4.8 NOISE

This EIR section evaluates the potential effects of noise and groundborne vibration associated with construction and operational activities that could occur as a result of implementation of the proposed Transit Zoning Code (SD 84A and SD 84B) area. The Initial Study (Appendix A) identified the potential for impacts to occur associated with a substantial temporary and/or permanent increase in ambient noise levels within or around the Transit Zoning Code (SD 84A and SD 84B) area. Additionally, the Initial Study identified the potential for people to be exposed to excessive noise levels, groundborne vibration, or groundborne noise levels in excess of standards established in the local General Plan or noise ordinance. Potential direct and indirect impacts resulting from construction and operation of the proposed projects are identified, and potential mitigation measures that could avoid or reduce these impacts are recommended, where feasible.

Issues scoped out include proximity to, or association with, an airport land use plan or airstrip. While the proposed project area is located outside of the 20,000-foot notification area as required by the Orange County Airport Land Use Commission (ALUC), the project must still comply with the Airport Environs Element that was adopted by the City of Santa Ana in 2008, in order to comply with the Airport Environs Land Use Plan (AELUP) for Orange County. Refer to Chapter 4.5 (Hazards and Hazardous Materials) for analysis of this issue. Data used to prepare this report were taken from the Traffic Impact Analysis Report prepared by KOA Corporation for the proposed project, and information obtained by measuring and modeling existing and future noise levels at the Transit Zoning Code (SD 84A and SD 84B) area and in the surrounding area.

Three comment letters associated with noise were received in response to the Notice of Preparation circulated for the proposed project. The comment letters can be found in Appendix A.

4.8.1 Existing Conditions

The project is located in the central urban core of Santa Ana and comprises approximately 100 blocks and 450 acres of land. The proposed project is generally bounded by First Street, Flower Street, Civic Center Drive, Grand Avenue, and Interstate 5 (I-5). More specifically, the proposed project is located in the area west of I-5, north of First Street, and between Grand Avenue and Flower Street and south of Civic Center Drive in the City of Santa Ana in Orange County, California.

Several roadways provide access to properties within the Transit Zoning Code (SD 84A and SD 84B) area, including Civic Center Drive, Fourth Street, First Street, and Santa Ana Boulevard, which run east-west through the area, and Flower Street, Main Street and Grand Avenue, which run north-south through the area.

The Transit Zoning Code (SD 84A and SD 84B) area includes the Government Center, downtown area, the Logan and Lacy neighborhoods, and the industrial parks surrounding the Santa Ana Regional Transportation Center (SARTC). The surrounding land uses include residential, professional,

commercial, industrial, and civic uses and their environs. Specific adjacent (off-site) uses include the following:

- **North**: Single-family residential, office, and commercial uses, as well as I-5
- **East**: Commercial and residential uses. I-5 is located immediately adjacent to portions of the Transit Zoning Code (SD 84A and SD 84B) area
- **South**: Institutional (including educational), commercial, industrial, and residential uses
- **West**: Residential and commercial uses with open space located further to the west

Fundamentals of Sound and Environmental Noise

Sound is technically described in terms of amplitude (loudness) and frequency (pitch). The standard unit of sound amplitude measurement is the decibel (dB). The decibel scale is a logarithmic scale that describes the physical intensity of the pressure vibrations that make up any sound. The pitch of the sound is related to the frequency of the pressure vibration. Because the human ear is not equally sensitive to a given sound level at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) provides this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Noise, on the other hand, is typically defined as unwanted sound. A typical noise environment consists of a base of steady "background" noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. These can vary from an occasional aircraft or train passing by to virtually continuous noise from, for example, traffic on a major highway. Table 4.8-1 (Representative Environmental Noise Levels) lists representative noise levels for the environment.

Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise upon people is largely dependent upon the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The L_{eq} is a measure of ambient noise, while the L_{dn} and CNEL are measures of community noise. Each is applicable to this analysis and defined as follows:

- L_{eq}, the equivalent energy noise level, is the average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
- L_{dn}, the Day-Night Average Level, is a 24-hour average L_{eq} with a 10 dBA "weighting" added to noise during the hours of 10:00 P.M. to 7:00 A.M. to account for noise sensitivity in the nighttime. The logarithmic effect of these additions is that a 60 dBA 24 hour L_{eq} would result in a measurement of 66.4 dBA L_{dn}.
- *CNEL*, the Community Noise Equivalent Level, is a 24-hour average L_{eq} with a 5 dBA "weighting" during the hours of 7:00 P.M. to 10:00 P.M. and a 10 dBA "weighting" added to noise during the hours of 10:00 P.M. to 7:00 A.M. to account for noise sensitivity in the evening and

nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24 hour L_{eq} would result in a measurement of 66.7 dBA CNEL.

- L_{min}, the minimum instantaneous noise level experienced during a given period of time.
- L_{max}, the maximum instantaneous noise level experienced during a given period of time.

Table 4.8-1 Representative Environmental Noise Levels

Common Outdoor Activities	*Noise Level (dBA)*	*Common Indoor Activities*
Power Saw	—110—	Rock Band
Jet Fly-over at 100 feet		Crying Baby
Subway	—100—	
Gas Lawnmower at 3 feet		
Tractor	—90—	
		Food Blender at 3 feet
Diesel Truck going 50 mph at 50 feet	—80—	Garbage Disposal at 3 feet
Noisy Urban Area during Daytime		
Gas Lawnmower at 100 feet	—70—	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
Heavy Traffic at 300 feet	—60—	Sewing Machine
Air Conditioner		Large Business Office
Quiet Urban Area during Daytime	—50—	Dishwasher in Next Room
		Refrigerator
Quiet Urban Area during Nighttime	—40—	Theater, Large Conference Room (background)
Quiet Suburban Area during Nighttime		
	—30—	Library
Quiet Rural Area during Nighttime		Bedroom at Night, Concert Hall (background)
	—20—	
		Broadcast/Recording Studio
	—10—	
Lowest Threshold of Human Hearing	—0—	Lowest Threshold of Human Hearing

SOURCE: League of the Hard of Hearing 2006

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night, or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA. Examples of low daytime levels are isolated, natural settings that can provide noise levels as low as 20 dBA and quiet, suburban, residential streets that can provide noise levels around 40 dBA. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are

urban residential or semi-commercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with more noisy urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). According to the City's Noise Control Ordinance, the exterior noise level standard is 55 dBA from 7:00 A.M. to 10:00 P.M., and 50 dBA from 10:00 P.M. to 7:00 A.M. The interior noise level standard is 55 dBA from 7:00 A.M. to 10:00 P.M., and 45 dBA from 10:00 P.M. to 7:00 A.M. Standards for impact noise, simple tone noise, speech, music, and any other combination are 5 dBA lower than the above standards, and noise levels exceeding these standards are limited to relatively shorter periods of time.

When evaluating changes in 24-hour community noise levels, a difference of 3 dBA is a barely perceptible increase to most people. A 5 dBA increase is readily noticeable, while a difference of 10 dBA would be perceived as a doubling of loudness.

Noise levels from a particular source decline as distance to the receptor increases. Other factors, such as the weather and reflecting or shielding, also intensify or reduce the noise level at a location. A common method for estimating roadway noise is that for every doubling of distance from the source, the noise level is reduced by about 3 dBA at acoustically "hard" locations (i.e., the area between the noise source and the receptor is nearly complete asphalt, concrete, hard-packed soil, or other solid materials) and 4.5 dBA at acoustically "soft" locations (i.e., the area between the source and receptor is normal earth or has vegetation, such as grass). Noise from stationary or point sources is reduced by about 6 to 7.5 dBA for every doubling of distance at acoustically hard and soft locations, respectively. Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA. The manner in which older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units is generally 30 dBA or more.

Fundamentals of Environmental Groundborne Vibration

Vibration is sound radiated through the ground. Groundborne noise is the rumbling sound caused by the vibration of room surfaces. The ground motion caused by vibration is measured as particle velocity in inches per second; in the U.S., this is referenced as vibration decibels (VdB).

The background vibration velocity level in residential and educational areas is usually around 50 VdB. The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the groundborne vibration from traffic is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration velocity level, to 100 VdB, which is the general threshold where minor damage can occur in

fragile buildings. Table 4.8-2 (Human Response to Different Levels of Groundborne Vibration) describes the general human response to different levels of groundborne vibration velocity levels.

Table 4.8-2 Human Response to Different Levels of Groundborne Vibration

Vibration Velocity Level	*Human Reaction*
65 VdB	Approximate threshold of perception for many people.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

SOURCE: HMMH, 2006

Existing Ambient Daytime Noise Levels

According to the Noise Element of the City of Santa Ana General Plan, the primary source of noise within the City is traffic noise from major roadways and freeways within the area from mobile sources such as automobiles, buses, trucks, and vehicles associated with construction equipment transport. Secondary noise sources in the City include aircraft operations, railroad operations, and construction activities. Also, stationary sources such as industrial activities, public gatherings, activities in open areas, and the use of equipment in unenclosed spaces, produce a significant amount of noise.

Existing daytime noise levels were monitored at twelve locations around the project area, which are depicted in Figure 4.8-1 (Noise Monitoring Locations), in order to identify representative noise levels at various areas. The noise levels were measured using a Larson-Davis Model 814 precision sound level meter, which satisfies the American National Standards Institute (ANSI) for general environmental noise measurement instrumentation. The average noise levels and sources of noise measured at each location are identified in Table 4.8-3 (Existing Noise Levels around the Proposed Transit Zoning Code [SD 84A and SD 84B] Area). As shown, the daytime noise levels range from a high of 77.0 dBA to a low of 52.9 dBA and are characteristic of a typical urban area.

Existing Local Noise Environment

The Atchison, Topeka, and Santa Fe Railroad (AT&SF) tracks, which are used by Amtrak and Metrolink for commuter train services during most of the day, run along the eastern edge of Santa Ana and through the eastern portion of the Transit Zoning Code (SD 84A and SD 84B) area. Rail transit traveling at grade typically produces a noise level of 80 dBA at a distance of 50 feet from the tracks while rail transit stopped at a station typically produces a noise level of 65 dBA at a distance of 50 feet (HMMH 2006). In addition, the sounding of train horns, which is required when approaching at-grade crossings with streets and highways for safety reasons, represents the highest noise levels associated with train services. The sounding of a train horn can generate noise levels in excess of 110 dBA at a distance of 100 feet.

Table 4.8-3 Existing Noise Levels around the Proposed Transit Zoning Code (SD 84A and SD 84B) Area

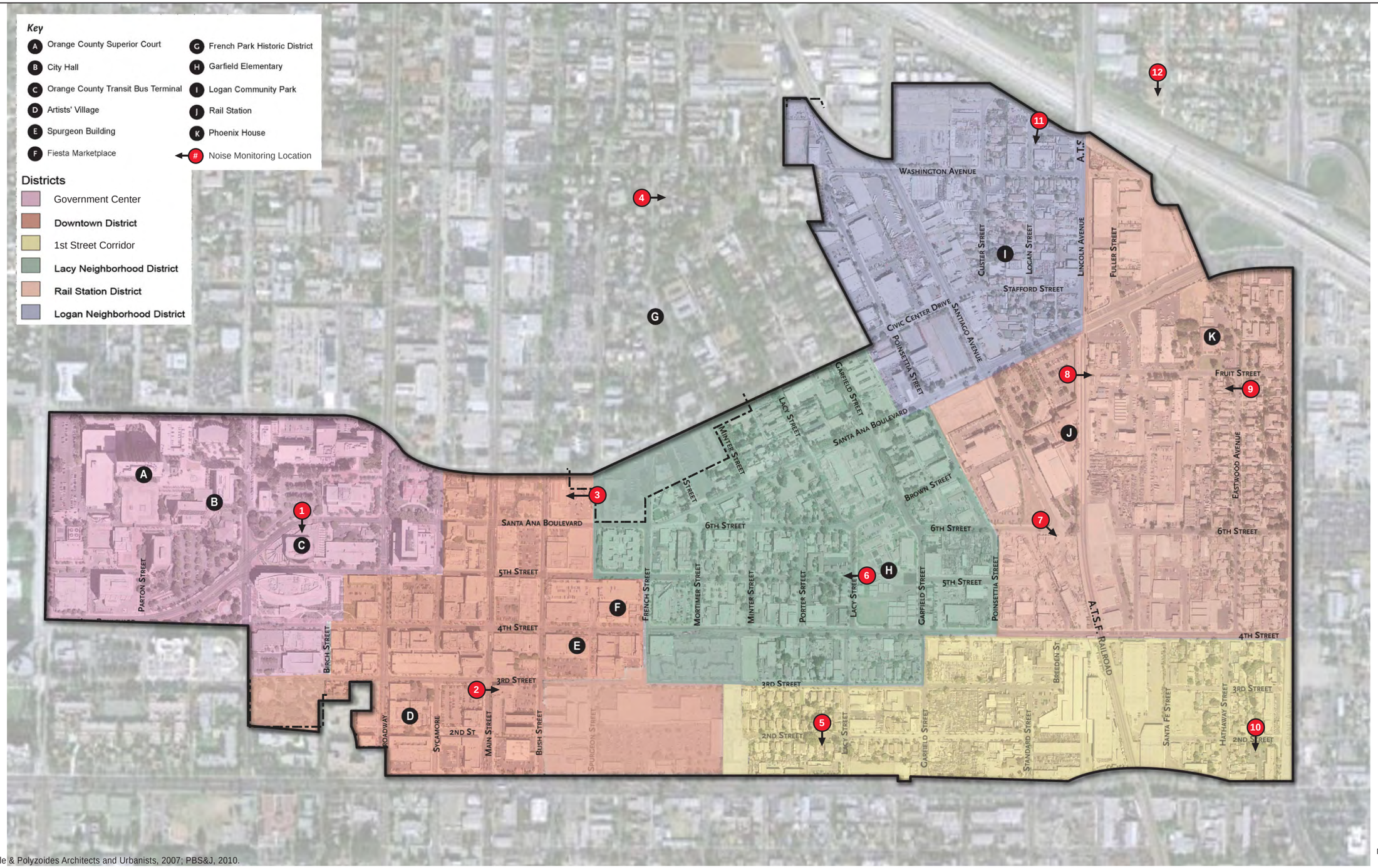
	Location	Primary Noise Sources	Noise Level Statistics		
			L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)
1	Santa Ana Blvd, east of Ross St.	Road Traffic	65.3	47.3	78.8
2	Main St. and Third St.	Road Traffic	71.9	54.8	90.2
3	Spurgeon St., between Santa Ana Blvd. and Civic Center Dr.	Road Traffic	59.0	49.2	70.9
4	1200 Block French St.	Road Traffic	57.5	39.9	77.6
5	700 Block 2nd St.	Road Traffic	54.2	44.2	71.7
6	Lacy St. and 5th St.	Road Traffic/Music	56.2	44.8	66.1
7	6th St. and Santiago St.	Road Traffic/Truck Yard	68.5	55.3	85.4
8	Rail Station Platform	Road Traffic/Trains	77.0	49.3	98.3
9	700 Block Eastwood Ave.	Road Traffic	52.9	46.1	63.7
10	2nd St., between Grand Ave, and Hathaway St.	Road Traffic	58.8	48.4	77.3
11	Logan St, south of I-5 Freeway	Freeway Traffic	74.0	71.0	77.6
12	1400 Block Hathaway St.	Freeway Traffic	60.8	58.3	65.9

SOURCE: PBS&J, January 5, 2010.

John Wayne Airport is located to the south of the City of Santa Ana and is served by several commercial air carriers and commuter airlines. A small portion of Santa Ana located along the southeast border of the City and not within the Transit Zoning Code (SD 84A and SD 84B) boundaries is located within the airport's 60 CNEL noise contour.

Existing Roadway Noise Levels Off-Site

Existing roadway noise levels were calculated for the roadway segments in the project site vicinity that have noise-sensitive uses facing the roadways. This task was accomplished using the Federal Highway Administration Highway Noise Prediction Model (FHWA-RD-77-108) and traffic volumes from the project traffic analysis. The model calculates the average noise level at specific locations based on traffic volumes, average speeds, roadway geometry, and site environmental conditions. The average vehicle noise rates (energy rates) utilized in the FHWA Model have been modified to reflect average vehicle noise rates identified for California by Caltrans. The Caltrans data show that California automobile noise is 0.8 to 1.0 dBA higher than national levels and that medium and heavy truck noise is 0.3 to 3.0 dBA lower than national levels. The average daily noise levels along these roadway segments are presented in Table 4.8-4 (Existing Roadway Noise Levels). As indicated, average daily noise levels along roadways within the Transit Zoning Code (SD 84A and SD 84B) area range from a high of 74.4 dBA CNEL to a low of 56.5 dBA CNEL.



NORTH
NOT TO SCALE

***Sources*:** Moule & Polyzoides Architects and Urbanists, 2007; PBS&J, 2010.

FIGURE **4.8-1**

Noise Monitoring Locations

Table 4.8-4 Existing Roadway Noise Levels	
Roadway Segment	*Reference 24-hour dBA CNEL Noise Level at 50 Feet [a]*
Flower Street—Santa Ana Blvd to Civic Center Dr	67.6
Flower Street—17th St to Civic Center Dr	67.5
Civic Center Dr—West of Flower St	67.6
Civic Center Dr—Flower St to Ross St	67.3
Flower Street—Santa Ana Blvd to 1st St	67.6
Santa Ana Blvd—West of Flower St	63.8
Santa Ana Blvd—Flower St to Parton St	64.7
Santa Ana Blvd—Parton St to Ross St	64.7
Civic Center Dr—Ross St to Broadway	66.8
Santa Ana Blvd—Ross St to Broadway	64.4
Broadway—Civic Center Dr to Santa Ana Blvd	67.7
Broadway—Civic Center Dr to Washington Ave	68.8
Civic Center Dr—Broadway to Sycamore St	66.7
Broadway—Santa Ana Blvd to 5th St	67.1
Santa Ana Blvd—Broadway to Sycamore St	63.6
Broadway—5th St to 4th St	67.0
5th St—Broadway to Ross St	61.0
5th St—Broadway to Main St	61.0
Broadway—3rd St to 4th St	67.0
Broadway—3rd St to 1st St	67.0
Broadway—South of 1st St	65.5
1st St—Broadway to Ross St	73.8
1st St—Main St to Broadway	73.6
Civic Center Dr—Sycamore St to Main St	66.7
Santa Ana Blvd—Sycamore St to Main St	63.6
5th St—Sycamore St to Broadway	61.0
5th St—Sycamore St to Main St	61.0
Main St—Civic Center Dr to Santa Ana Blvd	68.7
Main St—Civic Center Dr to Washington Ave	68.8
Civic Center Dr—Main St to Bush St	65.6
Main St—Santa Ana Blvd to 5th St	68.7
Santa Ana Blvd—Main St to Bush St	63.6
Main St—5th St to 4th St	68.7
5th St—Main St to Bush St	59.5

Table 4.8-4 Existing Roadway Noise Levels

Roadway Segment	Reference 24-hour dBA CNEL Noise Level at 50 Feet [a]
Main St—3rd St to 4th St	68.2
Main St—1st St to 3rd St	68.2
Santa Ana Blvd—Bush St to Spurgeon St	63.6
5th St—Bush St to French St	59.4
1st St—Spurgeon St to Main St	73.7
Santa Ana Blvd—Lacy St to Standard Ave	65.3
Civic Center Dr—French St to Lacy St	65.6
Santa Ana Blvd—Lacy St to French St	65.0
4th St—Lacy St to French St	62.5
1st St—Lacy St to Spurgeon St	73.7
1st St—Lacy St to Standard Ave	73.7
Santiago St—Washington Ave to Civic Center Dr	64.7
Santiago St—Washington Ave to 17th St	64.6
Santiago St—Santa Ana Blvd to Civic Center Dr	64.3
Civic Center Dr—Santiago St to Lacy St	65.5
Civic Center Dr—Lincoln Ave to Santiago St	56.5
Santiago St—Santa Ana Blvd to Brown St	63.1
Santa Ana Blvd—Santiago St to Lacy St	65.3
Santa Ana Blvd—Santiago St to U-24	68.0
4th St—Santiago St to Lacy St	64.5
Grand Ave—4th St to Santa Ana Blvd	72.1
Grand Ave—Santa Ana Blvd to 17th St	71.4
Santa Ana Blvd—East of Grand Ave	62.8
Grand Ave—1st St to 4th St	71.5
4th St—Grand Ave to Santiago St	64.5
4th St—East of Grand Ave	65.0
Grand Ave—South of 1st St	72.4
1st St—Standard Ave to Grand Ave	73.8
1st St—East of Grand Ave	73.5
Penn Way—South of I-5 SB Ramps	63.8
Penn Way—North of I-5 SB Ramps	66.5
Santa Ana Blvd—West of I-5 SB Ramps	69.7
Santa Ana Blvd—East of I-5 SB Ramps	67.7
17th St—West of I-5 NB Ramps	74.4
17th St—East of I-5 NB Ramps	73.4

Table 4.8-4 Existing Roadway Noise Levels	
Roadway Segment	*Reference 24-hour dBA CNEL Noise Level at 50 Feet [a]*
Grand Ave—South of I-5 NB Ramps	73.0
Grand Ave—North of I-5 NB Ramps	72.7

SOURCE: PBS&J, 2010 (calculation data and results are provided in Appendix F).

a. Distances are in feet from roadway centerline. The identified noise level at 50 feet from the roadway centerline is for reference purposes only. It does not reflect an actual building location or potential impact location.

Existing Groundborne Vibration Levels

The greatest regular source of ground-borne vibration in the Transit Zoning Code (SD 84A and SD 84B) area and in the immediate vicinity is roadway traffic, bus traffic, and rail traffic. Trucks and buses typically generate noticeable ground-borne vibration velocity levels at the edge of the road and typically produce a vibration level of 65 VdB at a distance of 50 feet from the roadway. Trains typically generate noticeable ground-borne vibration velocity levels at the edge of the right-of-way and typically produce a vibration level of 75 VdB at a distance of 50 feet from the tracks (HMMH 2006).

4.8.2 Regulatory Framework

Federal

The U.S. Department of Housing and Urban Development (HUD) has set a goal of 45 dBA L_{dn} as a desirable maximum interior standard for residential units developed under HUD funding. While HUD does not specify acceptable exterior noise levels, residential dwellings constructed under Title 24 of the California Code of Regulations typically provide 20 dBA of acoustical attenuation with the windows closed and 10 dBA with the windows open. Based on this assumption, the exterior L_{dn} or CNEL should not exceed 65 dBA under normal conditions.

State

The California Department of Health Services (DHS) Office of Noise Control has previously studied the correlation of noise levels and their effects on various land uses (DHS no longer exists). The most current guidelines prepared by the State noise officer were issued in 1987. They are contained in the "General Plan Guidelines" issued by the Governor's Office of Planning and Research in 1998. Noise-compatible land use planning depends on the ability to locate noise-sensitive land uses in an acceptable environment. Exterior noise environments are "normally acceptable" for schools and residences if they are below 60 dBA L_{dn} (or CNEL) and "conditionally acceptable" below 70 dBA L_{dn} (or CNEL). A "conditionally acceptable" designation implies that new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements and after necessary noise insulation features are incorporated into the design of the new land use. By comparison, a "normally acceptable" designation indicates that standard construction can occur without special noise reduction requirements.

The types of land uses addressed by the State standards and the acceptable noise categories for each are presented in Table 4.8-5 (Land Use Compatibility for Community Noise Sources). There is some overlap between the categories, indicating the importance of judgment required when determining the applicability of the numbers in certain situations.

Table 4.8-5 Land Use Compatibility for Community Noise Sources

Land Use Category	*Noise Exposure (dBA, CNEL)*						
	55	*60*	*65*	*70*	*75*	*80*	
Residential—Low-Density Single Family, Duplex, Mobile Homes							
Residential—Multiple Family							
Transient Lodging—Motels, Hotels							
School, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters							
Sports Areas, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Course, Riding Stables, Water Recreation, Cemeteries							

Table 4.8-5 Land Use Compatibility for Community Noise Sources

Land Use Category	Noise Exposure (dBA, CNEL) 55	60	65	70	75	80
Office Buildings, Business, Commercial and Professional						
Industrial, Manufacturing, Utilities, Agriculture						

	Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.
	Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but closed windows and fresh air supply or air conditioning will normally suffice.
	Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
	Clearly Unacceptable: New construction or development should generally not be undertaken.

SOURCE: Office of Noise Control, California Department of Health Services.

Title 24 of the California Code of Regulations requires performing acoustical studies before constructing dwelling units in areas that exceed 60 dBA L_{dn}. In addition, the California Noise Insulation Standards identify an interior noise standard of 45 dBA CNEL for new multi-family residential units.

Local

City of Santa Ana General Plan

Noise Element

The Noise Element of the General Plan identifies sources of noise in the City and provides objectives and policies that ensure that noise from various sources would not create an unacceptable noise environment. It is a tool that City planners use to achieve and maintain land uses with compatible environmental noise levels. As shown in Table 4.8-6 (City of Santa Ana Standards and Guidelines for Noise Levels by Land Use), the City has established the following standards and guidelines for noise levels for land use.

Table 4.8-6 City of Santa Ana Standards and Guidelines for Noise Levels by Land Use

Land Use Category	*Desirable Maximum (CNEL dBA)*	*Maximum Acceptable (CNEL dBA)*
Residential, Low Density	55	65
Residential, Medium Density	60	65
Residential, High Density	65	70
Schools	60	70
Commercial, Office	65	70
Industrial	70	75

SOURCE: City of Santa Ana General Plan Noise Element

Based on these standards, exterior noise levels of 55 dBA CNEL and lower are desirable for single-family residential uses, while exterior noise levels of 65 dBA CNEL and lower are desirable for high-density multi-family residential uses. Incompatible land uses should not be developed in areas where existing noise levels exceed the maximum acceptable guidelines. All residential uses should be protected with sound insulation over and above that provided by normal building construction when constructed in areas exposed to greater than 60 dBA CNEL.

The following goals, objectives, and policies from the Noise Element are relevant to the proposed Transit Zoning Code (SD 84A and SD 84B):

Goal 1 Prevent significant increases in noise levels in the community and minimize the adverse effects of currently existing noise sources

Objective 1.1 Prevent creation of new and additional sources of noise.

Objective 1.2 Reduce current noise levels of acceptable standards.

Implementation Policies

- Require consideration of noise generation potential and susceptibility to noise impacts in the siting, design and construction of new developments
- Require mitigating site and building design features, traffic circulation alternatives, insulation and other noise prevention measures of those new developments which generate high noise levels.
- Sound insulate and/or buffer sensitive land uses such as housing from adverse noise impacts in noise-prone areas
- Minimize noise generation in residential neighborhoods through control or elimination of truck traffic and through-traffic from these areas

Consistency Analysis

As described under Impact 4.8-1, construction-related noise could negatively affect nearby sensitive receptors. However, with the implementation of mitigation measures MM4.8-1 though MM4.8-4, construction-related noise would be reduced. Sources of noise generated by implementation of the proposed project would include new stationary sources (such as rooftop heating, ventilation, and air conditioning [HVAC] systems for the residential and office uses). As discussed under Impact 4.8-2, these noise sources have the potential to impact sensitive uses located both on- and off-site. Mitigation measures MM4.8-5 though MM4.8-7 would reduce exterior noise levels affecting nearby sensitive uses to below the exterior noise standard of 65 dBA CNEL. The primary source of noise in the vicinity of the proposed project is traffic noise. As discussed in Impact 4.8-7, traffic generated by the proposed project would generate noise along nearby road segments; however, the increase attributed to the proposed project would not be substantial and would not affect nearby sensitive uses both on- and off-site.

However, portions of the Transit Zoning Code (SD 84A and SD 84B) area are located within close proximity to the SARTC and the AT&SF rail line. As discussed in Impact 4.8-8, sensitive receptors may be exposed to noise levels from trains in excess of the desired exterior noise standard of 65 dBA CNEL and interior noise standard of 45 dBA CNEL. Implementation of mitigation measures outlined below would reduce noise levels but below the standards set by the City. For the reasons listed above, the proposed project is not consistent with Goal 1.

City of Santa Ana Municipal Code

The City of Santa Ana has also adopted a Noise Ordinance (Chapter 18, Article VI of the Santa Ana Municipal Code), which identifies exterior noise standards, specific noise restrictions, exemptions, and variances for sources of noise within the City. Section 18-311 of the Municipal Code designates the entire City as Noise Zone 1 for exterior and interior noises. Section 18-312 of the Municipal Code establishes exterior noise levels for residential land uses. The exterior noise standards established in the City's Noise Ordinance are identified in Table 4.8-7 (City of Santa Ana Noise Ordinance Exterior Noise Standards). If the ambient noise level is greater than the identified noise standards, the noise standard becomes the ambient noise level without the offending noise.

Table 4.8-7 City of Santa Ana Noise Ordinance Exterior Noise Standards

Noise Level That May Not Be Exceeded for More Than	*7:00 A.M.–10:00 P.M.*	*10:00 P.M.–7:00 A.M.*
30 minutes in any hour	55 dBA	50 dBA
15 minutes in any hour	60 dBA	55 dBA
5 minutes in any hour	65 dBA	60 dBA
1 minute in any hour	70 dBA	65 dBA
Any time	75 dBA	70 dBA

SOURCE: City of Santa Ana Municipal Code Section 18-312

In the event that the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music or any combination thereof, the specified noise limits are reduced by 5 dB(A)

Section 18-313 of the Municipal Code establishes interior noise standards that apply to all residential properties within the designation Noise Zone 1. Interior noise levels must not exceed 55 dBA between the hours of 7:00 A.M. and 10:00 P.M. or 45 dBA between the hours of 10:00 P.M. and 7:00 A.M., as shown in Table 4.8-8 (City of Santa Ana Noise Ordinance Interior Noise Standards). As with Section 18-312 of the Municipal Code, if the ambient noise level is greater than the identified noise standards, the noise standard becomes the ambient noise level without the offending noise.

Table 4.8-8 City of Santa Ana Noise Ordinance Interior Noise Standards

Noise Level That May Not Be Exceeded for More Than	*7:00 A.M.–10:00 P.M.*	*10:00 P.M.–7:00 A.M.*
5 minutes in any hour	55 dBA	45 dBA
1 minute in any hour	60 dBA	50 dBA
Any time	65 dBA	55 dBA

SOURCE: City of Santa Ana Municipal Code Section 18-312

Interior noise measurements shall be made within the affected dwelling unit. The measurement shall be made at a point at least four (4) feet from the wall, ceiling, or floor nearest the alleged offensive noise source and may be made with the windows of the affected unit open. In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB(A).

Section 18-314 of the Noise Ordinance provides special provisions which exempt certain activities from the standards established in the Noise Ordinance. As such, the following activities are exempt:

- Activities conducted on the grounds of any public or private nursery, elementary, intermediate or secondary school or college
- Outdoor gatherings, public dances and shows, provided said events are conducted pursuant to a license issued by the City of Santa Ana
- Activities conducted on any park or playground, provided such park or playground is owned and operated by a public entity
- Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work
- Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 P.M. and 7:00 A.M. on weekdays, including Saturday, or any time on Sunday or a federal holiday
- All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather condition
- Mobile noise sources associated with agricultural operations, provided such operations do not take place between the hours of 8:00 P.M. and 7:00 A.M. on weekdays, including Saturday, or at any time on Sunday or a federal holiday
- Mobile noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the agricultural commissioner

- Noise sources associated with the maintenance of real property, provided said activities take place between 7:00 A.M. and 8:00 P.M. on any day except Sunday or a federal holiday, or between the hours of 9:00 A.M. and 8:00 P.M. on Sunday or a federal holiday
- Any activity to the extent regulation thereof has been preempted by state or federal law

Under Section 18-314(e) of the Municipal Code, construction activity noise sources are exempt from the Noise Ordinance standards so long that the activities do not take place between the hours of 8:00 P.M. and 7:00 A.M. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

4.8.3 Project Impacts and Mitigation

Analytic Method

Implementation of the proposed project could result in the introduction of noise levels that may exceed permitted City noise levels. The primary sources of noise associated with the proposed project would be construction activities within the Transit Zoning Code (SD 84A and SD 84B) area and project-related traffic volumes associated with operation of those projects. Secondary sources of noise would include new stationary sources (such as heating, ventilation, and air conditioning units) and increased human activity throughout the Transit Zoning Code (SD 84A and SD 84B) area. In addition, land use allowed under the Transit Zoning Code (SD 84A and SD 84B) could be affected by noise generated by existing rail operations along the AT&SF tracks, which run through the eastern portion of the Transit Zoning Code (SD 84A and SD 84B) area. The net increase in noise levels generated by these activities and other sources have been quantitatively estimated and compared to the applicable noise standards and thresholds of significance.

Aside from noise levels, groundborne vibration would also be generated during the construction phase of the proposed projects within the Transit Zoning Code (SD 84A and SD 84B) area by various types of construction equipment. In addition, land uses allowed under the Transit Zoning Code (SD 84A and SD 84B) could be affected by groundborne vibration generated by existing rail operations along the AT&SF tracks. Thus, the groundborne vibration levels generated by construction equipment have also been quantitatively estimated and compared to applicable thresholds of significance.

Construction Noise Levels

Construction noise levels were estimated by data published by the U.S. Environmental Protection Agency (U.S. EPA). Potential noise levels are identified for on- and off-site locations that are sensitive to noise, including residences and schools.

The EPA has compiled data regarding the noise-generating characteristics of typical construction activities. These noise levels would diminish rapidly with distance from the construction site, at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 86 dBA measured at 50 feet from the noise source to the receptor would reduce to 80 dBA at 100 feet from the source to the receptor, and reduce by another 6 dBA to 74 dBA at 200 feet from the source to the receptor.

Roadway Noise Levels

Roadway noise levels have been calculated for various locations in and around the Transit Zoning Code (SD 84A and SD 84B) area. The noise levels were calculated using the FHWA-RD-77-108 model and traffic volumes from the project traffic study. The average vehicle noise rates (energy rates) utilized in the FHWA Model have been modified to reflect average vehicle noise rates identified for California by Caltrans. Traffic volumes used in the FHWA model are derived from the project traffic study, which is provided in its entirety Appendix G and summarized in Section 4.11 (Transportation/Traffic) of this document.

Railway Noise Levels

Railway noise levels resulting from railway operations occurring within the Transit Zoning Code (SD 84A and SD 84B) area were estimated using data published by Harris Miller Miller & Hanson Inc. (HMMH 2006) for the Federal Transit Administration (FTA).

Vibration Levels Associated with Construction Equipment

Groundborne vibration levels resulting from construction activities occurring within the Transit Zoning Code (SD 84A and SD 84B) area were estimated using data published by Harris Miller Miller & Hanson Inc. (HMMH 2006) for the FTA. Potential vibration levels are identified for on- and off-site locations that are sensitive to vibration, including residences and schools.

Vibration Levels Associated with Railway Operations

Groundborne vibration levels resulting from railway operations occurring within the Transit Zoning Code (SD 84A and SD 84B) area and were estimated using data published by Harris Miller Miller & Hanson Inc. (HMMH 2006) for the FTA. Potential vibration levels are identified for on-site locations that are sensitive to vibration, including residences and schools.

Thresholds of Significance

The following thresholds are based on Appendix G of the CEQA Guidelines, as amended. For purposes of this EIR, implementation of the proposed project may have a significant adverse impact on noise if it would result in any of the following:

- Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels
- Cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project
- Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

- Expose people residing or working in the project site to excessive noise levels from a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport
- Expose people residing or working in the project site to excessive noise levels from a project located within the vicinity of a private airstrip

The CEQA Guidelines do not define the levels at which temporary and permanent increases in ambient noise are considered "substantial." As discussed previously in this section, a noise level increase of 3 dBA is barely perceptible to most people, a 5 dBA increase is readily noticeable, and a difference of 10 dBA would be perceived as a doubling of loudness. Based on this information, the following thresholds would apply to the operational characteristics of the proposed project:

- Less than 3 dBA: not discernable, not significant
- Greater than 3 dBA but less than 5 dBA: noticeable, but not significant, if noise levels remain below 65 dBA CNEL noise level standard at sensitive land uses including residential uses
- Five dBA or greater: potentially significant, if the noise increase would meet or exceed 65 dBA CNEL noise level standard at sensitive land uses including residential uses
- Five dBA or greater: potentially significant

The CEQA Guidelines also do not define the levels at which groundborne vibration or groundborne noise is considered "excessive." For the purpose of this analysis, groundborne vibration impacts associated with human annoyance would be significant if the proposed project exceeds 85 VdB, which is the vibration level that is considered by FTA to be acceptable only if there are an infrequent number of events per day (as described in Table 4.8-2 [Human Response to Different Levels of Groundborne Vibration]). In terms of groundborne vibration impacts on structures, this analysis will use FTA's vibration damage threshold of approximately 100 VdB for fragile buildings and approximately 95 VdB for extremely fragile historic buildings (HMMH 2006).

Effects Found to Have No Impact

Threshold	If the project is located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airstrip, would it expose people residing or working in the project site to excessive noise levels?

As discussed in Section 4.6 (Hazards and Hazardous Materials), the proposed project is not located within an airport land use plan or within 2 miles of a public airport or public use airport. The nearest public airport to the project is the John Wayne Airport, which is located approximately 5.0 miles south of the proposed project. Further, the proposed project is located over 5,000 feet from the 60 CNEL noise contour for John Wayne Airport. Thus, no impact related to the exposure of people residing or working in the project area to excessive airport related noise levels is anticipated, and no further analysis is required in this EIR.

Threshold	If the project is located within the vicinity of a private airstrip, would it expose people residing or working in the project site to excessive noise levels?

The Transit Zoning Code (SD 84A and SD 84B) area is not located within the vicinity of a private airstrip. Thus, no impact related to the exposure of people residing or working in the project site to excessive airstrip-related noise levels is anticipated, and no further analysis is required in this EIR.

Effects Found to Be Less Than Significant

Threshold	Would the project result in the 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?

Impact 4.8-1 **Construction activities associated with the proposed project would generate noise levels that exceed the noise standards established by the City of Santa Ana Municipal Code. This is considered a potentially significant impact. Implementation of mitigation measures MM4.8-1 through MM4.8-4 would reduce this impact, but noise levels could still be substantial. However, the project's construction noise impacts would be temporary and would be consistent with the exemption for construction noise that exists in the Municipal Code. Therefore, this impact would be considered *less than significant*.**

The proposed project has the potential to result in events that may exceed permitted noise levels. The primary sources of noise associated with the proposed project would be construction activities and project-related traffic volumes. Secondary sources include increased human activity throughout the sites. Noise limits for sensitive uses established in Section 18-311 and 18-312 of the Santa Ana Municipal Code are shown in Table 4.8-7 and Table 4.8-8.

Development of projects under the Transit Zoning Code (SD 84A and SD 84B) would require the use of heavy equipment for demolition, site excavation, installation of utilities, site grading, paving, and building fabrication. Construction activities would also involve the use of smaller power tools, generators, and other sources of noise. During each stage of construction there would be a different mix of equipment operating, and noise levels would vary based on the amount of equipment in operation and the location of the activity.

The EPA has compiled data regarding the noise generating characteristics of specific types of construction equipment and typical construction activities. These data are presented in Table 4.8-9 (Noise Ranges of Typical Construction Equipment) and Table 4.8-10 (Typical Outdoor Construction Noise Levels). These noise levels would diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 86 dBA measured at 50 feet from the noise source to the receptor would reduce to 80 dBA at 100 feet from the source to the receptor, and reduce by another 6 dBA to 74 dBA at 200 feet from the source to the receptor.

Table 4.8-9 Noise Ranges of Typical Construction Equipment

Equipment	*Noise Levels in dBA L_{eq} at 50 Feet* [a]
Front Loader	73 to 86
Trucks	82 to 95
Cranes (moveable)	75 to 88
Cranes (derrick)	86 to 89
Vibrator	68 to 82
Saws	72 to 82
Pneumatic Impact Equipment	83 to 88
Jackhammers	81 to 98
Pumps	68 to 72
Generators	71 to 83
Compressors	75 to 87
Concrete Mixers	75 to 88
Concrete Pumps	81 to 85
Back Hoe	73 to 95
Pile Driving (peaks)	95 to 107
Tractor	77 to 98
Scraper/Grader	80 to 93
Paver	85 to 88

SOURCE: U.S. EPA 1971

a. Machinery equipped with noise control devices or other noise-reducing design features does not generate the same level of noise emissions as that shown in this table.

Noise that would be experienced by sensitive uses due to development associated with implementation of the proposed project is determined at their property lines. While the nearest sensitive uses vary at different locations in and around the Transit Zoning Code (SD 84A and SD 84B) area and as specific development plans have not yet been determined at individual sites, for the purpose of this analysis it is assumed that sensitive receptors could be as close as 50 feet from where construction would take place. Sensitive receptors in the project vicinity could experience noise levels up to 86 dBA L_{eq} as a result of construction activities, or as high as 107 dBA L_{eq} in the event that pile drivers are used. The City of Santa Ana Municipal Code, Section 18-314(e) allows for noise resulting from construction activities to be exempt from noise limits established in the Code. In accordance with the Noise Ordinance, construction activities would also be limited to the hours of 7:00 A.M. and 8:00 P.M. Monday through Saturday, and is prohibited on Sundays and federal holidays. As construction would not occur except during the times permitted in the Noise Ordinance, and as the Municipal Code, Section 18-314(e) of the Municipal Code allows construction noise in excess of standards to occur between these hours, the proposed project would not violate established standards.

Table 4.8-10 Typical Outdoor Construction Noise Levels		
Construction Phase	*Noise Levels at 50 Feet(dBA L_{eq})*	*Noise Levels at 50 Feet with Mufflers (dBA L_{eq})*
Ground Clearing	84	82
Excavation, Grading	89	86
Foundations	78	77
Structural	85	83
Finishing	89	86
SOURCE: U.S. EPA 1971		

The following mitigation measures shall be implemented as part of the proposed project:

MM4.8-1 *All construction activity within the City shall be conducted in accordance with Section 18-314(e) of the City of Santa Ana Municipal Code.*

MM4.8-2 *Each project applicant shall require by contract specifications that the following construction best management practices (BMPs) be implemented by contractors to reduce construction noise levels:*

- *Two weeks prior to the commencement of construction, notification must be provided to property owners within 300 feet of a project site disclosing the construction schedule, including the various types of activities that would be occurring throughout the duration of the construction period*
- *Ensure that construction equipment is properly muffled according to industry standards and be in good working condition*
- *Place noise-generating construction equipment and locate construction staging areas away from sensitive uses, where feasible*
- *Schedule high noise-producing activities between the hours of 8:00 A.M. and 5:00 P.M. to minimize disruption on sensitive uses*
- *Implement noise attenuation measures, which may include, but are not limited to, temporary noise barriers or noise blankets around stationary construction noise sources*
- *Use electric air compressors and similar power tools rather than diesel equipment, where feasible*
- *Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for more than 30 minutes*
- *Construction hours, allowable workdays, and the phone number of the job superintendent shall be clearly posted at all construction entrances to allow for surrounding owners and residents to contact the job superintendent. If the City or the job superintendent receives a complaint, the superintendent shall investigate, take appropriate corrective action, and report the action taken to the reporting party.*

Contract specifications shall be included in the proposed project construction documents, which shall be reviewed by the City prior to issuance of a grading permit.

MM4.8-3 *Each project applicant shall require by contract specifications that construction staging areas along with the operation of earthmoving equipment within the project area would be located as far away from vibration and noise sensitive sites as possible. Contract specifications shall be included in the proposed*

project construction documents, which shall be reviewed by the City prior to issuance of a grading permit.

MM4.8-4 *Each project applicant shall require by contract specifications that heavily loaded trucks used during construction would be routed away from residential streets. Contract specifications shall be included in the proposed project construction documents, which shall be reviewed by the City prior to issuance of a grading permit.*

Implementation of mitigation measures MM4.8-1 through MM4.8-4 would ensure that impacts associated with construction-related noise would be minimized. Therefore, this impact would be ***less than significant***.

Impact 4.8-2 **Operation of the proposed project could expose noise-sensitive land uses to noise levels that exceed the standards established by the City of Santa Ana General Plan. This is considered a potentially significant impact. Implementation of mitigation measures MM4.8-5 through MM4.8-7 would reduce this impact to a *less-than-significant* level.**

Sources of noise generated by implementation of the proposed project would include new stationary sources (such as rooftop heating, ventilation, and air conditioning [HVAC] systems for the residential and office uses). The proposed project would also introduce new activity and noise to the area as part of the development of a new mix of uses under the proposed project. As shown in Table 4.8-3 (Existing Noise Levels Within and Around the Transit Zoning Code (SD 84A and SD 84B) Area), noise monitoring in the project area indicates that existing noise levels on site currently exceed the 65 dBA "desirable maximum" noise standard for high density residential uses. Development of new residences in areas where existing noise levels are over 65 dBA could constitute a significant impact. As the noise levels monitored on-site exceed the 65 dBA thresholds, the project site would not meet acceptable noise levels for a residential use. It should be noted that some monitoring locations such as Santa Ana Street, east of Ross St., and the intersection of Main Street and Third Street, are located in institutional and commercial areas, respectively, and contain uses that typically do not qualify as sensitive receptors. Further, impacts related to substantial permanent increases in ambient noise levels that could potentially result with implementation of the proposed project are discussed below under Impact 4.8-8.

The City of Santa Ana General Plan states that all residential uses should be protected with sound insulation over and above that provided by normal building construction when constructed in areas exposed to greater than 60 dBA CNEL. As such the following mitigation measures shall be implemented to all residential development within the Transit Zoning Code (SD 84A and SD 84B) area where the existing noise levels exceed the 60 dBA CNEL standard established in the General Plan.

MM4.8-5 *When residential uses would be located in areas with noise levels in excess of 60 dBA CNEL (either through conversion of use/structure or new construction), the project applicant shall provide noise barriers around private open space areas, including patios and balconies, as necessary. The height and density of the barriers shall be sufficient to reduce the exterior noise levels within private open space areas to a CNEL of 65 dBA or less.*

MM4.8-6 *Prior to issuance of building permits, building plans shall specify the STC rating of windows and doors for all residential land uses. Window and door ratings shall be sufficient to reduce the interior noise level to a CNEL of 45 dBA or less, and shall be determined by a qualified acoustical consultant as part of the final engineering design of the project.*

As previously discussed, implementation of the proposed project would lead to the development of high-density residential uses in areas that exceed the 65 dBA CNEL "Desirable Maximum," and this would be considered a significant impact. However, implementation of mitigation measure MM4.8-5 would ensure that exterior living spaces, such as porches and patios, are constructed in a manner that noise levels do not exceed the 65 dBA CNEL. Further implementation of mitigation measure MM4.8-6 would ensure that interior living spaces of the residential units do not exceed 45 dBA CNEL. Therefore, this impact would be reduced to a level of ***less than significant***.

In addition, the HVAC systems that would be installed for the new residential development associated with the proposed project can result in noise levels that average between 50 and 65 dBA L_{eq} at 50 feet from the equipment. As 24-hour CNEL noise levels are about 6.7 dBA greater than 24-hour L_{eq} measurements, this means that the HVAC equipment associated with the retail-commercial buildings could generate community noise levels that average between 57 to 72 dBA CNEL at 50 feet when the equipment is operating constantly over 24 hours. These HVAC units would be mounted on the rooftops of the proposed buildings and would be screened from view by building features. However, the installation of shielding around these HVAC systems would be required as part of the proposed project, as stated in mitigation measure MM4.8-7 below.

MM4.8-7 *Each project applicant shall provide proper shielding for all new HVAC systems used by the proposed residential and mixed use buildings to achieve an attenuation of 15 dBA at 50 feet from the equipment.*

The shielding installed around these systems would typically reduce noise levels by approximately 15 dBA, which could reduce HVAC system noise to approximately 50 dBA L_{eq} at 50 feet from the equipment, which would be approximately 56.7 dBA CNEL. Implementation of mitigation measure MM4.8-7 would ensure that impacts related to the HVAC systems would remain below the 65 dBA CNEL "Desirable Maximum" exterior noise level guideline established in the City's General Plan for high density residential uses. As such impacts to residents of the proposed project relating to HVAC systems would be ***less than significant***.

Threshold	Would the project result in the exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Impact 4.8-3 **Operation of the proposed project would not generate and expose sensitive receptors on site or off site to excessive groundborne vibration or groundborne noise levels. This is considered a *less-than-significant* impact.**

During operation of the proposed project, background operational vibration levels would be expected to average around 50 VdB, as discussed previously in this section. This is substantially less than the 85 VdB

threshold for people in the vicinity of the project site. Groundborne vibration resulting from operation of the proposed project would primarily be generated by trucks making periodic deliveries to the proposed Transit Zoning Code (SD 84A and SD 84B) area. However, these types of deliveries would be consistent with deliveries that are currently made along roadways to commercial uses in the proposed Transit Zoning Code (SD 84A and SD 84B) area and in the proposed project vicinity and would not increase groundborne vibration above existing levels. Because no substantial sources of groundborne vibration would be built as part of the proposed project, no vibration impacts would occur during operation of the proposed project. Therefore, operation of the proposed project would not expose sensitive receptors on or off site to excessive groundborne vibration or groundborne noise levels, and this impact would be ***less than significant***.

Impact 4.8-4 **Operation of the Southern California Regional Rail Authority's rail line would not generate and expose sensitive receptors located within the Transit Zoning Code (SD 84A and SD 84B) area to excessive groundborne vibration or groundborne noise levels. This is considered a *less-than-significant* impact.**

Implementation of the Transit Zoning Code (SD 84A and SD 84B) would locate new sensitive land uses within the vicinity of the existing railroad tracks. Problems for residential uses, such as disturbance due to groundborne vibration from these sources, are usually contained to areas within about 200 feet of the vibration source (HMMH 2006). Typically, the main effect of groundborne vibration is to cause annoyances for occupants of nearby buildings. The proposed residential uses in the Logan Neighborhood, Transit Village, and First Street Corridor could be located within 200 feet from the centerline of the railroad. As discussed earlier, trains typically produce a vibration level of 75 VdB at a distance of 50 feet from the tracks during operation and 65 dBA at a distance of 50 feet while stopped at a train station, both of which are below the human annoyance threshold of 85 VdB. Therefore, the occupants of the proposed residential units would not be exposed to potentially significant vibration levels, and this impact would be ***less than significant***.

Threshold	Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Impact 4.8-5 **Construction activities associated with the proposed project would result in a substantial temporary or periodic increase in ambient noise levels. However, the project's construction noise impacts would be temporary, would not occur during recognized sleep hours, and would be consistent with the exemption for construction noise that exists in the Municipal Code. Therefore, this impact would be considered *less than significant*.**

As discussed in Impact 4.8-1, construction activities associated with the proposed project could reach above 86 dBA L_{eq} within 50 feet of the proposed project site. These construction activities would represent a substantial temporary or periodic increase in ambient noise levels. As discussed previously under "Thresholds of Significance," this analysis assumes that an increase of 5.0 dBA or greater over ambient noise levels is substantial and significant. As shown in Table 4.8-3, the highest existing daytime ambient noise level monitored in the project vicinity was 77.0 dBA L_{eq} at the Rail Station Platform. As

such, the noise generated by construction activities for the proposed project could result in a temporary increase in ambient noise levels of over 5 dBA at uses adjacent to the project site. However, with implementation of mitigation measure MM4.8-1, the construction activities would only occur during the permitted hours designated in the City of Santa Ana Municipal Code Section 18-314(e), and thus would not occur during recognized sleep hours for residences or on days that residents are most sensitive to exterior noise (Sundays and federal holidays). As such, while the physical impact from an increase in ambient noise levels could occur from the construction activities associated with the proposed project, an adverse effect on the nearby residents would not occur. Implementation of mitigation measures MM4.8-2 through MM4.8-4 would also help reduce this impact. Therefore, with mitigation, this impact would be ***less than significant***.

Impact 4.8-6 **Operation of the proposed project would not result in temporary or periodic increases in ambient noise levels. There would not be a substantial temporary or periodic increase and, thus, this impact would be *less than significant*.**

Operation of the proposed project would not include special events or temporary activities which would cause an increase in ambient noise levels. In addition, operation of the proposed project would not require periodic use of special stationary equipment that would expose off-site sensitive receptors to an increase in ambient noise levels above those existing without the proposed project. Therefore, there would be no temporary or periodic noise impacts to on- or off-site receptors due to operation of the proposed project. This impact would be ***less than significant***.

Threshold	Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Impact 4.8-7 **Operation of the proposed project would not generate increased local traffic volumes that would cause a substantial permanent increase in ambient noise levels in the project vicinity. This is considered a *less-than-significant* impact.**

The increase in traffic resulting from implementation of the proposed project would increase the ambient noise levels at sensitive off-site locations in the project vicinity. Traffic was analyzed both for near-term project opening year (2030) and long range (2035) General Plan buildout conditions. Traffic analyzed as part of the 2030 traffic analysis was derived from existing traffic, an ambient growth factor of 0.5 percent per year and the traffic that is anticipated to occur based on known development projects within the vicinity of the study area that will contribute some (or all) of their traffic to the various study area roadways and intersections. Traffic analyzed as part of the 2035 traffic analysis was obtained from the OCTA Traffic Demand model. Previous analysis was conducted by using OCTAM 3.2 travel demand forecasting model. KOA conducted screenline analysis for OCTA's later version model OCTAM 3.3. The screenline analysis surrounding the City indicates that OCTAM 3.3 represents about 11 percent higher traffic volumes forecasting for both the AM and PM peak hour models. KOA therefore applied an 11 percent growth factor to the original OCTAM 3.2 traffic volume forecast. The growth in housing, population, and employment included in the OCP-2004 demographic projections is consistent with the

anticipated growth that is expected in conjunction with buildout of the City of Santa Ana General Plan land uses and circulation element.

Table 4.8-11 compares near-term (2030) conditions with the project to existing conditions to identify the overall change in future noise levels along study area roadway segments. As discussed previously, a difference of 3.0 dBA between 24-hour noise levels is a barely perceptible increase to most people. A 5.0 dBA increase is readily noticeable, and a difference of 10 dBA would be perceived as a doubling of loudness. Existing traffic noise levels are identified in Table 4.8-4. Noise levels associated with traffic generated from existing conditions within the proposed project area were calculated along study-area roadway segments using traffic data from the traffic study (included in Appendix G). In addition, Table 4.8-10 (Traffic Noise Impacts for Year 2030) also compares near-term (2030) with project conditions to near-term (2030) without project conditions to determine the project's contribution to changes in noise levels along study area roadway segments.

Table 4.8-11 Traffic Noise Impacts for Year 2030

	Noise Levels in dBA CNEL at 50 feet						
Roadway Segment	*Existing Conditions*	*Year 2030 Without Project Traffic Volumes*	*Year 2030 With Project Traffic Volumes*	*Increase with Project over Existing Conditions*	*Project Contribution*	*Significance Threshold[a]*	*Exceeds Significance Threshold?*
Flower Street—Santa Ana Blvd to Civic Center Dr	67.6	68.2	68.2	0.6	0.0	3.0	No
Flower Street—17th St to Civic Center Dr	67.5	67.9	68.0	0.5	0.1	3.0	No
Civic Center Dr—West of Flower St	67.6	68.1	68.3	0.7	0.2	3.0	No
Civic Center Dr—Flower St to Ross St	67.3	67.8	68.1	0.8	0.3	3.0	No
Flower Street—Santa Ana Blvd to 1st St	67.6	68.2	68.3	0.7	0.1	3.0	No
Santa Ana Blvd—West of Flower St	63.8	64.2	64.6	0.8	0.4	5.0	No
Santa Ana Blvd—Flower St to Parton St	64.7	65.1	65.6	0.9	0.5	5.0	No
Santa Ana Blvd—Parton St to Ross St	64.7	65.1	65.6	0.9	0.5	5.0	No
Civic Center Dr—Ross St to Broadway	66.8	67.4	67.8	1.0	0.4	3.0	No
Santa Ana Blvd—Ross St to Broadway	64.4	64.9	65.4	1.0	0.5	5.0	No
Broadway—Civic Center Dr to Santa Ana Blvd	67.7	68.3	68.3	0.6	0.0	3.0	No

Table 4.8-11 Traffic Noise Impacts for Year 2030

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2030 Without Project Traffic Volumes	Year 2030 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Broadway—Civic Center Dr to Washington Ave	68.8	69.4	69.5	0.7	0.1	3.0	No
Civic Center Dr—Broadway to Sycamore St	66.7	67.3	67.7	1.0	0.4	3.0	No
Broadway—Santa Ana Blvd to 5th St	67.1	67.6	67.7	0.6	0.1	3.0	No
Santa Ana Blvd—Broadway to Sycamore St	63.6	64.3	64.5	0.9	0.2	5.0	No
Broadway—5th St to 4th St	67.0	67.6	67.7	0.7	0.1	3.0	No
5th St—Broadway to Ross St	61.0	61.4	61.8	0.8	0.4	5.0	No
5th St—Broadway to Main St	61.0	61.4	61.7	0.7	0.3	5.0	No
Broadway—3rd St to 4th St	67.0	67.5	67.7	0.7	0.2	3.0	No
Broadway—3rd St to 1st St	67.0	67.5	67.8	0.8	0.3	3.0	No
Broadway—South of 1st St	65.5	66.4	66.5	1.0	0.1	3.0	No
1st St—Broadway to Ross St	73.8	74.4	74.5	0.7	0.1	3.0	No
1st St—Main St to Broadway	73.6	74.5	74.6	1.0	0.1	3.0	No
Civic Center Dr—Sycamore St to Main St	66.7	67.1	67.5	0.8	0.4	3.0	No
Santa Ana Blvd—Sycamore St to Main St	63.6	64.1	64.4	0.8	0.3	5.0	No
5th St—Sycamore St to Broadway	61.0	61.4	61.7	0.7	0.3	5.0	No
5th St—Sycamore St to Main St	61.0	61.5	61.8	0.8	0.3	5.0	No
Main St—Civic Center Dr to Santa Ana Blvd	68.7	69.2	69.4	0.7	0.2	3.0	No
Main St—Civic Center Dr to Washington Ave	68.8	69.4	69.5	0.7	0.1	3.0	No

Table 4.8-11 Traffic Noise Impacts for Year 2030

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2030 Without Project Traffic Volumes	Year 2030 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Civic Center Dr—Main St to Bush St	65.6	66.1	66.5	0.9	0.4	3.0	No
Main St—Santa Ana Blvd to 5th St	68.7	69.4	69.6	0.9	0.2	3.0	No
Santa Ana Blvd—Main St to Bush St	63.6	64.1	64.4	0.8	0.3	5.0	No
Main St—5th St to 4th St	68.7	69.4	69.6	0.9	0.2	3.0	No
5th St—Main St to Bush St	59.5	60.1	60.5	1.0	0.4	5.0	No
Main St—3rd St to 4th St	68.2	68.9	69.2	1.0	0.3	3.0	No
Main St—1st St to 3rd St	68.2	68.9	69.2	1.0	0.3	3.0	No
Santa Ana Blvd—Bush St to Spurgeon St	63.6	64.1	64.3	0.7	0.2	5.0	No
5th St—Bush St to French St	59.4	59.9	60.3	0.9	0.4	5.0	No
1st St—Spurgeon St to Main St	73.7	74.2	74.4	0.7	0.2	3.0	No
Santa Ana Blvd—Lacy St to Standard Ave	65.3	65.8	65.8	0.3	0.0	3.0	No
Civic Center Dr—French St to Lacy St	65.6	66.5	66.8	1.2	0.3	3.0	No
Santa Ana Blvd—Lacy St to French St	65.0	65.6	66.1	1.1	0.5	3.0	No
4th St—Lacy St to French St	62.5	62.9	63.0	0.5	0.1	5.0	No
1st St—Lacy St to Spurgeon St	73.7	74.2	74.4	0.7	0.2	3.0	No
1st St—Lacy St to Standard Ave	73.7	74.2	74.4	0.7	0.2	3.0	No
Santiago St—Washington Ave to Civic Center Dr	64.7	65.4	65.9	1.2	0.5	5.0	No
Santiago St—Washington Ave to 17th St	64.6	65.2	65.6	1.0	0.4	5.0	No

Table 4.8-11 Traffic Noise Impacts for Year 2030

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2030 Without Project Traffic Volumes	Year 2030 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Santiago St—Santa Ana Blvd to Civic Center Dr	64.3	65.2	65.9	1.6	0.7	5.0	No
Civic Center Dr—Santiago St to Lacy St	65.5	66.0	66.2	0.7	0.2	3.0	No
Civic Center Dr—Lincoln Ave to Santiago St	65.4	66.0	66.0	0.6	0.0	5.0	No
Santiago St—Santa Ana Blvd to Brown St	63.1	63.5	64.7	1.6	0.2	5.0	No
Santa Ana Blvd—Santiago St to Lacy St	65.3	65.9	66.6	1.3	0.7	3.0	No
Santa Ana Blvd—Santiago St to U-24	68.0	68.7	69.0	1.0	0.3	3.0	No
4th St—Santiago St to Lacy St	64.5	64.9	65.0	0.5	0.1	5.0	No
Grand Ave—4th St to Santa Ana Blvd	72.1	72.7	72.8	0.7	0.1	3.0	No
Grand Ave—Santa Ana Blvd to 17th St	71.4	72.1	72.5	1.1	0.4	3.0	No
Santa Ana Blvd—East of Grand Ave	62.8	63.5	63.5	0.7	0.0	5.0	No
Grand Ave—1st St to 4th St	71.5	72.0	72.2	0.7	0.2	3.0	No
4th St—Grand Ave to Santiago St	64.5	65.0	65.5	1.0	0.5	5.0	No
4th St—East of Grand Ave	65.0	65.6	65.8	0.8	0.2	3.0	No
Grand Ave—South of 1st St	72.4	73.1	73.3	0.9	0.2	3.0	No
1st St—Standard Ave to Grand Ave	73.8	74.4	74.6	0.8	0.2	3.0	No
1st St—East of Grand Ave	73.5	73.9	74.1	0.6	0.2	3.0	No
Penn Way—South of I-5 SB Ramps	63.8	64.5	65.0	1.2	0.5	5.0	No
Penn Way—North of I-5 SB Ramps	66.5	66.9	67.2	0.7	0.3	3.0	No
Santa Ana Blvd—West of I-5 SB Ramps	69.7	70.1	70.8	1.1	0.7	3.0	No

Table 4.8-11 Traffic Noise Impacts for Year 2030

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2030 Without Project Traffic Volumes	Year 2030 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Santa Ana Blvd—East of I-5 SB Ramps	67.7	68.2	68.9	1.2	0.7	3.0	No
17th St—West of I-5 NB Ramps	74.4	74.8	74.8	0.4	0.0	3.0	No
17th St—East of I-5 NB Ramps	73.4	73.8	73.8	0.4	0.0	3.0	No
Grand Ave—South of I-5 NB Ramps	73.0	73.5	73.8	0.8	0.3	3.0	No
Grand Ave—North of I-5 NB Ramps	72.7	73.2	73.3	0.6	0.1	3.0	No

SOURCE: PBS&J, 2010 (calculation data and results are provided in Appendix F).

a. Significance Thresholds are set as follows:
5.0 dBA CNEL if the noise increase is below the City of Santa Ana standard of 65 dBA CNEL
3.0 dBA CNEL if the noise increase meets or exceeds the City of Santa Ana standard of 65 dBA CNEL

Similarly, Table 4.8-12 (Traffic Noise Impacts for Year 2035) compares long-term (2035) conditions with the project to existing conditions to identify the overall change in future noise levels along study area roadway segments. In addition, Table 4.8-12 also compares long-term (2035) with project conditions to long-term (2035) without project conditions to determine the project's contribution to changes in noise levels along study area roadway segments.

Table 4.8-12 Traffic Noise Impacts for Year 2035

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2035 Without Project Traffic Volumes	Year 2035 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Flower Street—Santa Ana Blvd to Civic Center Dr	67.6	68.8	68.8	1.2	0.0	3.0	No
Flower Street—17th St to Civic Center Dr	67.5	68.5	68.6	1.1	0.1	3.0	No
Civic Center Dr—West of Flower St	67.6	68.6	68.8	1.2	0.2	3.0	No
Civic Center Dr—Flower St to Ross St	67.3	68.4	68.7	1.4	0.3	3.0	No
Flower Street—Santa Ana Blvd to 1st St	67.6	69.2	69.2	1.6	0.0	3.0	No

Table 4.8-12 Traffic Noise Impacts for Year 2035

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2035 Without Project Traffic Volumes	Year 2035 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Santa Ana Blvd—West of Flower St	63.8	64.9	65.3	1.5	0.4	5.0	No
Santa Ana Blvd—Flower St to Parton St	64.7	65.7	66.1	1.4	0.4	5.0	No
Santa Ana Blvd—Parton St to Ross St	64.7	66.3	66.6	1.9	0.3	5.0	No
Civic Center Dr—Ross St to Broadway	66.8	68.0	68.3	1.5	0.3	3.0	No
Santa Ana Blvd—Ross St to Broadway	64.4	65.6	66.0	1.6	0.4	5.0	No
Broadway—Civic Center Dr to Santa Ana Blvd	67.7	68.8	68.8	1.1	0.0	3.0	No
Broadway—Civic Center Dr to Washington Ave	68.8	69.8	69.9	1.1	0.1	3.0	No
Civic Center Dr—Broadway to Sycamore St	66.7	68.0	68.3	1.6	0.3	3.0	No
Broadway—Santa Ana Blvd to 5th St	67.1	68.1	68.2	1.1	0.1	3.0	No
Santa Ana Blvd—Broadway to Sycamore St	63.6	65.0	65.2	1.6	0.2	5.0	No
Broadway—5th St to 4th St	67.0	68.1	68.3	1.3	0.2	3.0	No
5th St—Broadway to Ross St	61.0	62.0	62.3	1.3	0.3	5.0	No
5th St—Broadway to Main St	61.0	63.2	63.5	2.5	0.3	5.0	No
Broadway—3rd St to 4th St	67.0	68.1	68.3	1.3	0.2	3.0	No
Broadway—3rd St to 1st St	67.0	69.2	69.3	2.3	0.1	3.0	No
Broadway—South of 1st St	65.5	66.6	66.6	1.1	0.0	3.0	No
1st St—Broadway to Ross St	73.8	74.8	74.9	1.1	0.1	3.0	No

Table 4.8-12 Traffic Noise Impacts for Year 2035

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2035 Without Project Traffic Volumes	Year 2035 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
1st St—Main St to Broadway	73.6	74.8	74.9	1.3	0.1	3.0	No
Civic Center Dr—Sycamore St to Main St	66.7	67.7	68.1	1.4	0.4	3.0	No
Santa Ana Blvd—Sycamore St to Main St	63.6	64.7	64.9	1.3	0.2	5.0	No
5th St—Sycamore St to Broadway	61.0	62.0	62.3	1.3	0.3	5.0	No
5th St—Sycamore St to Main St	61.0	62.0	62.3	1.3	0.3	5.0	No
Main St—Civic Center Dr to Santa Ana Blvd	68.7	69.8	70.0	1.3	0.2	3.0	No
Main St—Civic Center Dr to Washington Ave	68.8	69.9	70.1	1.3	0.2	3.0	No
Civic Center Dr—Main St to Bush St	65.6	66.7	67.0	1.4	0.3	3.0	No
Main St—Santa Ana Blvd to 5th St	68.7	70.0	70.2	1.5	0.2	3.0	No
Santa Ana Blvd—Main St to Bush St	63.6	65.0	65.2	1.6	0.2	5.0	No
Main St—5th St to 4th St	68.7	70.0	70.2	1.5	0.2	3.0	No
5th St—Main St to Bush St	59.5	61.7	61.9	2.4	0.2	5.0	No
Main St—3rd St to 4th St	68.2	69.4	69.8	1.6	0.4	3.0	No
Main St—1st St to 3rd St	68.2	69.4	69.7	1.5	0.3	3.0	No
Santa Ana Blvd—Bush St to Spurgeon St	63.6	64.7	64.9	1.3	0.2	5.0	No
5th St—Bush St to French St	59.4	60.5	60.9	1.5	0.4	5.0	No
1st St—Spurgeon St to Main St	73.7	74.8	75.0	1.3	0.2	3.0	No

Table 4.8-12 Traffic Noise Impacts for Year 2035

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2035 Without Project Traffic Volumes	Year 2035 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Santa Ana Blvd—Lacy St to Standard Ave	65.3	66.5	66.5	1.2	0.0	3.0	No
Civic Center Dr—French St to Lacy St	65.6	66.9	67.2	1.6	0.3	3.0	No
Santa Ana Blvd—Lacy St to French St	65.0	66.2	66.7	1.7	0.5	3.0	No
4th St—Lacy St to French St	62.5	63.6	63.7	1.2	0.1	5.0	No
1st St—Lacy St to Spurgeon St	73.7	74.9	75.0	1.3	0.1	3.0	No
1st St—Lacy St to Standard Ave	73.7	74.9	75.0	1.3	0.1	3.0	No
Santiago St—Washington Ave to Civic Center Dr	64.7	67.7	68.1	3.4	0.4	5.0	No
Santiago St—Washington Ave to 17th St	64.6	67.1	67.4	2.8	0.3	5.0	No
Santiago St—Santa Ana Blvd to Civic Center Dr	64.3	67.9	68.3	4.0	0.4	5.0	No
Civic Center Dr—Santiago St to Lacy St	65.5	66.6	66.8	1.3	0.2	3.0	No
Civic Center Dr—Lincoln Ave to Santiago St	65.4	66.4	66.5	1.1	0.1	5.0	No
Santiago St—Santa Ana Blvd to Brown St	63.1	64.1	65.2	2.1	1.1	5.0	No
Santa Ana Blvd—Santiago St to Lacy St	65.3	67.7	68.2	2.9	0.5	3.0	No
Santa Ana Blvd—Santiago St to U-24	68.0	69.8	70.1	2.1	0.3	3.0	No
4th St—Santiago St to Lacy St	64.5	65.5	65.6	1.1	0.1	5.0	No
Grand Ave—4th St to Santa Ana Blvd	72.1	73.3	73.4	1.3	0.1	3.0	No

Table 4.8-12 Traffic Noise Impacts for Year 2035

Roadway Segment	Noise Levels in dBA CNEL at 50 feet						
	Existing Conditions	Year 2035 Without Project Traffic Volumes	Year 2035 With Project Traffic Volumes	Increase with Project over Existing Conditions	Project Contribution	Significance Threshold[a]	Exceeds Significance Threshold?
Grand Ave—Santa Ana Blvd to 17th St	71.4	73.2	73.6	2.2	0.4	3.0	No
Santa Ana Blvd—East of Grand Ave	62.8	63.9	63.9	1.1	0.0	5.0	No
Grand Ave—1st St to 4th St	71.5	72.5	72.7	1.2	0.2	3.0	No
4th St—Grand Ave to Santiago St	64.5	65.5	66.0	1.5	0.5	5.0	No
4th St—East of Grand Ave	65.0	66.1	66.2	1.2	0.1	3.0	No
Grand Ave—South of 1st St	72.4	73.7	73.9	1.5	0.2	3.0	No
1st St—Standard Ave to Grand Ave	73.8	75.1	75.2	1.4	0.1	3.0	No
1st St—East of Grand Ave	73.5	74.6	74.7	1.2	0.1	3.0	No
Penn Way—South of I-5 SB Ramps	63.8	66.7	67.0	3.2	0.3	5.0	No
Penn Way—North of I-5 SB Ramps	66.5	67.6	67.8	1.3	0.2	3.0	No
Santa Ana Blvd—West of I-5 SB Ramps	69.7	70.7	71.3	1.6	0.6	3.0	No
Santa Ana Blvd—East of I-5 SB Ramps	67.7	68.8	69.5	1.8	0.7	3.0	No
17th St—West of I-5 NB Ramps	74.4	75.4	75.4	1.0	0.0	3.0	No
17th St—East of I-5 NB Ramps	73.4	74.4	74.4	1.0	0.0	3.0	No
Grand Ave—South of I-5 NB Ramps	73.0	74.3	74.6	1.6	0.3	3.0	No
Grand Ave—North of I-5 NB Ramps	72.7	74.1	74.2	1.5	0.1	3.0	No

SOURCE: PBS&J, 2010 (calculation data and results are provided in Appendix F).

a. Significance Thresholds are set as follows:
5.0 dBA CNEL if the noise increase is below the City of Santa Ana standard of 65 dBA CNEL
3.0 dBA CNEL if the noise increase meets or exceeds the City of Santa Ana standard of 65 dBA CNEL

As stated in the Thresholds of Significance, a 3.0 dBA CNEL increase is considered substantial if the noise increase would meet or exceed the City's 65 dBA CNEL noise level standard at high density residential uses, and a 5.0 dBA CNEL increase is considered substantial where existing noise levels are below the 65 dBA CNEL standard at high density residential uses. As shown in Table 4.8-11 (Traffic Noise Impacts for Year 2030) and Table 4.8-12 (Traffic Noise Impacts for Year 2035), none of the roadways within the Transit Zoning Code (SD 84A and SD 84B) area would result in a 3.0 dBA or 5.0 dBA CNEL increase over existing conditions with implementation of the proposed project under both scenarios. Likewise, the contribution of the proposed project to this increase under both scenarios would not exceed 3.0 dBA or 5.0 dBA CNEL. Therefore, this impact would be considered ***less than significant***.

Effects Found to Be Significant

Threshold	Would the project result in the 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?

Impact 4.8-8 **Operation of the Southern California Regional Rail Authority's (SCRRA) rail line would potentially expose noise-sensitive land uses located within the Transit Zoning Code (SD 84A and SD 84B) area to noise levels that exceed the standards established by the City of Santa Ana General Plan. This is considered a *significant and unavoidable* impact.**

Under the Transit Zoning Code (SD 84A and SD 84B), additional sensitive uses (primarily residential structures) would be located in close proximity (approximately 100 feet) to the SCRRA rail line. As stated previously, typical commuter train noise produces a noise level of 80 dBA at 50 feet from the tracks, while a stopped commuter train would produce a noise level of 65 dBA. Per the Federal Railway Administration, noise levels associated with trains are anticipated to attenuate/reduce at a rate of 4.5 dBA for each doubling of distance. As such, potentially noise-sensitive uses, such as residential structures, would likely experience noise levels ranging from 60.5 to 75.5 dBA due to the physical movement and idling of commuter trains along the SCRRA rail line.

However, in addition to movement and idling noise levels, trains are required to use horns at any at-grade crossing for safety reasons. Depending on the type of horn used, noise levels could reach 110 dBA at a distance of 100 feet. Under the Transit Zoning Code (SD 84A and SD 84B), sensitive uses, both interior and exterior, could be located within areas that may experience excessive noise levels due to train horns. Interior uses would include predominantly residential structures, while exterior uses at new developments adjacent to the rail station and the SCRRA rail line may include communal open spaces, such as pocket parks or pedestrian walkways. It is expected that these uses could be located within the interior of new developments or on the opposite side of the development from the rail station and SCRRA tracks, thereby mitigating some of the noise generated by those transportation facilities. In terms of interior uses and as stated previously, under new construction practices, noise levels inside structures, such as residential buildings, can be expected to be 30 dBA less than exterior noise levels. As such, the instantaneous interior noise levels attributable to residential units located within 100 feet of the SCRRA

tracks would be reduced to approximately 80 dBA when a train horn blows. However, this noise level would remain in excess of City noise standards as established in Section 18-312 and 18-313 of the Municipal Code by approximately 15 dBA for instantaneous noise. As such, this impact would be considered potentially significant.

Implementation of the mitigation measures provided above (MM4.8-5 and MM4.8-6) will reduce potential noise levels at sensitive receptors associated with interior and exterior communal and private spaces but not to levels beneath the standards set in the City's Municipal Code. In addition to the aforementioned mitigation measures, the following mitigation measure would be implemented,

MM4.8-8 *The City shall provide a written statement to each applicant for projects located within 400 feet of the SCRRA tracks that shall be provided for each residential unit and resident, notifying them of potential noise and vibration issues associated with the railroad tracks, including the following:*

Notice of Disclosure

Each owner's [or renter's] interest is subject to the fact that trains operate at different times of the day and night on the railway tracks immediately adjacent to a project site; and that by accepting the conveyance of an interest [or lease agreement] in that project, owner [or renter] accepts all impacts generated by the trains.

Posting of Notice of Disclosure in each residential unit

Prior to offering the first residential unit for purchase, lease, or rent, the property owner or developer shall post a copy of the Notice of Disclosure in every unit in a conspicuous location. Also, a copy of the Notice of Disclosure shall be included in all materials distributed for the Project, including but not limited to: the prospectus, informational literature, and residential lease and rental agreements.

Although the above mitigation measure would reduce impacts, it would not serve to fully mitigate the potential impact to nearby residents of the Transit Zoning Code (SD 84A and SD 84B). However, it should also be noted that in accordance with the Final Rule for the Use of Locomotive Horns at Highway-Rail Grade Crossings, as established by the FRA, local jurisdictions have the ability to prevent trains from using their horns at at-grade crossings through the establishment of Quiet Zones. The establishment of a Quiet Zone involves the installation of additional design features that would limit potential vehicle and pedestrian conflicts with moving trains, including four-quadrant gates, advance warning signs, mountable curb medians with channelization devices, programmed enforcement, photo enforcement, and public education and awareness. The City of Santa Ana is currently pursuing the establishment of a Quiet Zone within the City; however, until such time, the use of a train horns would be considered to have a ***significant and unavoidable*** impact on sensitive receptors developed as part of the Transit Zoning Code (SD 84A and SD 84B).

Threshold	Would the project result in the exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Impact 4.8-9 **Construction activities associated with the proposed project could generate or expose persons or structures to excessive groundborne vibration. While implementation of mitigation measures MM4.8-1 through MM4.8-4 would minimize this impact, it would not reduce it to a less-than-significant level. This is considered a *significant and unavoidable* impact.**

Although construction-related vibration associated with individual development projects constructed pursuant to the Transit Zoning Code would be temporary there are two potential impacts that could occur. First, vibration at high enough levels can result in human annoyance. Second, groundborne vibration can potentially damage the foundations and exteriors of historic structures. Groundborne vibration that can cause this kind of damage is typically limited to impact equipment, especially pile drivers. Construction activities that would occur pursuant to the Transit Zoning Code have the potential to generate low levels of groundborne vibration. Table 4.8-13 (Vibration Source Levels for Construction Equipment) identifies various vibration velocity levels for the types of construction equipment that would operate within the City during construction.

Table 4.8-13 Vibration Source Levels for Construction Equipment

	Approximate VdB			
Equipment	*25 Feet*	*50 Feet*	*75 Feet*	*100 Feet*
Large Bulldozer	87	81	77	75
Loaded Trucks	86	80	76	74
Jackhammer	79	73	69	67
Small Bulldozer	58	52	48	46

SOURCE: Federal Railroad Administration 1998

In addition to the construction equipment shown in Table 4.8-13 (Vibration Source Levels for Construction Equipment), vibration that would be experienced from the use of impact pile drivers could reach as high as 112 VdB at a distance of 25 feet (HMMH 2006). Like noise, groundborne vibration will attenuate at a rate of approximately 6 VdB per doubling of distance. The groundborne vibration generated during construction activities would primarily impact existing sensitive uses (e.g., residences, schools, and hospitals) that are located adjacent to, or within, the vicinity of specific projects. These sensitive uses could sometimes be located as close as 25 feet to the construction site or as far as several hundred feet away. Based on the information presented in Table 4.8-13, vibration levels could reach up to 87 VdB at sensitive uses located within 25 feet of construction. For sensitive uses that are located at or within 25 feet of potential project construction sites, sensitive receptors (e.g., residents, school children, and hospital patients) at these locations may experience vibration levels during construction activities that exceed the FTA's vibration impact threshold of 85 VdB for human annoyance. So long as construction occurs more than 50 feet from sensitive receptors, the impact associated with groundborne vibration generated by the equipment would be below 85 VdB and thus would be less than significant. However, as specific site plans or constructions schedules for projects requiring impact pile drives are unknown at

this time, it may be possible that construction activities could occur as close as 25 feet from sensitive receptors. This would result in these sensitive receptors experiencing vibration impacts above the threshold of 85 VdB, in which case this impact would be potentially significant. Implementation of mitigation measures MM4.8-1 through MM4.8-4 would help to reduce this impact, but not to a less-than-significant level; therefore, this impact would remain ***significant and unavoidable***.

4.8.4 Cumulative Impacts

The geographic context for the analysis of cumulative noise impacts depends on the impact being analyzed. For construction impacts, only the immediate area around the project site would be included in the cumulative context. For operational/roadway related impacts, the context is existing and future development in the City of Santa Ana. This cumulative impact analysis considers development of the proposed project, in conjunction with ambient growth and other development within the vicinity of the proposed project in the City of Santa Ana. Noise is by definition a localized phenomenon, and significantly reduces in magnitude as distance from the source increases. The analysis accounts for all anticipated cumulative growth within this geographic area, as represented by full implementation of the City of Santa Ana General Plan Framework and development of the related projects provided in Table 3-3 in Chapter 3.0 (Project Description).

Increases in noise at sensitive uses would occur as a result of construction of individual projects pursuant to the Transit Zoning Code the proposed project, along with other construction in the vicinity. Other construction that may occur in the vicinity of the Transit Zoning Code area would contribute noise levels similar to those generated by individual development projects. Where this development adjoins a proposed project's construction, the combined construction noise levels would have a cumulative effect on nearby sensitive uses. Noise is not strictly additive, and a doubling of noise sources would not cause a doubling of noise levels; however, cumulative construction noise levels would be in excess of 65 dBA CNEL at nearby sensitive receptors.

As discussed under Impact 4.8-1, Section 18-314(e) of the City Municipal Code limits construction activities to between the hours of 7:00 A.M. and 8:00 P.M. Monday through Saturday, and also prohibits construction activities on Sundays and public holidays. Because compliance with this construction time limit is required by the City Municipal Code, the proposed project and all other cumulative development would be exempt, and the cumulative impact associated with construction noise in the Santa Ana area would be considered less than significant. Similarly, because construction-related noise generated under the proposed project would be exempt from established noise standards, the construction of the proposed project would not be cumulatively considerable and the cumulative impact of the project would also be ***less than significant***.

Other development projects within the City of Santa Ana could potentially introduce residential development into areas that currently exceed the 60 dBA CNEL standard for residential uses. However, such residential development would have to be constructed so that noise levels within exterior living spaces do not exceed the 65 dBA CNEL standard as set forth in the Noise Element of the General Plan. Since any potential new residential development within the City would be required to mitigate through site and building design, insulation and other noise preventative measures, the proposed project's impact

would not be cumulatively considerable and the cumulative impact of the project would also be ***less than significant***.

As discussed under Impact 4.8-2, all rooftop HVAC equipment would be shielded; therefore, no source would generate maximum noise levels of greater than 57 dBA L_{eq} at 50 feet. Consequently, multiple units would have to be located within 50 feet of a receptor to achieve noise levels that would exceed the City standards. The development types associated with the proposed project and other nearby projects are not so dense that multiple stationary units would be so closely spaced, either on-site or off-site. Consequently, the cumulative effect of multiple HVAC units and other mechanical equipment would be less than significant and the contribution of the project would not be cumulatively considerable. This would be a ***less than significant*** impact.

As discussed in Impact 4.8-9, the construction of individual projects pursuant to the Transit Zoning Code would produce temporary vibration impacts. However, as discussed in Impact 4.8-9, the construction vibration impact would be significant and unavoidable. Cumulative development in the City of Santa Ana is not considered likely to result in the exposure of on-site or off-site receptors to excessive groundborne vibration due to the localized nature of vibration impacts, the fact that all construction would not occur at the same time and at the same location, and the largely built-out nature of the City, which would usually preclude the use of heavy equipment such as bulldozers. Other projects listed in Table 3-3 in Chapter 3.0 (Project Description) are proposed in close enough proximity to affect the same receptors as the proposed project. Only receptors located in close proximity to each construction site would be potentially affected by each activity. Construction activities associated with these projects, which are adjacent to or within, the Transit Zoning Code (SD 84A and SD 84B) area, may overlap with construction activities for other projects for some amount of time. Sensitive uses in the immediate vicinity of the Transit Zoning Code (SD 84A and SD 84B) area may be exposed to two sources of groundborne vibration. However, for the combined vibration impact from the two projects to reach cumulatively significant levels, intense construction from both projects would have to occur simultaneously within 50 feet of any receptor. As individual development projects under the Transit Zoning Code (SD 84A and SD 84B) area may be constructed concurrently with each other or other related projects, it is possible that intense construction from two or more projects would simultaneously occur at distances of 50 feet or less from existing nearby receptors. Therefore, vibration from future development could potentially combine with construction vibration of other projects to result in a potentially significant cumulative impact. Mitigation measures MM4.8-1 through MM4.8-4 would help reduce this impact, but not to a less than significant level. Therefore, the cumulative impact of the proposed project would be ***significant and unavoidable***.

Groundborne vibration could conceivably be generated by operation of projects in the vicinity of the Transit Zoning Code (SD 84A and SD 84B) area. Since no substantial sources of groundborne vibration would be built as part of the proposed project, no vibration impacts would occur during operation of the proposed project. The same is expected to hold true for other projects in the vicinity of the Transit Zoning Code (SD 84A and SD 84B) area. Consequently, there would be no cumulative operational groundborne vibration impacts to any on-site or off-site receptor. This impact would be ***less than significant***.

The proposed project and two related projects with residential components identified in Table 3-3 in Chapter 3.0 (Project Description) are located within close proximity to the AT&SF rail line. Problems for residential uses, such as disturbance due to groundborne vibration from these sources, are usually contained to areas within about 200 feet of the vibration source (HMMH 2006). Typically, the main effect of groundborne vibration is to cause annoyances for occupants of nearby buildings. The effect of vibration at each related project site is site specific and is dependent on existing localized conditions. However, as none of the related projects are located within 100 feet of the railroad right of way, impacts associated with vibration from the tracks are expected to be less than significant. As discussed in Impact 4.8-4, the occupants of the proposed residential units within the Transit Zoning Code (SD 84A and SD 84B) area would not be exposed to potentially significant vibration levels. Therefore, this impact would be ***less than significant***.

As discussed in Impact 4.8-7, noise impacts as the result of increased traffic on local roadways was analyzed both for near-term project plan completion (2030) and long range (2035) conditions. The near-term (2030) analysis included both ambient growth and development of the related projects provided in Table 3-3 in Chapter 3.0 (Project Description). The long range (2035) analysis included data obtained from the OCTAM 3.2 travel demand forecasting model which utilizes the latest adopted demographic forecasts for the City. As a result both the near-term (2030) analysis and the long range (2035) analysis are cumulative in nature.

As discussed above, cumulative traffic would not result in substantial increases in noise along any roadway segments under either near-term (2030) or long-range (2035) conditions. Roadway noise under either scenarios with the project would not increase roadway noise levels above the 3.0 dBA CNEL significance threshold in areas where existing noise levels meet or exceed the 65 dBA CNEL standard for sensitive uses, or above the 5.0 dBA CNEL significance threshold in areas where existing noise levels are below the 65 dBA CNEL standard. Likewise, the contribution of the proposed project to this increase under both scenarios would not exceed 3.0 dBA or 5.0 dBA CNEL. As a result, the contribution of the proposed project to future roadway noise levels would not exceed the identified thresholds of significance and, therefore, would not be considered cumulatively considerable and the cumulative impact would be ***less than significant***.

The proposed project and two related projects with residential components are located within close proximity to the AT&SF rail line. Sensitive receptors, including residential uses with exterior uses such as communal areas consisting of pocket parks or pedestrian walkways and private balconies, may or may not be shielded from noise generated by railroad operations. As a result, noise levels within these areas may exceed the 65 dBA CNEL "Desirable Maximum" standard, and this would be considered a ***significant and unavoidable*** cumulative impact. Mitigation measures MM4.8-5, MM4.8-6, and MM4.8-8 would reduce noise levels at these receptors but not to a less-than-significant level.

Periodic and temporary noise levels would be generated by construction of individual projects along with other construction in the vicinity. As discussed in Impact 4.8-1, these projects by themselves would expose some receptors to noise levels in excess of acceptable City standards. Construction noise impacts are localized in nature and decrease substantially with distance. Consequently, in order to achieve a substantial cumulative increase in construction noise levels, more than one source emitting high levels of

construction noise would need to be in close proximity to a sensitive receptor. As discussed previously, related projects provided in Table 3-3 in Chapter 3.0 (Project Description) are in the vicinity of the Transit Zoning Code area. Construction activity associated with these projects may overlap with construction activity for the proposed project. Thus, the possibility exists that a substantial cumulative increase in construction noise levels could result from construction associated with the projects in the Transit Zoning Code area and related projects. The cumulative impact concerning these projects and the related projects, concurrently emitting high levels of construction noise, would likely be significant and unavoidable. As discussed previously, the City exempts construction noise from the provisions of the Municipal Code as long as construction occurs within certain hours of the day. All of the projects analyzed in the cumulative context that would construct concurrently with the individual projects within the plan area would be required to comply with the same provisions of the Municipal Code described above. Consequently, all projects analyzed in the cumulative context would fall under the Municipal Code exemption, and the cumulative impact of the proposed project would be ***less than significant***.

Operation of the projects constructed in the Transit Zoning Code area would not include special events or temporary activities which would cause an increase in ambient noise levels. Therefore, there would be no temporary or periodic noise impacts to on- or off-site receptors due to operation of the proposed project, and the cumulative impact of the proposed project would be ***less than significant***.

4.8.5 References

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