5.11 - Noise

5.11.1 - Introduction

Noise can be defined as a sound or series of sounds that are intrusive, irritating, objectionable, or disruptive to daily life. Excessive noise may also cause actual physical harm and have adverse effects on health. Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit, which expresses the ratio of the sound pressure level being measured to a standard reference level. A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum - they are adjusted to reflect only those frequencies that are audible to the human ear. Typically, a 10-dBA increase is perceived as a doubling of the sound, while a 3-dBA increase is not noticeable to the human ear.

For comparison, Table 5.11-1 provides noise levels typical of the urban environment.

Table 5.11-1: Representative Environmental Noise Levels

Noise from Common Outdoor Activities at a Given Distance	A-Weighted Sound Level in Decibels (dBA)	Noise from Common Indoor Activities at a Given Distance	Subjective Impression
Jet Takeoff (200 feet)	—120—		Pain Threshold
	—110—	Rock Music Concert	
Jet Fly-over at 100 feet			
Ambulance Siren (100 feet)	—100—		Very Loud
Gas Lawnmower at 3 feet			
	—90—	Boiler room	
		Food Blender at 3 feet	
Diesel Truck going 50 mph at 50 feet Freight Cars at 50 feet Pneumatic Drill at 50 feet	—80—	Garbage Disposal at 3 feet	
Noisy Urban Area during Daytime			
Gas Lawnmower at 100 feet Freeway at 100 feet	—70—	Vacuum Cleaner at 10 feet	Moderately Loud
Commercial Area		Normal Speech at 3 feet	
Heavy Traffic at 300 feet	—60—		
		Large Business Office	

Noise from Common Outdoor Activities at a Given Distance	A-Weighted Sound Level in Decibels (dBA)	Noise from Common Indoor Activities at a Given Distance	Subjective Impression
Light Traffic (100 feet) Quiet Urban Area during Daytime	—50—	Dishwasher in Next Room	
Quiet Urban Area during Nighttime	—40—	Theater, Large Conference Room (background)	Quiet
Quiet Suburban Area during Nighttime			
	—30—	Library Soft Whisper (5 feet)	
Quiet Rural Area during Nighttime		Bedroom at Night, Concert Hall (background)	
	—20—		
		Broadcast/Recording Studio	
	—10—		Threshold of Hearing
	—0—		Lowest Threshold of Human Hearing
Source: California Department of Transportation, 1998.			

Noise Descriptors

Noise equivalent sound levels are not measured directly, but are calculated from sound pressure levels typically measured in dBA. The equivalent sound level (L_{eq}) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. The peak traffic hour L_{eq} is the noise metric used by the California Department of Transportation (Caltrans) for all traffic noise impact analyses.

The Day-Night Average Sound Level (L_{dn}) is the weighted average of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The time-of-day corrections require the addition of ten decibels to sound levels at night between 10 p.m. and 7 a.m. The Community Noise Equivalent Level (CNEL) is similar to the L_{dn}, except that it has another addition of 4.77 dB to sound levels during the evening hours between 7 p.m. and 10 p.m. These additions are made to the sound levels at these times because during the evening and nighttime hours, when compared to daytime hours, there is a decrease in the ambient or background noise levels, which creates an increased sensitivity to sounds. These weighted averages attempt to model real-world conditions. Noises during the day are generally expected, whereas in the evening or at night when people typically are sleeping, noises are more bothersome. For this reason, the sound is perceived to be louder in the evening and nighttime hours and is weighted accordingly. Many jurisdictions rely on the CNEL noise standard to assess transportation-related impacts on noise sensitive land uses.

Another noise descriptor that is used primarily for the assessment of aircraft noise impacts is the Sound Exposure Level, which is also called the Single Event Level (SEL). The SEL descriptor represents the acoustic energy of a single event (i.e., an aircraft overflight) normalized to one-second event duration. This is useful for comparing the acoustical energy of different events involving different durations of the noise sources. The SEL is based on an integration of the noise during the period when the noise first rises within 10 dBA of its maximum value and last falls below 10 dBA of its maximum value. The SEL is often 10 dBA greater, or more, than the L_{MAX}, since the SEL logarithmetically adds the L_{eq} for each second of the duration of the noise.

Tone Noise

A pure tone noise is a noise produced at a single frequency. Laboratory tests have shown the humans are more perceptible to changes in noise levels of a pure tone (Caltrans 1998). For a noise source to contain a "pure tone," there must be a significantly higher A-weighted sound energy in a given frequency band than in the neighboring bands, thereby causing the noise source to "stand out" against other noise sources. A pure tone occurs if the sound pressure level in the one-third octave band with the tone exceeds the average of the sound pressure levels of the two contagious one-third octave bands by: 5 dB for center frequencies of 500 Hertz (Hz) and above; by 8 dB for center frequencies between 160 and 400 Hz; and by 15 dB for center frequencies of 125 Hz or less.

Noise Propagation

From the noise source to the noise receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source, as well as ground absorption, atmospheric effects and refraction, and shielding by natural and manmade features. Sound from point sources, such as air conditioning condensers, radiate uniformly outward as it travels away from the source in a spherical pattern. The noise drop-off rate associated with this geometric spreading is 6 dBA per each doubling of the distance (dBA/DD). Transportation noise sources such as roadways are typically analyzed as line sources, since at any given moment the receiver may be impacted by noise from multiple vehicles at various locations along the roadway. Because of the geometry of a line source, the noise drop-off rate associated with the geometric spreading of a line source is 3 dBA/DD.

Ground Absorption

The sound drop-off rate is highly dependent on the conditions of the land between the noise source and receiver. To account for this ground-effect attenuation (absorption), two types of site conditions are commonly used in traffic noise models: (1) soft-site and (2) hard-site conditions. Soft-site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. For point sources, a drop-off rate of 7.5 dBA/DD is typically observed over soft ground with landscaping, as compared with a 6.0 dBA/DD drop-off rate over hard ground such as asphalt, concrete, stone, and very hard packed earth. For line sources a 4.5 dBA/DD is typically observed for soft-site conditions, compared to the 3.0 dBA/DD drop-off rate for hard-site conditions. To be conservative, hard-site conditions are generally used in noise analysis.

Noise Attenuation

Noise-related land use issues are typically composed of three basic elements: (1) the noise source, (2) a transmission path, and (3) a receiver. The appropriate acoustical treatment for a given project should consider the nature of the noise source and the sensitivity of the receiver. When the potential for a noise-related problem is present, either avoidance of the noise-related problem or noise control techniques should be selected to provide an acceptable noise environment for the receiver while remaining consistent with local aesthetic standards and practical structural and economic limits. Fundamental noise control options are described below.

Noise Barriers

Effective noise barriers can reduce noise levels by 10 to 15 dBA, cutting the loudness of traffic noise in half. For a noise barrier to work, it must be high enough and long enough to block the view of a road. A noise barrier is most effective when placed close to the noise source or receiver. A noise barrier can achieve a 5-dBA noise level reduction when it is tall enough to not allow a line-of-sight view of the road. When the noise barrier is an earthen berm instead of a wall, the noise attenuation can be increased by another 3 dBA.

Setbacks

Noise exposure may be reduced by increasing the setback distance between the noise source and the receiving use. Setback areas can take the form of open space, frontage roads, recreational areas, and storage yards. The available noise attenuation from this technique is limited by the characteristics of the noise source, but generally ranges between 4 and 6 dBA.

Site Design

Buildings can be placed on a property to shield other structures or areas affected by noise, and to prevent an increase in noise levels caused by reflections. The use of one building to shield another can significantly reduce overall noise control costs, particularly if the shielding structure is insensitive to noise. An example would be placing a detached garage nearest the noise source to shield the house or backyard.

Site design should guard against creating reflecting surfaces that may increase onsite noise levels. For example, two buildings placed at an angle facing a noise source may cause noise levels within that angle to increase by up to 3 dBA. The open end of U-shaped buildings should point away from noise sources for the same reason. Landscaping walls or noise barriers located within a development may inadvertently reflect noise back to a noise-sensitive area unless carefully located.

Building Facades

When interior noise levels are of concern in a noisy environment, noise reduction may be obtained through acoustical design of building facades. Standard construction practices provide a noise reduction of 10–15 dBA for building facades with open windows, and a noise reduction of approximately 25 dBA when windows are closed (Table 5.11-2). An exterior-to-interior noise reduction of 25 dBA can be obtained by requiring that building design include adequate ventilation

systems, which allows windows facing a noise source to remain closed, even during periods of excessively warm weather.

Table 5.11-2: Noise Reduction Afforded by Common Building Construction

Construction Type	Typical Occupancy	General Description	Range of Noise Reduction (dB)[1]
1	Residential, Commercial, Schools	Wood frame, stucco or wood sheathing exterior. Interior drywall or plaster. Sliding glass windows, with windows partially open.	15 to 20
2	Same as 1 above	Same as 1 above, but with windows closed.	25 to 30
3	Commercial, Schools	Same as 1 above, but with fixed 0.25-inch plate glass windows.	30 to 35
4	Commercial, Industrial	Steel or concrete frame, curtain wall, or masonry exterior wall. Fixed 0.25-inch plate glass windows.	30 to 40

Notes:
[1] Range depends on the amount windows are open, degree of window seal, and glass area of windows.
Source: Caltrans 2002: 7-37.

Where greater noise reduction is required, acoustical treatment of the building facade may be necessary. Reducing relative window area is the most effective control technique, followed by providing acoustical glazing (e.g., thicker glass or increased air space between panes) within frames with low air infiltration rates, using fixed (i.e., non-movable) acoustical glazing, or eliminating windows altogether. Noise transmitted through walls can be reduced by increasing wall mass (e.g., using stucco or brick in lieu of wood siding), or isolating wall members by using double or staggered stud walls, while noise transmitted through doorways can be lessened by reducing door area, using solid-core doors, or sealing door perimeters with suitable gaskets. Noise-reducing roof treatments include using plywood sheathing under roofing materials.

Landscaping

While the use of trees and other vegetation is often thought to provide significant noise attenuation, approximately 100 feet of dense foliage – with no visual path extending through the foliage – is required to achieve a 5-dBA attenuation of traffic noise. Thus, the use of vegetation as a noise barrier is not considered a practical method of noise control unless large tracts of dense foliage are part of the existing landscape.

Vegetation can be used, however, to acoustically "soften" intervening ground between a noise source and a receiver, increasing ground absorption of sound, and thus, increasing the attenuation of sound with distance. Planting trees and shrubs also offers aesthetic and psychological value, and it may reduce adverse public reaction to a noise source by removing the source from view, even though noise levels would be largely unaffected.

Groundborne Vibration Fundamentals

Groundborne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. Groundborne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although groundborne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Groundborne noise is an effect of groundborne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room and may consist of the rattling of windows or dishes on shelves.

Vibration Descriptors

Several different methods are used to quantify vibration amplitude such as the maximum instantaneous peak in the vibrations velocity, which is known as the peak particle velocity (PPV) or the root mean square (RMS) amplitude of the vibration velocity. Because of the typically small amplitudes of vibrations, vibration velocity is often expressed in decibels, it is denoted as LV, and is based on the RMS velocity amplitude. A commonly used abbreviation is VdB, which in this text, is when vibration level (L_V) is based on the reference quantity of 1 micro inch per second.

Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Offsite sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads. Smooth, well-maintained roads rarely produce perceptible groundborne noise or vibration. Acceptable vibration levels for an office environment would be 84 VdB, while acceptable levels for residential uses would be 78 VdB (Federal Transportation Administration 2006). Caltrans guidelines recommend a standard of 0.3 in/sec PPV not be exceeded for the protection of "normal" residential buildings and 0.1 in/sec PPV not be exceeded for the protection of old or historically significant structures (Caltrans 2004).

Vibration Propagation

The propagation of groundborne vibration is not as simple to model as airborne noise. This is because noise in the air travels through a relatively uniform median, while groundborne vibrations travel through the earth, which may contain significant geological differences. There are three main types of vibration propagation: (1) surface, (2) compression, (3) and shear waves. Surface waves, or Rayleigh waves, travel along the ground surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a body of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration

source. As stated above, this drop-off rate can vary greatly depending on the particular soil conditions, but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

Construction-Related Vibration Level Prediction

There are no federal, State, or local regulatory standards for ground-borne vibration. However, various criteria has been established to assist in the evaluation of vibration impacts. For instance, the California Department of Transportation (Caltrans) has developed vibration criteria based on potential structural damage risks and human annoyance. Caltrans criteria for the evaluation of ground-borne vibration levels, with regard to structural damage and human annoyance, are provided in Table 5.11-3 and Table 5.11-4, respectively. The criteria differentiate between transient and continuous/frequent sources. Transient sources of ground-borne vibration include intermittent events, such as blasting. Continuous and frequent events include the operations of equipment, including construction equipment, and vehicle traffic on roadways.

Table 5.11-3: Damage Potential to Buildings at Various Groundborne Vibration Levels

Structure and Condition	Vibration Level (in/sec ppv)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely Fragile Historic Buildings, Ruins, Ancient Monuments	0.12	0.08
Fragile Buildings	0.2	0.1
Historic and Some Old Buildings	0.5	0.25
Older Residential Structures	0.5	0.3
New Residential Structures	1.0	0.5
Modern Industrial/Commercial Buildings	2.0	0.5
Note: Transient sources create a single isolated vibration event, such as blasting. Intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, and vibratory compaction equipment. Source: Caltrans 2004		

Table 5.11-4: Annoyance Potential to People at Various Groundborne Vibration Levels

Human Response	Vibration Level (in/sec ppv)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.10

Human Response	Vibration Level (in/sec ppv)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Severe	2.0	0.4

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, and vibratory compaction equipment.
Source: Caltrans 2004

The ground-borne vibration criteria recommended by Caltrans for evaluation of potential structural damage is based on building classifications, which take into account the age and condition of the building. For residential structures and newer buildings, Caltrans considers a peak-particle velocity (ppv) threshold of 0.5 inches per second (in/sec) for transient sources and 0.3 in/sec for continuous/frequent sources to be sufficient to protect against building damage. Continuous ground-borne vibration levels below approximately 0.08 in/sec ppv are unlikely to cause damage to any structure.

In terms of human annoyance, continuous vibrations in excess of 0.04 in/sec ppv and transient sources in excess of 0.25 in/sec ppv are identified by Caltrans as the minimum perceptible level for ground vibration. Short periods of ground vibration in excess of 2.0 in/sec ppv, or continuous / frequent vibrations in excess of 0.4 in/sec ppv, can be expected to result in severe annoyance to people. .

5.11.2 - Environmental Setting

Study Area for Project Impacts

The study area for project impacts regarding noise is the City of Fresno Planning Area and the immediate surrounding areas including the County of Fresno, County of Madera, and City of Clovis because potential development under the proposed project could affect areas inside and outside the Planning Area.

Study Area for Cumulative Impacts

The study area for the analysis of cumulative noise impacts is similar to the study area for project impacts. The study area for cumulative noise impacts is the City of Fresno Planning Area and the immediate surrounding County of Fresno, County of Madera, and City of Clovis areas because cumulative development in the areas immediately surrounding the City of Fresno Planning Area could combine with development under the proposed project and result in cumulative noise impacts.

Existing Noise Levels

Generally, the three primary sources of substantial noise that affect the City of Fresno and its residents are all transportation-related and consist of local streets and regional highways; airport

operations at the Fresno Yosemite International, the Fresno-Chandler Downtown, and the Sierra Sky Park Airports; and railroad operations along the BNSF Railway and the Union Pacific Railroad lines.

The existing noise conditions in the General Plan Update Planning Area were measured at nine locations from May 30 to June 1, 2012. Noise monitoring sites were selected to be representative of typical residential, commercial, and industrial sites within the Planning Area, as well as arterial roadways, elevated and below-grade freeways, and railroad crossings with and without train horn soundings. At each of the nine long-term 24-hour noise monitoring sites, day-night statistical noise level trends were recorded to develop DNL values. Descriptions of each location and the measured noise levels are provided in Table 5.11-5.

Table 5.11-5: Measured Existing Noise Levels from General Plan Update

Location	Distance from Noise Source Centerline (feet)	Measured Noise Level (dBA L_{dn})
Railroad crossing at Shields Avenue	100	84
Along Railroad near W Barstow Avenue	100	74
SR 41 between W Barstow Avenue and W Shaw Avenue	100	76
SR 180 near N Peach Avenue	100	76
E Shaw Avenue near N Cedar Avenue	100	72
N Blackstone Avenue near E Ashlan Avenue	100	70
S Elm Avenue near E Jensen Avenue	100	68
N Valentine Avenue between W Ashlan Avenue and W Holland Avenue	100	67
S Fruit Avenue north of Church Avenue	100	65
Source: City of Fresno General Plan 2014.		

In addition to the above noise measurements, First Carbon Solutions took noise measurements at 27 locations throughout the City and the results are shown below in Table 5.11-6.

Table 5.11-6: Additional Measured Existing Noise Levels

Location	Distance from Noise Source (feet)	Measured Noise Level (dBA L_{eq})
Shaw Avenue (Polk Avenue to SR-99)	25	66.5
Grantland Avenue (W Ashland Avenue to E Shields Avenue)	20	64.8
Golden State Boulevard (W Shaw Avenue to W Santa Ana Avenue)	25	72.2
N Brawley Avenue (W Clinton Avenue to McKinley Avenue)	20	65.5

Location	Distance from Noise Source (feet)	Measured Noise Level (dBA L_{eq})
W Belmont Avenue (Marks Avenue to Hughes Avenue)	20	65.9
E McKinley Avenue (West Avenue to N Fruit Avenue)	25	64.2
W Kearney Boulevard (West Avenue to S Fruit Avenue)	20	63.3
Jensen Avenue (Fruit Avenue to Walnut Avenue)	20	71.0
N Friant Road (E Audubon Avenue to Blackstone Avenue)	20	73.3
E Herndon Avenue (SR-41 NB Off Ramp to N Fresno Street)	30	57.0
W Ashlan Avenue (N Fruit Avenue to N Palm Avenue)	20	70.4
W Bullard Avenue (West Avenue to N Palm Avenue)	20	68.7
Fresno Street (B Street to A Street)	20	69.7
Ventura Avenue (M Street to O Street)	20	67.4
Divisadero Street (Van Ness Avenue to San Pablo Avenue)	20	64.5
Blackstone Avenue (Belmont Avenue to Divisadero Street)	20	65.5
P Street (Divisadero Street to Tuolumne Street)	25	62.3
Tulare Street (U Street to SR-41)	20	78.3
First Street (Belmont Avenue to SR-180)	25	66.1
S Peach Avenue (E Kings Canyon Road to Lane Avenue)	20	61.7
E Jensen Avenue (S Clovis Avenue to S Peach Avenue)	25	70.8
S Temperance Avenue (E Butler Avenue to E Kings Canyon Road)	20	64.9
N Clovis Avenue (E Olive Avenue to E McKinley Avenue)	20	66.3
E McKinley Avenue (SR-168 to N Maple Avenue)	25	71.2
E Shaw Avenue (SR-168 to N Chestnut Avenue)	20	67.6
Willow Avenue (E Bullard Avenue to E Barstow Avenue)	20	70.5
Source: City of Fresno General Plan 2014.		

Roadways

Those areas in the City that experience sound levels greater than 60 dBA L_{dn} are typically near major vehicular traffic corridors. Highway traffic noise levels typically depend on three factors: (1) the volume of traffic, (2) the average speed of traffic, and (3) the vehicle mix (i.e., the percentage of trucks versus automobiles in the traffic flow). Vehicle noise includes noises produced by the engine, exhaust, tires, and wind generated by taller vehicles. Other factors that affect the perception of traffic noise include the distance from the highway, terrain, vegetation, and natural and structural obstacles. While tire noise from automobiles is generally located at ground level, truck noise sources

can be located as high as 10 to 15 feet above the roadbed due to tall exhaust stacks and higher engines.

Freeway traffic is the dominant noise source in Fresno. The freeways in Fresno consist of State Route 41 (SR-41), which has up to 76,800 vehicles per day, State Route 99 (SR-99), which has up to 58,100 vehicles per day, and State Route 180 (SR-180), which has up to 68,740 vehicles per day. Although most noise sensitive land uses adjacent to these freeways are mitigated by existing sound walls, topography or buildings, there are still some noise sensitive land uses that currently exceed the City's 60 dBA L_{dn} noise standard. In addition to the freeways, there are places throughout the City where traffic volumes on every roadway classification are high enough to create noise levels that currently exceed the City's 60 dBA L_{dn} noise standard at the nearby sensitive land uses.

Airport Operations

There are currently three airports located within the City of Fresno and consist of Fresno Yosemite International Airport, Fresno-Chandler Downtown Airport (also known as the "Fresno-Chandler Executive Airport"), and Sierra Sky Park Airport. CNEL Noise contours have been developed and are provided in the Land Use Policy Plan prepared for each airport (refer to the heading "Airport Land Use Commission of Fresno County" under Section 5.11.3, Regulatory setting, below). Each of the Environs Plans includes CNEL noise contours based on projected airport and aircraft operations. These noise contours are used to determine land use compatibility and locations for noise mitigation measures.

Commercial jet aircraft operations are limited to the Fresno Yosemite International Airport. The Air National Guard is also stationed there and operates military jets and other aircraft. Private and commercial operations with smaller aircraft use the Fresno Chandler Downtown Airport, while only small private aircraft use the Sierra Sky Park Airport.

Railroad Operations

The two major rail lines that traverse the City are the Union Pacific Railroad line, which is generally located along SR-99, and the BNSF Railway, which diverges from SR-99 in the southwest and travels through the downtown (behind City Hall) to the northwest. The Union Pacific line is generally located within a heavy commercial and industrial corridor, although residential uses occur in the vicinity of the line north of Shaw Avenue. The Union Pacific line limits its use to only freight traffic.

South of the Central Area, the BNSF Railway is bound by industrial uses, while north of the Central Area the line is generally located within a residential area. The BNSF Railway carries both freight and passenger traffic (Amtrak).

Stationary Noise Sources

Stationary noise sources can also have an effect on the population, and unlike mobile, transportation-related noise sources, these sources generally have a more permanent and consistent impact on people. These stationary noise sources involve a wide spectrum of uses and activities, including various industrial uses, commercial operations, agricultural production, school

playgrounds, high school football games, HVAC units, generators, lawn maintenance equipment, and swimming pool pumps.

Even with incorporation of the best available noise control technology, noise emanating from industrial uses can be substantial and exceed local noise standards. These noise sources can be continuous and may contain tonal components that may be annoying to nearby receptors. Although industrial uses in the City of Fresno are typically located in industrial districts near freeways and commercial uses, and away from residences and other sensitive noise receptors, noise sources associated with commercial uses such as automotive repair facilities, recycling centers, and loading docks may occur in the vicinity of residential uses.

5.11.3 - Regulatory Setting

The General Plan Update Planning Area encompasses the City of Fresno and its SOI. Noise regulations are addressed through the efforts of various federal, State, and local government agencies. The agencies responsible for regulating noise are discussed below.

Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Promulgating noise emission standards for interstate commerce
- Assisting state and local abatement efforts
- Promoting noise education and research

The Federal Office of Noise Abatement and Control (ONAC) was initially tasked with implementing the Noise Control Act. However, the ONAC has since been eliminated, leaving the development of federal noise policies and programs to other federal agencies and interagency committees. For example, the Occupational Safety and Health Administration (OSHA) agency limits noise exposure of workers to 90 dB L_{eq} or less for 8 continuous hours, or 105 dB L_{eq} or less for 1 continuous hour. The Department of Transportation (DOT) assumed a significant role in noise control through its various operating agencies. The Federal Aviation Administration (FAA) regulates noise of aircraft and airports. Surface transportation system noise is regulated by a host of agencies, including the Federal Transit Administration (FTA). Transit noise is regulated by the federal Urban Mass Transit Administration (UMTA), while freeways that are part of the interstate highway system are regulated by the Federal Highway Administration (FHWA). Finally, the federal government actively advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that "noise sensitive" uses are either prohibited from being sited adjacent to a highway or, alternately, that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation sources, local jurisdictions are limited to regulating the noise

generated by the transportation system through nuisance abatement ordinances and land use planning.

State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model, which is shown in Exhibit 5.11-1, the "Land Use Compatibility for Community Noise Environments Matrix," which allows a local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

Title 24, Chapter 1, Article 4 of the California Administrative Code (California Noise Insulation Standards) requires noise insulation in new transient (e.g., hotels, motels) and multi-family dwellings (other than single-family detached housing) that provides an annual average noise level of no more than 45 dB CNEL. When such structures are located within a 60 dB CNEL (or greater) noise contour, an acoustical analysis is required to ensure that interior levels do not exceed the 45 dB CNEL annual threshold. In addition, Title 21, Chapter 6, Article 1 of the California Administrative Code requires that all habitable rooms, hospitals, convalescent homes, and places of worship shall have an interior CNEL of 45 dB or less due to aircraft noise.

Government Code Section 65302 mandates that the legislative body of each county and city in California adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

Local

The General Plan Update Planning Area encompassed the City of Fresno and its SOI. The existing City of Fresno regulations regarding noise and vibration are presented below.

City of Fresno General Plan

The City of Fresno 2025 General Plan contains goals, objectives, and policies that address noise. The following General Plan goals, objectives, and policies are applicable to the proposed project:

Goal 1. Enhance the quality of life for the citizens of Fresno and plan for the projected population within the moderately expanded Fresno urban boundary in a manner which will respect physical, environmental, fiscal, economic, and social issues.

Goal 14. Protect and improve public health and safety.

Noise Element

H-1. OBJECTIVE. Protect the citizens of the city from the harmful and annoying effects of exposure to excessive noise.

H-1-a. Policy. Noise-sensitive land uses impacted by existing or projected future transportation noise sources shall include mitigation measures so that resulting noise levels do not exceed the standards shown in Table 8 [Table 5.11-7 of this section] below:

Table 5.11-7: Maximum Allowable Noise Exposure for Noise-Sensitive Land Uses

Land Use[1]	Outdoor Activity Areas[2] L_{dn} dB	Interior Spaces	
		L_{dn} dB	L_{dn} dB[3]
Residential	60[4]	45	—
Transient Lodging	60[4]	45	—
Hospitals, Nursing Homes	60[4]	45	—
Theaters, Auditoriums, Music Halls	—	—	35
Churches, Meeting Halls	60[4]	—	45
Office Buildings	—	—	45
Schools, Libraries, Museums	—	—	45

Notes:
1 The Planning and Development Director, on a case-by-case basis, may designate land uses other than those shown in this table to be noise-sensitive, and may require appropriate noise mitigation measures.
2 Where the location of the outdoor activity area is unknown or is not applicable, the exterior noise level standard shall be applied to the property line of the receiving land use.
3 As determined for a typical worst-case hour during periods of use.
4 Noise levels up to 65 dB Ldn adjacent to the Burlington Northern Santa Fe and Union Pacific mainline tracks may be allowed by the project approving authority when it is determined that it is not possible to achieve 60 dB Ldn in outdoor activity areas using a practical application of the best-available noise reduction technology, and when all feasible exterior noise reduction measures have been proposed.
Source: 2025 Fresno General Plan, Noise Element, February 2002, p. 163.

H-1-b. Policy. For purposes of city analyses of noise impacts, and for determining appropriate noise mitigation, a significant increase in ambient noise levels is assumed if the project causes ambient noise levels to exceed the following:

- The ambient noise level is less than 60 dB Ldn and the project increase noise levels by 5 dB or more.
- The ambient noise level is 60-65 dB Ldn and the project increases noise levels by 3 dB or more.
- The ambient noise level is greater than 65 dB Ldn and the project increases noise levels by 1.5 dB or more.

H-1-c. Policy. The city shall review new public and private development proposals to determine conformance with the policies of this Noise Element.

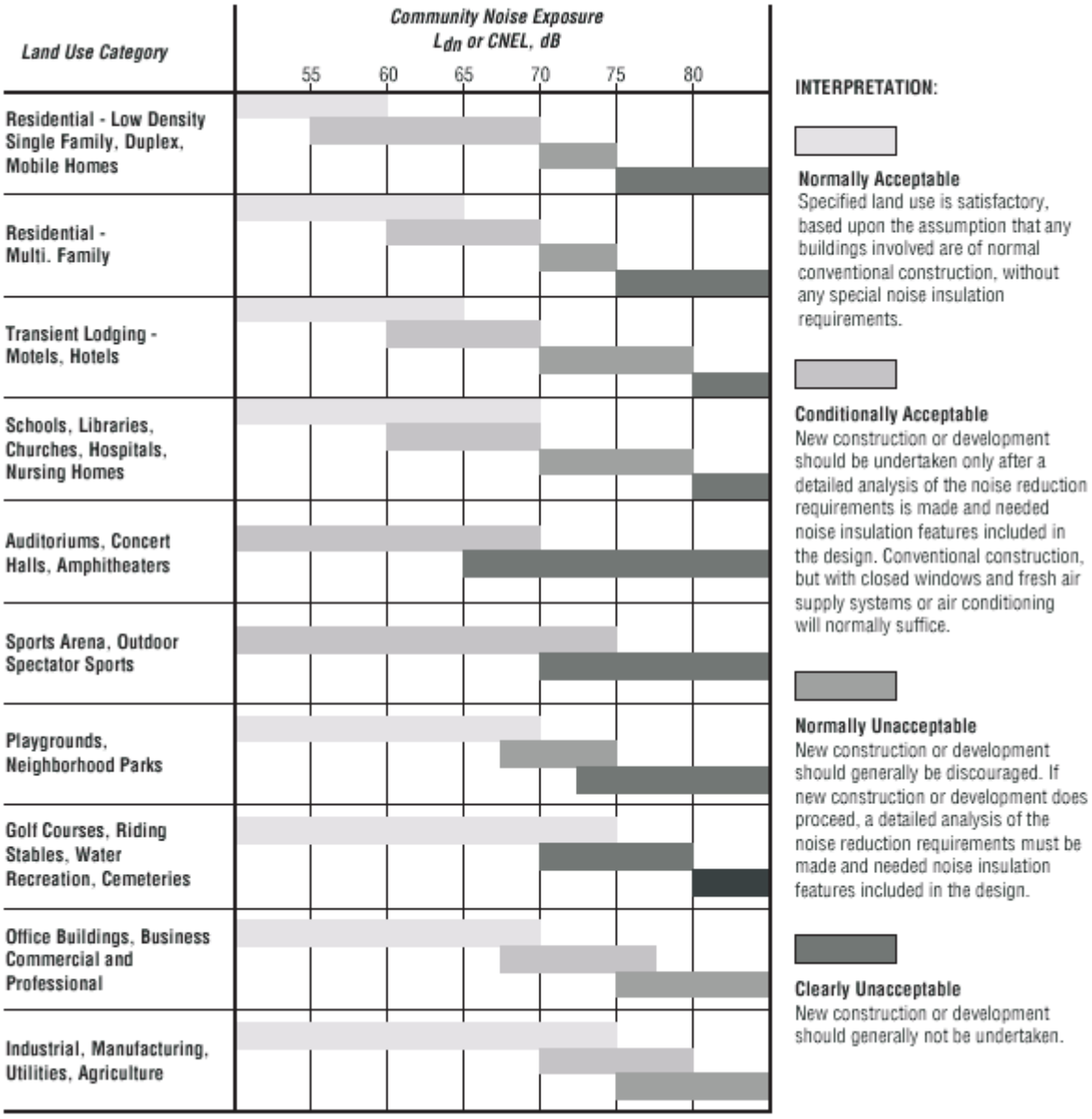

Exhibit 5.11-1
Land Use Compatibility for Community Noise Environments Matrix

H-1-d. Policy. The city shall require an acoustical analysis in those cases where a project potentially threatens to expose existing or proposed noise-sensitive land uses to excessive noise levels. The presumption of potentially excessive noise levels shall be based on the location of new noise-sensitive uses to known noise sources or staff's professional judgment that a potential for adverse noise impacts exists. Acoustical analyses shall be required early in the review process so that noise mitigation may be included in the project design. For development not subject to environmental review, the requirements for an acoustical analysis shall be implemented prior to the issuance of building permits. The requirements for the content of an acoustical analysis are established by the Planning and Development Department in conjunction with environmental health agencies.

H-1-e. Policy. The city shall develop and employ procedures to ensure that noise mitigation measures required pursuant to an acoustical analysis are implemented in the development review and building permit processes.

H-1-f. Policy. The city shall develop and employ procedures to monitor compliance with the policies of the Noise Element after completion of projects where noise mitigation measures have been required.

H-1-g. Policy. The city shall enforce the State Noise Insulation Standards (California Code of Regulations, Title 24) and Chapter 35 of the Unicom Building Code (UBC) concerning interior noise exposure for multi-family housing, hotels and motels.

H-1-h. Policy. The city shall request the California Highway Patrol, the Sheriff's and Police Department to actively enforce the California Vehicle Code sections relating to adequate vehicle mufflers and modified exhaust systems, and sound systems in vehicles.

H-1-i. Policy. The city shall review and update the Noise Element and the Noise Ordinance to ensure that noise exposure information and specific policies and ordinances are consistent with changing conditions with the city and with noise control regulations or policies enacted after the adoption of this element.

H-1-j. Policy. Noise created by new transportation noise sources, including roadway improvement projects, shall be mitigated so that resulting noise levels do not exceed the adopted standards at noise-sensitive land uses.

H-1-k. Policy. Noise-sensitive land uses impacted by stationary noise sources shall include mitigation measures so that resulting noise levels do not exceed the standards shown in Table 9 [Table 5.11-8 of this section] as follows:

Table 5.11-8: Maximum Allowable Noise Exposure-Stationary Noise Sources

	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly Equivalent Sound Level (L_{eq}), dB	50	45
Maximum Sound Level (L_{max}), dB	70	65
Notes: Noise sources were determined at the outdoor activity areas. Where the location of outdoor activity area is unknown or not applicable, the noise exposure standard shall be applied at the property line of the receiving land use. When ambient noise levels exceed or equal the levels in this table, mitigation shall only be required to limit noise to the ambient plus five (5) dB. Source: 2025 Fresno General Plan Noise Element, February 2002, p. 165.		

H-1-l. Policy. Noise created by new proposed stationary noise sources or existing stationary noise sources which undergo modifications that may increase noise levels shall be mitigated so as not to exceed the noise level standards of Table 9 [Table 5.11-8 of this section] at noise-sensitive land uses.

H-1-m. Policy. As a guideline, noise barrier (wall, earth berms, or berm/wall combinations) shall not exceed 15 feet in height as measured from the elevation of the nearest building pad. The Planning Department Director, on a case-by-case basis, may allow noise barrier heights differing from this guideline. However, resulting noise levels must satisfy the maximum allowable noise exposure standards.

City of Fresno Municipal Code

Chapter 10e, Article 1 (Noise Regulations), of the Fresno Municipal Code establishes excessive noise guidelines and exemptions. The following portions of the Municipal Code are applicable to the proposed project:

SEC. 10-102. Definitions.

(b) Ambient Noise. "Ambient noise" is the all-encompassing noise associated with a given environment, being usually a composite of sounds from many sources near and far. For the purpose of this ordinance, ambient noise level is the level obtained when the noise level is averaged over a period of fifteen minutes, without inclusion of the offending noise, at the location and time of day at which a comparison with the offending noise is to be made. Where the ambient noise level is less than that designated in this section, however, the noise level specified herein shall be deemed to be the ambient noise level for that location.

District	Time	Sound Level Decibels
Residential	10 pm to 7 am	50
Residential	7 pm to 10 pm	55
Residential	7 am to 7 pm	60
Commercial	10 pm to 7 am	60

District	Time	Sound Level Decibels
Commercial	7 am to 10 pm	65
Industrial	anytime	70

SEC. 10-105. Excessive Noise Prohibited. No person shall make, cause, or suffer or permit to be made or caused upon any premises or upon any public street, alley, or place within the city, any sound or noise which causes discomfort or annoyance to any reasonable person of normal sensitiveness residing or working in the area, unless such noise or sound is specifically authorized by or in accordance with this article. The provisions of this section shall apply to, but shall be limited to, the control, use, and operation of the following noise sources:

(a) Radios, musical instruments, phonographs, television sets, or other machines or devices used for the amplification, production, or reproduction of sound or the human voice.

(b) Animals or fowl creating, generating, or emitting any cry or behavioral sound.

(c) Machinery or equipment, such as fans, pumps, air conditioning units, engines, turbines, compressors, generators, motors or similar devices, equipment, or apparatus.

(d) Construction equipment or work, including the operation, use or employment of pile drivers, hammers, saws, drills, derricks, hoists, or similar construction equipment or tools.

SEC. 10-107. School, Hospitals, and Churches. No person shall create any noise on any street, sidewalk, or public place adjacent to any school, institution of learning, or church while the same is in use, or adjacent to any hospital, which noise unreasonably interferes with the workings of such institution or which disturbs or unduly annoys patients in the hospital, provided conspicuous signs are displayed in such street, sidewalk, or public place indicating the presence of a school, church, or hospital.

SEC. 10-109. Exceptions. The provisions of this article shall not apply to:

(a) Construction, repair or remodeling work accomplished pursuant to a building, electrical, plumbing, mechanical, or other construction permit issued by the city or other governmental agency, or to site preparation and grading, provided such work takes place between the hours of 7:00 a.m. and 10:00 p.m. on any day except Sunday.

(b) Emergency work.

(c) Any act or acts which are prohibited by any law of the State of California or the United States.

Airport Land Use Commission of Fresno County

The Fresno Yosemite International Airport Land Use Compatibility Plan (ALUCP), the Fresno-Chandler Downtown Airport ALUCP, and the Sierra Sky Park ALUCP include policies designed to regulate the compatibility of land uses surrounding the airport and associated operations. The following ALUCP policies are applicable to the proposed project:

Fresno Yosemite International Airport Compatibility Land Use Plan

Chapter 3: Compatibility Policies and Criteria

3.1 Noise. The purpose of noise compatibility policies is to avoid establishment of new noise-sensitive land uses and exposure of the users to levels of aircraft noise that can disrupt activities involved. The noise contours established for the purpose of evaluating noise compatibility of land use are depicted on Figure 4.1. The state law (Public Utilities Code Section 21675(a)) requires that noise contours reflect the anticipated growth of the airport during at least the next 20 years. The AMP, 2011 EA/EIR, and 2012 EA/MND provided the activity forecast used in the contour calculations.

(2) The maximum noise exposure which shall be considered normally acceptable for residential areas is 65 dBA CNEL. The residential area criterion establishes the baseline from which noise compatibility for other land uses shall be evaluated.

(3) The relative acceptability or unacceptability of particular land uses with respect to the noise levels to which they would be exposed is indicated in the "Airport/Land Use Noise Compatibility Criteria" matrix, Table E l. These criteria shall be the principal determinants of whether a proposed land use is compatible with the noise impact from the FYI [Fresno Yosemite International Airport]. Special circumstances which would affect the specific proposal's noise sensitivity (e. g., the extent or lack of outdoor activity) also shall be taken into account.

(4) As determined by the ALUC, a condition for approval of a proposed land use which is shown on Table 1 identified as "Conditional" for a given noise environment shall be that the building intended for habitation or occupation provide a satisfactory degree of noise attenuation. Table 2 sets forth the permitted interior noise levels, the use may be deemed compatible.

(5) New residential development and new schools shall be prohibited within the adopted 65 [dBA] CNEL contour of FYI [the Fresno Yosemite International Airport] unless it is determined that there is no feasible alternative to such development of the subject property and provided that the following conditions are met:

(a) The record property owner grants an aviation easement to the City of Fresno.

(b) The record property owner executes an agreement in favor of the City of Fresno, whereby the property owner shall indemnify, hold harmless and defend the City and the ALUC, and every officer and employee thereof from any and all loss, liability, damages, costs, suits or claims arising out of the location of the development within the 65 [dBA] CNEL contour.

(c) New residential structures shall incorporate noise insulation in compliance with Title 24 of the California Code of Regulations such that interior noise levels are reduced to no more than 45 dB CNEL.

(6) An acoustical analysis shall be required prior to the approval of a special permit (site plan or conditional use permit) for any new residential use, transient lodging, school, library,

hospital, nursing home, day nursery, church, auditorium or a concert hall located within a 65 or greater CNEL contour. For single family residential proposals, an acoustical analysis shall be required as a condition of subdivision map approval, said analysis to be submitted prior to the issuance of building permits. The acoustical analysis shall be completed in a manner consistent with Title 24 of the California Code of Regulations. A special permit for the uses listed above shall not be approved unless the acoustical analysis demonstrates that interior noise levels attributable to exterior sources does not exceed 45 db CNEL in any habitable room with windows and doors closed. In quantifying aircraft noise exposure of the project site, the acoustical analysis shall include consideration of engine run up noise where applicable. A single report may suffice for all similar proposals within the same CNEL contour.

(7) Within the 70 dBA CNEL contour, new or redeveloped schools, hospitals, nursing homes, libraries, day nurseries, churches, auditoriums, and amphitheaters shall be prohibited. New residential uses (excluding transient lodging) shall be prohibited, except as provided for in Policy No. (8), below.

(8) Existing residential uses lying within the 70 dBA CNEL contour, that conform to the land use designations of this plan, may be remodeled in such a way that does not increase the floor space of the residence, or rebuilt if destroyed by fire, explosion or other catastrophic means, consistent with regulations adopted by the local jurisdiction. consistent with regulations adopted by the local jurisdiction.

Fresno-Chandler Downtown Airport Land Use Policy Plan

Policy A.1. Airport and use noise compatibility shall be evaluated in terms of the Community Noise Equivalent Level (CNEL), as defined in Title 21, Subchapter 6, of the California Code of Regulations (noise standards). Wherever used in this plan, the term CNEL shall be assumed to be an annual average.

Policy A.2. The maximum noise exposure, which shall be considered acceptable for residential areas in the immediate area of FCH, is 60 CNEL, as shown in the Environs Plan Map (Figure D-I). This contour matches the moderate forecast for the year 2018, as described in the City of Fresno's Fresno-Chandler Downtown Airport Master Plan Report (1998). The residential area criterion establishes the baseline from which noise compatibility for other land uses shall be evaluated.

Policy A.3. The relative acceptability or unacceptability of particular land uses with respect to the noise levels to which they would be exposed is indicated in the "Noise Compatibility Criterion matrix (Table C-I). These criteria shall be the principal determinants of whether a proposed land use is compatible with the noise impact from the airport. Special circumstances, which would affect the specific proposal's noise sensitivity (e.g., the extent or lack of outdoor activity) shall also be taken into account.

Policy A.4. Any new residential use, transient lodging, school, library, hospital, nursing home, day nursery, church, auditorium or concert hall which requires a special permit (site plan or conditional use permit) and is located within a 60 or greater CNEL contour shall be constructed to comply with

Title 24 of the California Code of Regulations such that interior noise levels will measure no more than 45 CNEL. Mitigation measures must be done to achieve compliance with Title 24 requirements as recommended by a certified noise consultant. Any building opening shall be acoustically treated.

Policy A.5. New residential development and new schools shall be prohibited within the adopted 60 CNEL contour of FCH unless the ALUC makes specific findings that there is no feasible alternative to such development of the subject property and provided that the following conditions are met:

a) The property owner of record grants an avigation easement.

b) The record property owner executes an agreement whereby the property owner shall indemnify, hold harmless and defend the City of Fresno and every officer and employee thereof from any and all loss, liability, damages, costs, suits or claims arising out of the location of the development within the 60 CNEL contour.

c) New residential structures shall incorporate noise insulation in compliance with Title 24 of the California Code of Regulations such that interior noise levels are reduced to no more than 45 CNEL.

Policy A.6. Within the 65 CNEL contour, new or redeveloped schools, hospitals, nursing homes, libraries, day nurseries, churches, auditoriums, and amphitheaters shall be prohibited. New residential uses shall be prohibited, except as provided for in policy number 7 below.

Policy A.7. Existing residential uses lying within the 65 CNEL contour, that conform to the land use designations of this plan, may be remodeled in such a way that does not increase the floor space of the residence, or rebuilt if destroyed by fire, explosion or other catastrophic means, if the ALUC makes a specific finding that there is no feasible alternative to such development of the subject property, and if the remodled residence conforms to the conditions of Policy No. F, above. A use is considered to be destroyed if the cost of reconstruction, repairing or rebuilding would exceed fifty percent of the reasonable replacement value of the building immediately prior to the destruction.

Sierra Sky Park Land Use Policy Plan

Policy 1. The airport/aircraft noise exposure which shall be considered normally acceptable for residential areas is 65 dB CNEL as defined by Title 21, Subchapter 6 of the California Administrative Code (Noise Standards).

Policy 2. The relative acceptability or unacceptability of a particular land use with respect to the noise levels to which it would be exposed is indicated in the "Airport Noise Compatibility Criteria" matrix, Table 1. These criteria shall be the principal determinants of whether a proposed land use is compatible with a given airport/aircraft noise exposure. Special circumstances which could affect a specific proposal's noise sensitivity (e.g., the extent or lack of outdoor activity) shall also be taken into account.

Policy 3. The interior noise level attributable to airport-aircraft noise sources shall not exceed 45 dB CNEL with windows and doors closed in any habitable room or a residential dwelling.

Policy 4. An acoustical analysis shall be required for proposed projects involving land uses which are "conditionally acceptable" within a noise environment exceeding 65 dB CNEL, when such projects are proposed for areas within the 65 dB CNEL contour of the airport unless otherwise required by California Administrative Code (CAC) Title 24 (California Noise Insulation Standards). The acoustical analysis shall be completed in a manner which is consistent with the requirements of CAC Title 24. In quantifying aircraft noise exposure on site, the acoustical analysis shall include consideration of engine run-up noise where applicable.

Policy 5. When applying the noise compatibility criteria listed in Table 1to a given location, the basis for evaluation shall be the CNEL contours shown in the Policy Plan Map (Year 2000 forecast, projected future conditions - 76,320 annual operations). If the noise analysis, which may include noise monitoring, indicates that project noise exposure may be higher or lower than indicated by the Policy Map Plan due to site-specific conditions or changes in airport/aircraft operations, the noise exposure used for project evaluation may be adjusted based upon the best available information at the discretion of the Airport Land Use Commission.

5.11.4 - Thresholds of Significance

CEQA Thresholds

In accordance with CEQA, the effects of a project are evaluated to determine if they will result in significant adverse impacts on the environment. The criteria used to determine the significance of an impact to noise are based on the Environmental Checklist in Appendix G of the State CEQA Guidelines and identified below. Accordingly, noise impacts resulting from the proposed project are considered significant if the project would:

a) 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? (See Noise Levels in Excess of Standards, Impact NOI-1)

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels? (See Excessive Groundborne Vibration, Impact NOI-2)

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project? (See Permanent Increase in Ambient Noise Levels, Impact NOI-3)

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project? (See Temporary or Periodic Increase in Ambient Noise Levels, Impact NOI-4)

e) For a project located within 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? (See Airport Noise Levels, Impact NOI-5)

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels? (See Private Airstrip Noise Levels, Impact NOI-6)

5.11.5 - Project Impacts and Mitigation Measures

Noise Levels in Excess of Standards

Impact NOI-1	**The project would 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.**

Project Specific Impact Analysis

Short-Term Construction Impacts

Construction noise generated from development activities associated with buildout of the General Plan Update would typically occur intermittently and vary depending upon the nature or phase (e.g., demolition, land clearing, grading, excavation, erection) of construction. Noise produced by construction equipment such as earthmovers, material handlers, and portable generators can reach high levels. Generally, the grading phase of construction involves the most equipment and generates the highest noise levels, although noise ranges are usually similar across all construction phases. Typical construction equipment noise levels are provided in Table 5.11-9. As shown, noise levels generated by individual pieces of construction equipment generally range from approximately 77 dBA to 90 dBA L_{max} at 50 feet. Typical operating cycles vary by equipment type and specific activity, although cycles generally involve two minutes of full power, followed by three to four minutes at lower settings. Depending on the equipment required and duration of use, average-hourly noise levels associated with construction activity typically ranges from roughly 65 to 90 dBA L_{eq} at 50 feet. The highest noise levels are generally associated with grading and excavation phases (FHWA 2006).

Table 5.11-9: Typical Construction Noise Levels

Equipment	Typical Noise Level (dBA L_{max}) 50 feet from Source
Backhoe/Front-End Loader	80
Compactor	80
Concrete Mixer Truck	85
Dozer	85
Grader	85
Excavator/Scraper	85
Air Compressor	80
Gradall	85
Crane, Mobile	85
Generator	82
Truck (Dump/Flat Bed)	84
Jack Hammer	85
Paver	85
Pneumatic Tool	85
Pump	77

Equipment	Typical Noise Level (dBA L_{max}) 50 feet from Source
Roller	85
Concrete Saw	90
Sources: FHWA 2006, Roadway Construction Noise Model User's Guide	

Implementation of the project would include the demolition and construction of various uses throughout the Planning Area, including single- and multi-family residential, commercial, industrial, mixed use, and public facilities, as well as ancillary infrastructural improvements such as roadways and water delivery and wastewater conveyance pipelines.

As set forth by Chapter 10, Article 1, Section 10-109 – Exemptions, the provisions of Article 1 – Noise Regulations of the Fresno Municipal Code shall not apply to:

> Construction, repair or remodeling work accomplished pursuant to a building, electrical, plumbing, mechanical, or other construction permit issued by the city or other governmental agency, or to site preparation and grading, provided such work takes place between the hours of 7:00 a.m. and 10:00 p.m. on any day except Sunday.

Thus, although development activities associated with buildout of the Planning Area could potentially result in a temporary or periodic increase in ambient noise levels in the project vicinity (as addressed below in Impact NOI-4), construction activity would be exempt from City of Fresno noise regulations, as long as such activity is conducted pursuant to an applicable construction permit and occurs between 7:00 a.m. and 10:00 p.m., excluding Sunday. Therefore, short-term construction impacts associated with the exposure of persons to or the generation of noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies would be less than significant.

Long-Term Project Impacts

Based on existing noise measurements taken in the City (Table 5.11-5 and Table 5.11-6), as well as on existing and future noise modeling (Figure NS-2 and NS-3 of the GP Update), noise levels in excess of existing standards set forth by the City of Fresno currently occur and would continue to occur throughout the City, potentially affecting residential and other noise-sensitive uses.

As shown in Figure NS-3 of the GP Update, future noise levels along many major roadway segments would exceed the City's existing 60 dBA L_{dn} standard for adjacent residential uses, and in certain instances, future noise levels along some major roadway segments may even exceed the City's current 65 dBA L_{dn} and 70 dBA L_{dn} for commercial and industrial uses, respectively. Future development activities within the City would result in higher land use densities, which would result in increased traffic volumes and increases in commercial and industrial uses that would incrementally increase noise levels in some areas. Substantial noise level exposures can also be expected from aircraft and trains.

Roadways

Future noise exposure contours for each of the City of Fresno's roadway classifications were modeled by applying the Federal Highway Administration's (FHWA) noise modeling procedure, using roadway, speed, and traffic mix data from the City of Fresno, and projected traffic volumes based on existing, existing with project, cumulative with project and other anticipated traffic volume levels that were calculated by the transportation planning and engineering firm of Fehr & Peers. The existing, existing with project and cumulative with project traffic volumes are based on the maximum traffic volumes anticipated to be experienced for each roadway classification.

In order to quantify the traffic noise impacts along the analyzed roadways, the roadway noise contours were calculated. Noise contours represent the distance to noise levels of a constant value and are measured from the center of the roadway. For analysis comparison purposes, the noise levels are calculated at the right-of-way of each roadway type, which is the nearest location where development may occur to each roadway. In establishing noise contours for land use planning, it is customary to ignore noise attenuation afforded by buildings, roadway elevations, and depressions, and to minimize the barrier effect of natural terrain features. The result is a worst-case estimate of the existing and future noise environment. The developed noise contours for the City of Fresno are conservative, meaning that the contours are modeled with minimal noise attenuation by natural barriers and buildings, with the exception of significantly depressed sections of highways.

Table 5.11-10 shows the anticipated noise levels for each roadway type for existing, existing with project, cumulative with project, and other representative traffic volume levels at the right-of-way. The distance from the centerline to the 55-, 60-, 65-, and 70-dBA noise levels have been calculated and are also shown in Table 5.11-10 with the noise calculation spreadsheets provided in Appendix C.

Table 5.11-10: Traffic Noise Contours prior to Mitigation

Roadway	Scenario	dBA CNEL at Right-of-Way	Distance to Contour (feet)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
2-Lane Collector	Existing	66	36	79	169	365
2-Lane Collector	Existing Plus Project	66	39	84	182	391
2-Lane Collector	Cumulative Plus Project	66	41	89	191	412
4-Lane Collector	Existing	61	RW	51	109	235
4-Lane Collector	Existing Plus Project	62	RW	55	119	257
4-Lane Collector	Cumulative Plus Project	62	RW	56	120	258
3-Lane Arterial	Existing	65	RW	72	155	335
3-Lane Arterial	Existing Plus Project	63	RW	71	153	329
3-Lane Arterial	Cumulative Plus Project	63	RW	72	154	332
4-Lane Arterial	Existing	67	62	133	287	619
4-Lane Arterial	Existing Plus Project	68	78	169	363	782

Roadway	Scenario	dBA CNEL at Right-of-Way	Distance to Contour (feet)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
4-Lane Arterial	Cumulative Plus Project	69	81	175	376	811
4-Lane Super Arterial	Existing	66	64	137	295	636
4-Lane Super Arterial	Existing Plus Project	68	96	208	448	965
4-Lane Super Arterial	Cumulative Plus Project	68	97	209	450	970
6-Lane Arterial	Existing	68	89	192	414	893
6-Lane Arterial	Existing Plus Project	69	101	217	468	1,009
6-Lane Arterial	Cumulative Plus Project	69	106	229	494	1,063
Scenic Arterial	Existing	61	RW	70	151	326
Scenic Arterial	Existing Plus Project	63	RW	95	204	439
Scenic Arterial	Cumulative Plus Project	63	RW	96	207	446
6-Lane Expressway	Existing	70	119	256	551	1,188
6-Lane Expressway	Existing Plus Project	71	138	296	639	1,376
6-Lane Expressway	Cumulative Plus Project	72	141	304	655	1,410
Scenic Expressway	Existing	68	97	208	448	966
Scenic Expressway	Existing Plus Project	69	122	262	565	1,218
Scenic Expressway	Cumulative Plus Project	70	132	284	613	1,320
SR-41 Freeway	Existing	73	251	540	1,164	2,508
SR-41 Freeway	Existing Plus Project	75	308	663	1,427	3,075
SR-41 Freeway	Cumulative Plus Project	75	316	680	1,465	3,155
SR-180 Freeway	Existing	72	263	566	1,220	2,628
SR-180 Freeway	Existing Plus Project	74	332	716	1,542	3,322
SR-180 Freeway	Cumulative Plus Project	74	337	725	1,563	3,367
SR-99 Freeway	Existing	73	202	435	937	2,019
SR-99 Freeway	Existing Plus Project	76	287	619	1,334	2,875
SR-99 Freeway	Cumulative Plus Project	76	298	642	1,383	2,979
SR-168 Freeway	Existing	71	194	418	901	1,941
SR-168 Freeway	Existing Plus Project	72	235	505	1,089	2,345
SR-168 Freeway	Cumulative Plus Project	73	257	554	1,195	2,574

Notes:
RW = Noise contour is located within right-of-way of roadway.
Source: FirstCarbon Solutions, 2014.

Table 5.11-10 shows that all roadway classification scenarios would exceed the City's 60 dBA CNEL standard for sensitive land uses at the right-of-way. This would be considered a significant impact.

Implementation of proposed General Plan Policy NS-1-a would increase the City's noise standard for sensitive land uses to 65 dB L_{dn} or CNEL from transportation sources and through implementation of proposed General Plan Policy NS-1-g, which requires the implementation of noise reduction performance standards for new noise sensitive uses that requires consideration of the following noise reduction measures:

- Construct façades with substantial weight and insulation;
- Use sound-rated windows for primary sleeping and activity areas;
- Use sound-rated doors for all exterior entries at primary sleeping and activity areas;
- Use minimum setbacks and exterior barriers;
- Use acoustic baffling of vents for chimneys, attic and gable ends;
- Install a mechanical ventilation system that provides fresh air under closed window conditions.

Many of the noise reduction features provided in Policy NS-1-g are dependent of the project design and are not feasible to quantify on a generic level, however the use of exterior barriers is quantifiable and would provide similar noise reduction levels throughout the City. Table 5.11-11 shows the noise levels for each roadway classification, the required sound wall or noise attenuation feature height to meet the proposed 65 dBA CNEL standard and the resultant noise levels with implementation of the proposed sound walls.

Table 5.11-11: Mitigated Traffic Noise Contours

Roadway	Scenario	Unmitigated dBA CNEL at Right-of-Way	Wall Height (feet)	Mitigated dBA CNEL at Right-of-Way
2-Lane Collector	Existing	66	3.0	64
2-Lane Collector	Existing Plus Project	66	3.0	65
2-Lane Collector	Cumulative Plus Project	66	3.0	65
4-Lane Collector	Existing	61	0.0	61
4-Lane Collector	Existing Plus Project	62	0.0	62
4-Lane Collector	Cumulative Plus Project	62	0.0	62
3-Lane Arterial	Existing	65	0.0	64
3-Lane Arterial	Existing Plus Project	63	0.0	63
3-Lane Arterial	Cumulative Plus Project	63	0.0	63
4-Lane Arterial	Existing	67	4.0	62

Roadway	Scenario	Unmitigated dBA CNEL at Right-of-Way	Wall Height (feet)	Mitigated dBA CNEL at Right-of-Way
4-Lane Arterial	Existing Plus Project	68	4.0	64
4-Lane Arterial	Cumulative Plus Project	69	5.0	63
4-Lane Super Arterial	Existing	66	3.0	65
4-Lane Super Arterial	Existing Plus Project	68	4.0	64
4-Lane Super Arterial	Cumulative Plus Project	68	4.0	64
6-Lane Arterial	Existing	68	4.0	63
6-Lane Arterial	Existing Plus Project	69	5.0	64
6-Lane Arterial	Cumulative Plus Project	69	5.0	64
Scenic Arterial	Existing	61	0.0	61
Scenic Arterial	Existing Plus Project	63	0.0	63
Scenic Arterial	Cumulative Plus Project	63	0.0	63
6-Lane Expressway	Existing	70	6.0	64
6-Lane Expressway	Existing Plus Project	71	6.0	65
6-Lane Expressway	Cumulative Plus Project	72	6.0	65
Scenic Expressway	Existing	68	4.0	64
Scenic Expressway	Existing Plus Project	69	5.0	64
Scenic Expressway	Cumulative Plus Project	70	6.0	63
SR-41 Freeway	Existing	73	7.0	61
SR-41 Freeway	Existing Plus Project	75	8.0	64
SR-41 Freeway	Cumulative Plus Project	75	8.0	64
SR-180 Freeway	Existing	72	7.0	64
SR-180 Freeway	Existing Plus Project	74	7.0	65
SR-180 Freeway	Cumulative Plus Project	74	7.0	65
SR-99 Freeway	Existing	73	7.0	64
SR-99 Freeway	Existing Plus Project	76	7.0	64
SR-99 Freeway	Cumulative Plus Project	76	7.0	64
SR-168 Freeway	Existing	71	6.0	65
SR-168 Freeway	Existing Plus Project	72	7.0	64
SR-168 Freeway	Cumulative Plus Project	73	7.0	64
Source: FirstCarbon Solutions, 2014.				

Table 5.11-11 shows that through implementation of the increase in noise standards as detailed in General Plan Policy NS-1-a and through implementation of sound walls as detailed as a possible noise reduction measure detailed in General Plan Policy NS-1-g the roadway noise levels would be reduced to within the City's proposed noise standard of 65 dBA CNEL for noise sensitive land uses. Table 5.11-11 shows that up to 8-foot high sound walls would be required to reduce roadway noise impacts to less than significant levels. However, Section 12-306 of the Municipal Code limits walls heights to a maximum of 7 feet high. Furthermore, while the suggested wall heights may be implemented on new development projects, there is a possibility that there is existing development in the City where adequate sound walls were not constructed that would allow roadway noise to exceed the proposed 65 dBA CNEL noise standard for noise sensitive land uses. Therefore, roadway noise impacts would result in a significant unavoidable impact.

Stationary Noise Sources

Stationary noise sources can also have an effect on the population, and unlike mobile, transportation-related noise sources, these sources generally have a more permanent and consistent impact on people. These stationary noise sources involve a wide spectrum of uses and activities, including various industrial uses, commercial operations, agricultural production, school playgrounds, high school football games and marching bands, HVAC units, generators, lawn maintenance equipment, and swimming pool pumps.

Even with incorporation of the best available noise control technology, noise emanating from industrial uses can be substantial and exceed local noise standards. These noise sources can be continuous and may contain tonal components that may be annoying to nearby receptors. Although industrial uses in the City of Fresno are typically located in industrial districts near freeways and commercial uses and away from residences and other sensitive noise receptors, noise sources associated with commercial uses such as automotive repair facilities, recycling centers, and loading docks may occur in the vicinity of residential uses.

In an effort to address noise impacts in the City, the General Plan Update includes the following policies designed to reduce noise impacts from all noise sources:

Policy NS-1-a. Desirable and Generally Acceptable Exterior Noise Environment. Establish 60 dB LDN or CNEL as the standard for the desirable maximum average exterior noise levels for defined usable exterior areas of residential and noise-sensitive uses for noise, but accept 65 dB LDN or CNEL for noise generated by transportation sources.

Policy NS-1-e. Update Noise Ordinance. Update the Noise Ordinance to ensure that noise exposure information and specific standards for both exterior and interior noise and measurement criteria are consistent with this General Plan and changing conditions within the city and with noise control regulations or policies enacted after the adoption of this element.

Policy NS-1-f. Performance Standards. Implement performance standards for noise reduction for new residential and noise sensitive uses exposed to exterior community noise levels from transportation sources above 65 dB DNL or CNEL, as shown on Figure NS-3: Future Noise Contours,

or as identified by a project-specific acoustic study based on the target acceptable noise levels set in Tables 9-2 and 9-3 and Policies NS-1-a through NS-1-c.

Policy NS-1-g Noise mitigation measures which help achieve these noise level targets may include, without limitation, the following:

- Construct façades with substantial weight and insulation;
- Use sound-rated windows for primary sleeping and activity areas;
- Use sound-rated doors for all exterior entries at primary sleeping and activity areas;
- Use minimum setbacks and exterior barriers;
- Use acoustic baffling of vents for chimneys, attic and gable ends;
- Install a mechanical ventilation system that provides fresh air under closed window conditions.

Alternative acoustical designs that achieve the prescribed noise level standards may be approved by the City, provided that a qualified Acoustical Consultant submits information demonstrating that the alternative designs will achieve and maintain the specific targets for outdoor activity areas and interior spaces.

Policy NS-1-h. Interior Noise Level Requirement. Comply with the State Code requirement that any new multifamily residential, hotel, or dorm building exposed to exterior noise levels above 60 decibels CNEL must be designed to incorporate noise reduction measures to meet the 45 dB LDN interior noise criterion, and apply this standard as well to all new single-family residential and noise sensitive issues.

Policy NS-1-i. Mitigation by New Development. Require a noise study where new development of industrial, commercial or other noise generating land uses (including transportation facilities such as roadways, railroads, and airports) may result in noise levels that exceed the noise level exposure criteria established by Tables 9-2 and 9-3 to determine impacts, and require developers to mitigate these impacts in conformance with Tables 9-2 and 9-3 as a condition of permit approval through appropriate means.

Noise mitigation measures may include, but are not limited to:

- Screen and control noise sources, such as parking and loading facilities, outdoor activities, and mechanical equipment;
- Increase setbacks for noise sources from adjacent dwellings;
- Retain fences, walls, and landscaping that serve as noise buffers;
- Use soundproofing materials and double-glazed windows;

- Use open space, building orientation and design, landscaping and running water to mask sounds; and
- Control hours of operation, including deliveries and trash pickup, to minimize noise impacts.

Alternative acoustical designs that achieve the prescribed noise level reduction may be approved by the City, provided a qualified Acoustical Consultant submits information demonstrating that the alternative designs will achieve and maintain the specific targets for outdoor activity areas and interior spaces. As a last resort, developers may propose to construct noise walls along state routes (freeways and expressways), super arterials, and arterials when compatible with aesthetic concerns and neighborhood character. This would be a developer responsibility, with no City funding.

Policy NS-1-j. Significance Threshold. Establish, as a threshold of significance for the City's environmental review process, that a significant increase in ambient noise levels is assumed if the project would increase noise levels in the immediate vicinity by 5 dB LDN or CNEL or more.

Policy Guidance. When an increase in noise would result in a "significant" impact to residents or businesses, then mitigation is required to reduce noise exposure. If the increase is five dBA or more, the change in noise is discretional. If the increase in noise is four dBA or less, then the noise impact is considered insignificant and no mitigation is needed.

Policy NS-1-k. Proposal Review. Review all new public and private development proposals that may potentially be affected by or cause a significant increase in noise levels, per Policy NS-1-i, to determine conformance with the policies of this Noise Element. Require developers to reduce the noise impacts of new development on adjacent properties through appropriate means.

Policy NS-1-l. Enforcement. Continue to enforce applicable State Noise Insulation Standards and Uniform Building Code noise requirements, as adopted by the City.

Policy NS-1-m. Transportation Projects. For projects subject to City approval, require that the project sponsor mitigate noise created by new transportation and transportation-related stationary noise sources, including roadway improvement projects, so that resulting noise levels do not exceed the City's adopted standards for noise-sensitive land uses.

Policy NS-1-n. Best Available Technology. Require new noise sources to use best available control technology to minimize noise emissions.

Policy NS-1-n. Sound Wall Guidelines. Develop, distribute, and implement standard guidelines on heights, materials, and aesthetic design for sound walls and other noise barriers, within two years of General Plan adoption. Include aesthetic considerations in the guidelines, such as variable noise barrier heights, a combination of a landscaped berm with wall, and reduced barrier height in combination with increased distance or elevation differences between noise source and noise receptor, with a maximum allowable height of 15 feet.

In unison with Policy NS-1-a, which would update the City's Noise Ordinance to set noise levels from 65 dB to 70 dB as the "conditionally unacceptable" range for residential uses, and those greater than 70 dB as "generally unacceptable", the maximum allowable noise exposure for noise-sensitive land uses such as residential, transient lodging, hospitals/nursing homes, and churches/meeting halls would be set at 65 dB from 60 dB. Increasing this noise level threshold of noise-sensitive land uses would be consistent with the intensification of land uses in the City under the General Plan Update, as noise control would be an increasing consideration for infrastructure and new development, particularly for infill residential projects. Major cities in California typically consider maximum noise levels of 65 dB to be considered "normally acceptable" for unshielded residential development, including outdoor space in an urban environment. Suburban communities, by contrast, prefer a 60 dB threshold. As a result of the continuing urbanization of the City and the future development of the General Plan Update Planning Area, a 65 dB threshold for noise-sensitive land uses would be appropriate based on the changing character of the City.

Coupled with this revised noise level threshold, implementation of the Policy NS-1-a through Policy NS-1-p, which includes several structural design measures proven to reduce the effects of noise, would in most instances, reduce noise impacts to less than significant levels. However, these proposed policies and the measures that they would implement are ultimately limited, as even advanced policies and measures are limited in what they can do to remediate or reduce the magnitude of noise effects on many existing noise-sensitive land uses in areas with current high noise exposures or where substantial noise increases are expected. Thus, the continuing exposure of existing noise-sensitive land uses to noise levels in excess of standards established by the City, or to substantial noise increases as a result of future growth according to the General Plan Update, and consistent with the community and specific plans as amended or repealed, would be considered a potentially significant impact. Therefore, long-term project impacts associated with the exposure of persons to or the generation of noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies would be potentially significant.

Cumulative Impact Analysis

Short-Term Construction Impacts

Buildout of the General Plan Update Planning Area, along with construction of related projects in the Planning Area vicinity, would introduce construction activities to the Planning Area that could potentially result in temporary or periodic increases in ambient noise levels. Construction activities would typically occur intermittently and vary depending upon the nature or phase of construction, although noise ranges are usually similar across all construction phases. Depending on the equipment required and duration of use, average-hourly noise levels associated with construction activities typically ranges from roughly 65 to 90 dBA Leq at 50 feet.

As previously addressed, site preparation, grading, and other construction activity conducted pursuant to a building or other construction permit issued by the City of Fresno or other governmental agency would be exempt for the provisions of Chapter 10, Article 1 – Noise Regulations, of the Fresno Municipal Code, provided such work occurs between 7:00 a.m. and 10:00 p.m., excluding Sunday. Additionally, the counties of Fresno and Madera and the City of Clovis have established similar provisions that exempt construction noise within their jurisdictions from their

respective noise ordinances during daytime hours. As a result, construction noise generated along the Planning Area boundary but emanating into neighboring jurisdictions, and vice versa, should be excluded from both the noise provisions set forth by the City of Fresno and the surrounding jurisdictions, granted construction activities occur within specific parameters of each particular exception. Therefore, the proposed project contributions to cumulative construction noise would be less than cumulatively considerable and thus would result in a less than significant cumulative impact.

Long-Term Project Impacts

Buildout of the General Plan Update Planning Area, along with construction of related projects in the Planning Area vicinity, would result in increased traffic volumes, thus incrementally increasing noise levels in some areas. Future noise levels along existing roadways and highways are projected to increase by approximately 2 to 10 dB, as shown on Table 5.11-12. New roadways, significantly expanded roadways, or sparsely populated areas where significant new development is expected to occur may see noise levels increase by more than 10 dB. Substantial noise level exposures can also be expected from aircraft, trains, and stationary sources.

In most instances, when coupled with the revised 65 dB noise level threshold, implementation of General Plan Update Policy NS-1-a through Policy NS-1-k, as provided above, would reduce noise impacts to less than significant levels. However, these proposed policies and the measures that they would implement are ultimately limited, as even advanced policies and measures are limited in what they can do to remediate or reduce the magnitude of noise effects on many existing noise-sensitive land uses in areas with current high noise exposures or where substantial noise increases are expected. Thus, the continuing exposure of existing noise-sensitive land uses to noise levels in excess of standards established by the City, or to substantial noise increases as a result of future growth according to the General Plan Update, would be considered a potentially significant impact. As a result, cumulative impacts associated with the long-term exceedance of standards established in the local general plan or noise ordinance or applicable standards of other agencies would potentially occur in the Planning Area vicinity, and therefore, implementation of the General Plan Update is deemed cumulatively considerable.

Mitigation Measures

Project Specific

No feasible mitigation measures are available.

Cumulative

No feasible mitigation measures are available.

Level of Significance After Mitigation

Project Specific

Potentially significant impact.

Cumulative

Potentially significant impact.

Excessive Groundborne Vibration

Impact NOI-2 **The project would not result in expose persons to or generation of excessive groundborne vibration or groundborne noise levels.**

Project Specific Impact Analysis

Ground vibration generated by construction equipment and transportation sources spreads through the ground and diminishes in strength with distance. The effects of ground vibration can vary from no perceptible effects at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels, and slight damage to nearby structures at the highest levels. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in structural damage.

For transient sources of vibrations such as a single isolated vibration event (e.g., blasting), a peak particle velocity (ppv) threshold of 0.5 inches per second (in/sec) is sufficient to avoid structure damage for most buildings, including modern industrial/commercial buildings, new residential structures, and older residential structures, as well as many historic and some old buildings (refer to Table 5.11-3). For the protection of "fragile" structures, a more conservative threshold for transient sources of 0.2 in/sec ppv is typically recommended. This threshold roughly represents the level at which vibrations would be "distinctly perceptible" to humans (refer to Table 5.11-4). The standards for continuous and frequently intermittent sources, including impact pile drivers, pogo-stick compactors, crack-and-seat equipment, and vibratory compaction equipment are lower. For instance, a ppv threshold of 0.5 in/sec ppv is recommended to avoid structure damage for modern industrial/commercial buildings and new residential structures, while a threshold of 0.3 ppv is recommended for older residential structures. For the protection of fragile structures, a more conservative threshold of 0.1 in/sec ppv is typically recommended.

Based on these aforementioned standards, long-term project activities associated with buildout of the Planning Area would not involve the use of any equipment or processes that would result in potentially significant levels of ground vibration. Increases in ground-borne vibration levels attributable to the project would be primarily associated with short-term construction activities. Ground-borne vibration levels associated with typical construction equipment is provided in Table 5.11-12.

Table 5.11-12: Representative Vibration Source Levels for Construction Equipment

Equipment	Peak Particle Velocity at 25 Feet (in/sec)
Hoe Ram	0.089
Large Tractors	0.089
Caisson Drilling	0.089
Loaded Trucks	0.076
Jackhammer	0.035

Equipment	Peak Particle Velocity at 25 Feet (in/sec)
Small Tractors	0.003
Source: FTA 2006	

Construction activities associated with buildout of the Planning Area would likely require the use of various tractors, trucks, and jackhammers. Based on the vibration levels provided in Table 5.11-12, ground vibration generated by common construction equipment would be less than 0.09 inches per second ppv at 25 feet. Given that much of the construction activities would occur on vacant parcels in sparsely to moderately developed areas, the nearest offsite structures to a particular project site would likely be located in excess of 25 feet from construction activities. As a result, predicted vibration levels at the nearest offsite structures would not exceed even the conservative threshold for "fragile" buildings of 0.2 in/sec ppv for transient sources of vibrations, or the conservative threshold of 0.1 in/sec ppv for continuous/frequently intermittent sources. Additionally, the project would allow for infill development in more densely developed areas where offsite structures would be more prevalent. Even during these occurrences, the mandatory buffers set forth by the City of Fresno Development Code (e.g., setbacks, easements, right-of-ways) would ensure that in most cases onsite and offsite structures would be separated by at least 25 feet, and thus construction activities would be buffered by at least 25 feet from existing offsite structures. Therefore, short-term construction and long-term project impacts associated with groundborne vibration would be less than significant.

Cumulative Impact Analysis

Buildout of the General Plan Update Planning Area, along with construction of related projects in the Planning Area vicinity, would use construction equipment such as tractors, trucks, and jackhammers. Based on the vibration levels provided in Table 5.11-12, ground vibration generated by these pieces of equipment would be less than 0.09 inches per second ppv at 25 feet, which is below the conservative threshold for "fragile" buildings of 0.2 in/sec ppv for transient sources of vibrations, and the conservative threshold of 0.1 in/sec ppv for continuous/frequently intermittent sources.

Hypothetically, if several different projects were constructed simultaneously upon the same construction site within 25 feet of an existing structure, there would be potential for cumulative ground vibration effects. However, this scenario is highly unlikely. A more reasonable assumption is that future construction activities would occur at different locations throughout the Planning Area and the Planning Area vicinity. Although scheduling of some of these construction activities would likely overlap, projects would not be constructed simultaneously, but instead would occur over a number of years. As a result, no cumulative impacts associated with ground vibration would occur in the Planning Area vicinity, and therefore, implementation of the General Plan Update is not deemed cumulatively considerable.

Mitigation Measures

Project Specific

No mitigation measures are required.

Cumulative

No mitigation measures are required.

Level of Significance After Mitigation

Project Specific

Less than significant impact.

Cumulative

Less than significant impact.

Permanent Increase in Ambient Noise Levels

Impact NOI-3	**The project would result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.**

Project Specific Impact Analysis

As addressed in Impact NOI-1, future development activities within the Planning Area would result in increased traffic volumes, thus incrementally increasing noise levels in some areas. Future noise levels along existing roadways and highways are projected to increase by 2 to 10 dB. New roadways, significantly expanded roadways, or sparsely populated areas where significant new development is expected to occur may see noise levels increase by more than ten dB. Such increases in noise level can subsequently increase annoyance to populations and communities adjacent to the roadways. Future noise contours for vehicles are provided in Figure NS-3 of the General Plan.

Intervening structures or other noise-attenuating obstacles between a roadway and a receptor may reduce roadway noise levels at the receptor, but such potential reductions cannot be assumed in the noise contouring modeling. In order to determine the proposed project's contribution to roadway noise, each of the City of Fresno's roadway classifications were modeled by applying the Federal Highway Administration's (FHWA) noise modeling procedure, using roadway, speed, and traffic mix data from the City of Fresno, and the greatest project increase anticipated for each roadway type, which have been based on traffic volume levels provided by the engineering firm of Fehr & Peers. The proposed project's incremental increase to existing conditions is shown in Table 5.11-13.

Table 5.11-13: Project Traffic Noise Contributions

Roadway	dBA CNEL at Nearest Right-of-Way			Potential Significant Impact?
	Existing	Existing Plus Project	Project Contribution	
6-Lane Expressway	63	71	8	Yes
6-Lane Super Arterial	64	69	5	Yes

Roadway	dBA CNEL at Nearest Right-of-Way			Potential Significant Impact?
	Existing	Existing Plus Project	Project Contribution	
3-Lane Arterial	59	63	4	No
4-Lane Arterial	50	68	18	Yes
6-Lane Arterial	67	69	2	Yes
2-Lane Collector	59	66	7	Yes
4-Lane Collector	52	62	10	Yes
Freeway	66	76	10	Yes
Scenic Arterial	61	63	2	No
Scenic Expressway	68	69	1	No
4-Lane Super Arterial	65	68	3	Yes
Connector	42	62	20	Yes
Source: FirstCarbon Solutions, 2014.				

Table 5.11-13 shows that the for the existing conditions that the proposed project would increase roadway noise by as much as 20 dBA CNEL. The project contributions to roadway noise for the existing scenario would exceed the noise increase thresholds provided in existing General Plan Policy H-1-b. This would be considered a significant impact. Substantial noise level exposures could also be expected from aircraft, trains, and stationary sources.

In an effort to address noise impacts in the General Plan Update Planning Area, the General Plan Update includes Policy NS-1-a through NS-1-p, which are designed to reduce noise impacts. In conjunction with Policy NS-1-a, which would update the City's Noise Ordinance to set noise levels from 65 dB to 70 dB as the "conditionally unacceptable" range for residential uses, and those above 70 dB as "generally unacceptable", the maximum allowable noise exposure for noise-sensitive land uses such as residential, transient lodging, hospitals/nursing homes, and churches/meeting halls would be set at 65 dB from 60 dB. Increasing this noise level threshold of noise-sensitive land uses would be consistent with the intensification of land uses in the City under the General Plan Update, as noise control would be an increasing consideration for infrastructure and new development, particularly for infill residential projects. As a result of the continuing urbanization of the City and the future development of the General Plan Update Planning Area, a 65 dB threshold for noise-sensitive land uses would be appropriate based on the changing character of the City.

Coupled with this revised noise level threshold, implementation of the Policy NS-1-a through Policy NS-1-p, which includes several structural design measures proven to reduce the effects of noise, would in most instances, reduce noise impacts to less than significant levels. However, these proposed policies and the measures that they would implement are ultimately limited, as even advanced policies and measures are limited in what they can do to remediate or reduce the magnitude of noise effects on many existing noise-sensitive land uses in areas with current high

noise exposures or where substantial noise increases are expected. Thus, the continuing exposure of existing noise-sensitive land uses to noise levels in excess of standards established by the City, or to substantial noise increases as a result of future growth according to the General Plan Update, would result in a significant unavoidable permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

Cumulative Impact Analysis

Buildout of the General Plan Update Planning Area, along with construction of related projects in the Planning Area vicinity, would result in increased traffic volumes, thus incrementally increasing noise levels in some areas. Future noise levels along existing roadways and highways are projected to increase by one to five decibels. New roadways, significantly expanded roadways, or sparsely populated areas where significant new development is expected to occur may see noise levels increase by more than five decibels. Substantial noise level exposures can also be expected from aircraft, trains, and stationary sources.

The proposed project's incremental increase to cumulative conditions is shown in Table 5.11-14.

Table 5.11-14: Cumulative Plus Project Traffic Noise Contributions

Roadway	dBA CNEL at Nearest Right-of-Way			Potential Significant Impact?
	Existing	Cumulative Plus Project	Project Contribution	
6-Lane Expressway	62	72	10	Yes
6-Lane Super Arterial	64	68	4	Yes
3-Lane Arterial	58	63	5	Yes
4-Lane Arterial	58	69	11	Yes
6-Lane Arterial	66	69	3	Yes
2-Lane Collector	58	66	8	Yes
4-Lane Collector	52	62	10	Yes
Freeway	65	76	11	Yes
Scenic Arterial	60	63	3	No
Scenic Expressway	67	70	3	Yes
4-Lane Super Arterial	64	68	4	Yes
Connector	41	62	21	Yes
Source: FirstCarbon Solutions, 2014.				

Table 5.11-14 shows that the proposed project would increase roadway noise by as much as 21 dBA CNEL for the cumulative conditions. The project contributions to roadway noise for the cumulative scenario would exceed the noise increase thresholds provided in existing General Plan Policy H-1-b.

This would be considered a significant impact. Substantial cumulative noise level exposures could also be expected from aircraft, trains, and stationary sources.

In most instances, when coupled with the revised 65 dB noise level threshold, implementation of General Plan Update Policy NS-1-a through Policy NS-1-p, as provided above, would reduce noise impacts to less than significant levels. However, these proposed policies and the measures that they would implement are ultimately limited, as even advanced policies and measures are limited in what they can do to remediate or reduce the magnitude of noise effects on many existing noise-sensitive land uses in areas with current high noise exposures or where substantial noise increases are expected. Thus, the continuing exposure of existing noise-sensitive land uses to noise levels in excess of standards established by the City, or to substantial noise increases as a result of future growth according to the General Plan Update, would be considered a potentially significant impact. As a result, cumulative impacts associated with a permanent increase in ambient noise levels would occur in the Planning Area vicinity, and therefore, implementation of the General Plan Update is deemed cumulatively considerable.

Mitigation Measures

Project Specific

No feasible mitigation measures are available.

Cumulative

No feasible mitigation measures are available.

Level of Significance After Mitigation

Project Specific

Potentially significant impact.

Cumulative

Potentially significant impact.

Temporary or Periodic Increase in Ambient Noise Levels

Impact NOI-4	**The project would not result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.**

Project Specific Impact Analysis

Construction noise generated from development activities associated with buildout of the Planning Area would typically occur intermittently and vary depending upon the nature or phase (e.g., demolition, land clearing, grading, excavation, erection) of construction. Noise produced by construction equipment such as earthmovers, material handlers, and portable generators can reach high levels. Generally, the grading phase of construction involves the most equipment and generates the highest noise levels, although noise ranges are usually similar across all construction phases. Typical construction equipment noise levels are provided in Table 5.11-9. As shown, noise levels generated by individual pieces of construction equipment generally range from approximately 77

dBA to 90 dBA L_{max} at 50 feet. Typical operating cycles vary by equipment type and specific activity, although cycles generally involve two minutes of full power, followed by three to four minutes at lower settings. Depending on the equipment required and duration of use, average-hourly noise levels associated with construction activity typically ranges from roughly 65 to 90 dBA Leq at 50 feet. The highest noise levels are generally associated with grading and excavation phases (FHWA 2006).

Implementation of the project would include the demolition and construction of various divergent uses throughout the City of Fresno Planning Area, including single- and multi-family residential, commercial, industrial, mixed use, and public facilities, as well as ancillary infrastructural improvements such as roadways and water delivery and wastewater conveyance pipelines.

As addressed in Impact NOI-1, site preparation, grading, and other construction activity conducted pursuant to a building or other construction permit issued by the City of Fresno or other governmental agency would be exempt for the provisions of Chapter 10, Article 1 – Noise Regulations, of the Fresno Municipal Code, provided such work occurs between 7:00 a.m. and 10:00 p.m., excluding Sunday. However, although exempt, construction noise can still result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project to the extent that there is potential for physical harm to surrounding noise-sensitive receptors. Because of the nature of the project, which would include construction activity within and adjacent to previously developed areas within the City, including densely populated residential areas, there would be potential for a temporary or periodic increase in ambient noise levels in the Planning Area and subsequent harm to noise-sensitive receptors.

The Occupational Safety and Health Administration (OSHA) has adopted noise exposure thresholds, which establish the highest permissible exposure limit based on periods of exposure. The permissible noise exposure limit increases with shorter periods of exposure. OSHA allows a noise exposure level of 90 dB over an eight-hour exposure period. The highest permissible noise exposure limit increases to 92 dB for a six-hour exposure period, 95 dB for four hours of exposure, 97 dB for a three-hour period, and 105 dB for one hour of exposure. The highest permissible noise exposure level for periods of 15 minutes or less is 115 dB. Exposure to impulsive or impact noise cannot exceed 140 dB peak sound pressure level. It is important to note that these noise exposure limits apply only to employees in the workplace, but are useful in understanding noise exposure levels with regard to potential hearing loss and physiological damage.

As provided in Table 5.11-9, average-hourly noise levels associated with construction activity typically ranges from roughly 65 to 90 dBA L_{eq} at 50 feet, and can potentially reach levels of 90 dBA when concrete saw or similar equipment is used. These average-hourly noise levels would conform with the noise thresholds adopted by OSHA for exposure periods ranging from 115 dBA over 15 minutes to 90 dBA over eight hours (i.e., a full construction workday). As such, the various construction activity associated with buildout of the Planning Area would not exceed noise levels recognized as causing harm to nearby receptors. Therefore, impacts associated with a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project would be less than significant.

Cumulative Impact Analysis

Buildout of the General Plan Update Planning Area, along with construction of related projects in the Planning Area vicinity, would introduce construction activity to the Planning Area that could potentially result in temporary or periodic increases in ambient noise levels. Construction activities would typically occur intermittently and vary depending upon the nature or phase of construction, although noise ranges are usually similar across all construction phases. Depending on the equipment required and duration of use, average-hourly noise levels associated with construction activities typically ranges from roughly 65 to 90 dBA Leq at 50 feet.

Hypothetically, if several different projects were constructed simultaneously within the same immediate vicinity, there would be potential for cumulative temporary noise effects, since construction noise from individual projects could compound. However, this scenario is highly unlikely. A more reasonable assumption is that future construction activities would occur at different locations throughout the Planning Area and the Planning Area vicinity. Although scheduling of some of construction activities would likely overlap, projects would not be constructed simultaneously, but instead would occur over a number of years. This distribution of individual projects would reduce the potential for compounding of construction noise.

As previously addressed, typical construction noise levels would fall within those noise exposure limits established by OSHA. As a result, considering that buildout of the Planning Area and construction of related projects would occur at different locations and over several years, temporary noise levels would not exceed those limits recognized as causing harm to nearby receptors. As a result, no cumulative impacts associated with a temporary or periodic increase in ambient noise levels would occur in the Planning Area vicinity, and therefore, implementation of the General Plan Update is not deemed cumulatively considerable.

Mitigation Measures

Project Specific

No mitigation measures are required.

Cumulative

No mitigation measures are required.

Level of Significance After Mitigation

Project Specific

Less than significant impact.

Cumulative

Less than significant impact.

Airport Noise Levels

Impact NOI-5	**The project is located within an airport land use plan and within two miles of a public airport or public use airport, but the project would not expose people residing or working in the project area to excessive noise levels.**

Project Specific Impact Analysis

One public commercial airport, Fresno Yosemite International Airport, and two public general aviation airports, Fresno-Chandler Downtown Airport, and Sierra Sky Park Airport, are located in the General Plan Update Planning Area. As required by the Caltrans Division of Aeronautics, the Fresno County Airport Land Use Commission (ALUC) must prepare an ALUCP (refer to the heading "Airport Land Use Commission of Fresno County" under Section 5.11.3, Regulatory setting, above) for each public and public use airport within its jurisdiction. An ALUCP guides local jurisdictions in determining appropriate compatible land uses with detailed findings and policies. The City of Fresno General Plan, other City land use plans, and all City land use decisions must be compatible with the adopted ALUCP. Each ALUCP includes CNEL noise contours based on projected airport and aircraft operations. The purpose of these noise contours are to minimize the effect of airport and aircraft noise on the adjacent community by determining land use compatibility and locations for noise mitigation measures during the planning, design, and development process.

The Fresno Yosemite International Airport Land Use Compatibility Plan ALUCP, the Fresno-Chandler Downtown Airport ALUCP, and the Sierra Sky Park ALUCP establish land uses that are either acceptable or unacceptable within each CNEL noise contour based on the noise sensitivity of the particular use. Noise-sensitive land uses such as residential uses are typically only acceptable within area between the 60 and 65 dB CNEL noise contours. It is within these areas that the Fresno County ALUC has determined that residential uses can occur while still minimizing the effects of adjacent and overhead aircraft noise on noise-sensitive receptors. Any land use decision made within the jurisdictional boundary of an applicable ALUCP, and based upon policies set forth by the General Plan Update, must be consistent with the ALUCP, including the land use compatibility policies based on CNEL noise contours, as required by law. Additionally, in an effort to address aircraft noise impacts in the General Plan Update Planning Area, the General Plan Update includes the following policies designed to reduce aircraft noise impacts:

Additionally, in an effort to address aircraft noise impacts in the General Plan Update Planning Area, the General Plan Update includes the following policies designed to reduce aircraft noise impacts:

> **NS-1-p.** Airport Noise Compatibility. Implement the land use and noise exposure compatibility provisions of the adopted Fresno Yosemite International Airport Land Use Compatibility Plan, the Fresno-Chandler Downtown Airport Master and Environs Specific Plan and the Sierra Skypark Land Use Policy Plan to assess noise compatibility of proposed uses and improvements within airport influence and environs areas.

To address aircraft noise impacts, Policy NS-1-p would require that the City approve only noise-compatible land uses and limit noise-sensitive land use, including residential uses, as defined by the applicable ALUCPs. In the event that residential uses or similar noise-sensitive land use are proposed

for areas susceptible to aircraft noise levels exceeding those levels that are typically considered acceptable, Policy NS-1-p would conditionally allow development of such uses following preparation of a noise study and implementation of mitigation measures.

Along with compliance with the applicable ALUCPs and the land use compatibility policies contained within, Policy NS-1-p would reduce impacts from adjacent and overhead aircraft noise on noise-sensitive land uses to acceptable levels. Therefore, impacts associated with noise produced by public and public use airports in the Planning Area vicinity would be less than significant.

Cumulative Impact Analysis

Buildout of the General Plan Update Planning Area, along with construction of related projects in the Planning Area vicinity, would introduce noise-sensitive land uses such as residential uses to areas potentially affected by public or public use airport and aircraft noise. However, all development occurring within the Planning Area would be subject to the land use compatibility polices of the applicable ALUCPs. Each ALUCP includes CNEL noise contours based on projected airport and aircraft operations. The purpose of these noise contours are to minimize the effect of airport and aircraft noise on the adjacent community by determining land use compatibility and locations for noise mitigation measures during the planning, design, and development process. Any land use decision made within the jurisdictional boundary of an applicable ALUCP (regardless of whether within or outside the Planning Area) and based upon policies set forth by the General Plan Update must be consistent with the ALUCP, including the land use compatibility policies based on CNEL noise contours, as required by law. Additionally, incorporation of General Plan Update Policy NS-1-p, as previously provided, would further reduce airport-related noise effects within the Planning Area and reduce any potential contribution to cumulative airport noise effects. As a result, no cumulative impacts associated with airport and aircraft noise would occur in the Planning Area vicinity, and therefore, implementation of the General Plan Update is not deemed cumulatively considerable.

Mitigation Measures

Project Specific

No mitigation measures are required.

Cumulative

No mitigation measures are required.

Level of Significance After Mitigation

Project Specific

Less than significant impact.

Cumulative

Less than significant impact.

Private Airstrip Noise Levels

Impact NOI-6	**The project is within the vicinity of a private airstrip, but the project would not expose people residing or working in the project area to excessive noise levels.**

Project Specific Impact Analysis

Currently, there are no private airstrips operating within the General Plan Update Planning Area. A few private airstrips potentially occur outside of the Planning Area boundary, although the operational status of these airstrips is presently undetermined. These dirt-surfaced airstrips are associated with agricultural operations in the Planning Area vicinity and were/are likely used by smaller aircraft to apply pesticides to fields. If still in use, these airstrips would not support more than a few smaller aircraft operating intermittently throughout the growing season. Conversely, due to infrastructural limitations, these airstrips are not physically capable of supporting large-scale flight operations, larger aircraft fleets, or consistent aircraft flights that would result in generation of substantial noise effects on the adjacent and surrounding areas. As a result, any noise potentially produced by these airstrips would not constitute a substantial increase in noise levels within the Planning Area.

Additionally, in an effort to address aircraft noise impacts in the General Plan Update Planning Area, the General Plan Update includes the following policies designed to reduce aircraft noise impacts:

> **NS-1-p.** Airport Noise Compatibility. Implement the land use and noise exposure compatibility provisions of the adopted Fresno Yosemite International Airport Land Use Compatibility Plan, the Fresno-Chandler Downtown Airport Master and Environs Specific Plan and the Sierra Skypark Land Use Policy Plan to assess noise compatibility of proposed uses and improvements within airport influence and environs areas.

To address aircraft noise impacts, Policy NS-1-p would require that the City approve only noise-compatible land uses and limit noise-sensitive land use, including residential uses, as defined by the applicable ALUCPs. In the event that residential uses or similar noise-sensitive land use are proposed for areas susceptible to aircraft noise levels exceeding those levels that are typically considered acceptable, Policy NS-1-p would conditionally allow development of such uses following preparation of a noise study and implementation of mitigation measures.

Along with compliance with the applicable ALUCPs and the land use compatibility policies contained within, Policy NS-1-p would reduce impacts from adjacent and overhead aircraft noise on noise-sensitive land uses to acceptable levels. Therefore, impacts associated with noise produced by private airstrips in the Planning Area vicinity would be less than significant.

Cumulative Impact Analysis

Buildout of the General Plan Update Planning Area, along with construction of related projects in the Planning Area vicinity, would introduce noise-sensitive land uses such as residential uses to areas potentially affected by private airstrip noise. However, because of infrastructural limitations, all of the private airstrips in the Planning Area vicinity are not physically capable of supporting large-scale flight operations, larger aircraft fleets, or consistent aircraft flights that would result in generation of

substantial noise effects on the adjacent and surrounding areas. As such, any noise potentially produced by these airstrips would not constitute a substantial increase in noise levels within the Planning Area and beyond. As a result, no cumulative impacts associated with airstrip noise would occur in the Planning Area vicinity, and therefore, implementation of the General Plan Update is not deemed cumulatively considerable.

Mitigation Measures

Project Specific

No mitigation measures are required.

Cumulative

No mitigation measures are required.

Level of Significance After Mitigation

Project Specific

Less than significant impact.

Cumulative

Less than significant impact.