the Plan is another regional-scale plan (such as Air Quality Management Plans within the region) and similar regional plans for adjacent regions. Because the Plan, in and of itself, would result in significant adverse environmental impacts with respect to noise and vibration, these impacts would add to the environmental impacts of other cumulative or related projects. Mitigation measures that reduce the Plan's impacts would similarly reduce the Plan's contribution to cumulative impacts.

## 3.13.4 Sources

Alameda Corridor Transportation Authority. 2019. *Alameda Corridor Fact Sheet*. 2019. http://www.acta.org/projects/projects_completed_alameda_factsheet.asp. Accessed July 20, 2023.

Amtrak. 2019. California Train Routes. 2019. http://www.amtrak.com/california-train-routes. Accessed July 20, 2023.

Aratani, L. 2016. "Advances in airport technology mean sleepless nights for some." *Washington Post*. March 4, 2016. https://www.washingtonpost.com/local/trafficandcommuting/advances-in-airport-technology-mean-sleepless-nights-for-some/2016/03/04/7b8eb936-e098-11e5-9c36-e1902f6b6571_story.html. Accessed July 20, 2023.

Biggar, D. 2019. "American Airlines Retires the Last of Its Iconic MD-80 Jets." NBC San Diego. September 16, 2019. https://www.nbcsandiego.com/news/national-international/american-airlines-retires-the-last-of-its-iconic-md-80-jets/1965375/. Accessed July 20, 2023.

California Department of Consumer Affairs. 2014. *State of California Laws and Regulations Pertaining to Automotive Repair Dealers, Smog Check Stations and Technicians, Official Lamp and Brake Adjusting Stations and Adjusters*. Section 27204. https://www.dca.ca.gov/publications/02_03_annrpt.pdf.

California Department of Transportation (Caltrans). 2009. *Project Development Procedures Manual*, Chapter 30 – Highway Traffic Noise Abatement. June 2009.

Caltrans. 2011. *California Airport Land Use Planning Handbook*. Division of Aeronautics. October 2011.

Caltrans. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. Division of Environmental Analysis. Sacramento, CA.

Caltrans. 2019. Airport Noise Program. https://dot.ca.gov/programs/aeronautics/airport-noise-program. Accessed July 20, 2023.

Caltrans. 2020a. *Transportation and Construction Vibration Guidance Manual*. Division of Environmental Analysis.

Caltrans. 2020b. *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects*. Division of Environmental Analysis.

California Legislative Information. 1961. Chapter 2, Rules and Regulations [17920–17928], Section 17922.6. https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=17922.6&lawCode=HSC. Accessed July 20, 2023.

California Legislative Information. 1965. Article 5, Authority for and Scope of General Plans [65300–65303.4], Section 65302. https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV&sectionNum=65302. Accessed July 20, 2023.

California Legislative Information. 1975. Article 2.5, Vehicle Code Noise Limits [27200–27207]. https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=VEH&division=12.&title=&part=&chapter=5.&article=2.5. Accessed July 21, 2023.

California Legislative Information. 1975. Division 28, Noise Control Act, 46000–46080. https://leginfo.legislature.ca.gov/faces/codes_displayexpandedbranch.xhtml?tocCode=HSC&division=28.&title=&part=&chapter=&article=, accessed July 20, 2023.

California Legislative Information. 1986. Article 6, Freeway Noise Attenuation [215.5–216.5], Section 216. https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=SHC&sectionNum=216. Accessed July 20, 2023.

California Legislative Information. 2023. Assembly Bill No. 1307. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240AB1307. Accessed September 19, 2023.

Carpio, A.C. "Hollywood Burbank Airport noise rattles residents, who want flights spread over wider area." *Los Angeles Times*. September 16, 2019. https://www.latimes.com/california/story/2019-09-16/hollywood-burbank-airport-noise-rattles-residents-who-want-flights-spread-over-wider-area. Accessed July 20, 2023.

Code of Federal Regulations. Title 14, Aeronautics and Space, Parts 1 to 59. 2018. https://www.govinfo.gov/content/pkg/CFR-2018-title14-vol1/pdf/CFR-2018-title14-vol1.pdf.

Code of Federal Regulations. Title 14, Aeronautics and Space, Parts 110 to 199. 2018. https://www.govinfo.gov/content/pkg/CFR-2018-title14-vol3/pdf/CFR-2018-title14-vol3.pdf.

Code of Federal Regulations. Title 23, Highways. 2018. https://www.govinfo.gov/content/pkg/CFR-2018-title23-vol1/pdf/CFR-2018-title23-vol1.pdf.

Code of Federal Regulation. Title 24, Housing and Urban Development, Parts 0 to 199. 2018. https://www.govinfo.gov/content/pkg/CFR-2018-title24-vol1/pdf/CFR-2018-title24-vol1.pdf.

Code of Federal Regulations. 2023. Title 14, Part 36 - Noise Standards: Aircraft Type And Airworthiness Certification. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-36. Accessed July 28, 2023.

Code of Federal Regulations. Title 40, Protection of the Environment, Parts 190 to 259. 2018. https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol27/pdf/CFR-2018-title40-vol27.pdf.

Code of Federal Regulations. Title 40, Protection of the Environment, Volume 27. 2018. https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol27/pdf/CFR-2018-title40-vol27.pdf.

Code of Federal Regulations. Title 49, Transportation, Parts 200 to 299. 2018. https://www.govinfo.gov/content/pkg/CFR-2018-title49-vol4/pdf/CFR-2018-title49-vol4.pdf.

Cowan, J.P. 1993. *Handbook of Environmental Acoustics*. Hoboken, NJ: John Wiley and Sons.

Federal Aviation Administration (FAA). 2005. Stage 4 Airplane Noise Standards. July 5, 2005. https://www.federalregister.gov/documents/2005/07/05/05-13076/stage-4-aircraft-noise-standards. Accessed July 13, 2023.

FAA. 2007. *Environmental Desk Reference for Airport Actions*. Chapter 17, Noise. Washington, DC. October 2007.

FAA. 2017. Stage 5 Airplane Noise Standards. October 4, 2017. https://www.federalregister.gov/documents/2017/10/04/2017-21092/stage-5-airplane-noise-standards. Accessed July 20, 2023.

FAA. 2019a. How NextGen works. 2019. https://www.faa.gov/nextgen/how_nextgen_works/. Accessed July 20, 2023.

FAA. 2019b. Next Generation Air Transportation System (NextGen). 2019. https://www.faa.gov/nextgen. Accessed July 20, 2023.

FAA. 2020. 1050.1 Desk References, Version 2, pages 11-2, February 2020. https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/media/desk-ref.pdf.

FAA. 2023. Aircraft Noise Levels & Stages. https://www.faa.gov/noise/levels. Accessed June 22, 2023.

Federal Highway Administration (FHWA). *FHWA Highway Construction Noise Handbook*. 2006.

Federal Interagency Committee on Noise. *Federal Agency Review of Selected Airport Noise Analysis Issues*. August 1992. Washington, DC.

Federal Railroad Administration. 2012. *High-Speed Ground Transportation Noise and Vibration Impact Assessment. Final Report*. Washington, DC. September 2012.

Federal Transit Administration (FTA). *Transit Noise and Vibration Assessment*. 2006.

FTA. 2018. Office of Planning and Environment. *Transit Noise and Vibration Impact Assessment Manual*. Washington, DC. September 2018.

Government Publishing Office. *Electronic Code of Federal Regulations*. Section 202.20, Standards for highway operations. 2019. https://www.ecfr.gov/cgi-bin/text-idx?SID=253c20b841de78b34cfdf69afe316a6f&mc=true&node=se40.27.202_120&rgn=div8. Accessed July 20, 2023.

Government Publishing Office. 40 CFR 205, Subpart B, Medium and Heavy Trucks. https://www.govinfo.gov/content/pkg/CFR-2012-title40-vol26/pdf/CFR-2012-title40-vol26-part205-subpartB.pdf.

Governor's Office of Planning and Research. *State of California 2017 General Plan Guidelines*. 2017.

Los Angeles County Metropolitan Transportation Authority (Metro). 2023. *Facts at a Glance*. https://www.metro.net/news/facts-glance/. Accessed July 13, 2023.

Los Angeles World Airports. 2023. Automated People Mover. https://www.lawa.org/en/connectinglax/automated-people-mover. Accessed July 20, 2023.

Metrolink. 2019. Experience Metrolink's History. https://www.metrolinktrains.com/about/agency/history-of-metrolink/. Accessed July 20, 2023.

Naples Airport Authority (NAA). 2023. Naples Airport Noise Program Chronology. https://www.flynaples.com/noise-program-milestones/. Accessed August 24, 2023.

Nelson, J.T., and H.J. Saurenman. 1983. *State-of-the-Art Review: Prediction and Control of Ground-Borne Noise and Vibration from Rail Transit Trains*. U.S. Department of Transportation, Urban Mass Transportation Administration, Report Number UMTA-MA-06-0049-83-4, DOT-TSC-UMTA-83-3.

Port of Hueneme. 2019. *Comprehensive Annual Financial Report: Fiscal Year Ended June 30, 2019*. November 2019.

Port of Los Angeles. 2019. *Facts & Figures*. https://kentico.portoflosangeles.org/getmedia/a43d3038-7713-4ebd-8c6a-dc72195a65f1/2019-facts-figures. Accessed July 20, 2023.

Southern California Association of Governments (SCAG). 2008. SCAG Commercial Airport System Map. July 2008. https://scag.ca.gov/sites/main/files/file-attachments/commercialairport_2008.pdf?1603480655.

SCAG. 2012. *On the Move: Southern California Delivers the Goods. Summary Report*. December 2012.

SCAG. 2019. *Connect SoCal Program Draft Environmental Impact Report.* Section 3.13, Noise. https://scag.ca.gov/certified-2020-peir. Accessed August 4, 2023.

SCAG. 2023. *Connect SoCal 2024 Aviation and Airport Ground Access*. Draft Technical Report. November 2, 2023.

The Harbor Department, an Enterprise Fund of the City of Long Beach, California, 2019. *Comprehensive Annual Financial Report for the Fiscal Year Ended September 30, 2019*.

U.S. Environmental Protection Agency (USEPA). 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health with an Adequate Margin of Safety*. https://nepis.epa.gov/Exe/ZyPDF.cgi/2000L3LN.PDF?Dockey=2000L3LN.PDF.

USEPA. 1978. *Noise: A Health Problem*. Washington, DC.

USEPA. 2022. Summary of the Noise Control Act, 42 U.S.C Section 4901 et seq. (1972). 2022.

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