4.9 NOISE

This section describes and evaluates the potential noise impacts associated with the proposed project. This section was summarized from the *Environmental Noise Study for the Proposed City Place Sky Lofts in the City of Santa Ana* (Wieland Associates, Inc. 2007), included as Appendix G of this DEIR.

4.9.1 EXISTING SETTING RELATED TO NOISE

4.9.1.1 Background Information on Noise

The following sections briefly describe the noise descriptors that will be used throughout this section.

<u>Decibels</u>

Sound pressures can be measured in units called microPascals (μPa). However, expressing sound levels in terms of μPa would be very cumbersome as it would require a wide range of very large numbers. For this reason, sound pressure levels are described in logarithmic units of ratios of actual sound pressures to a reference pressure squared. These units are called bels. In order to provide a finer resolution, a bel is subdivided into 10 decibels, abbreviated dB.

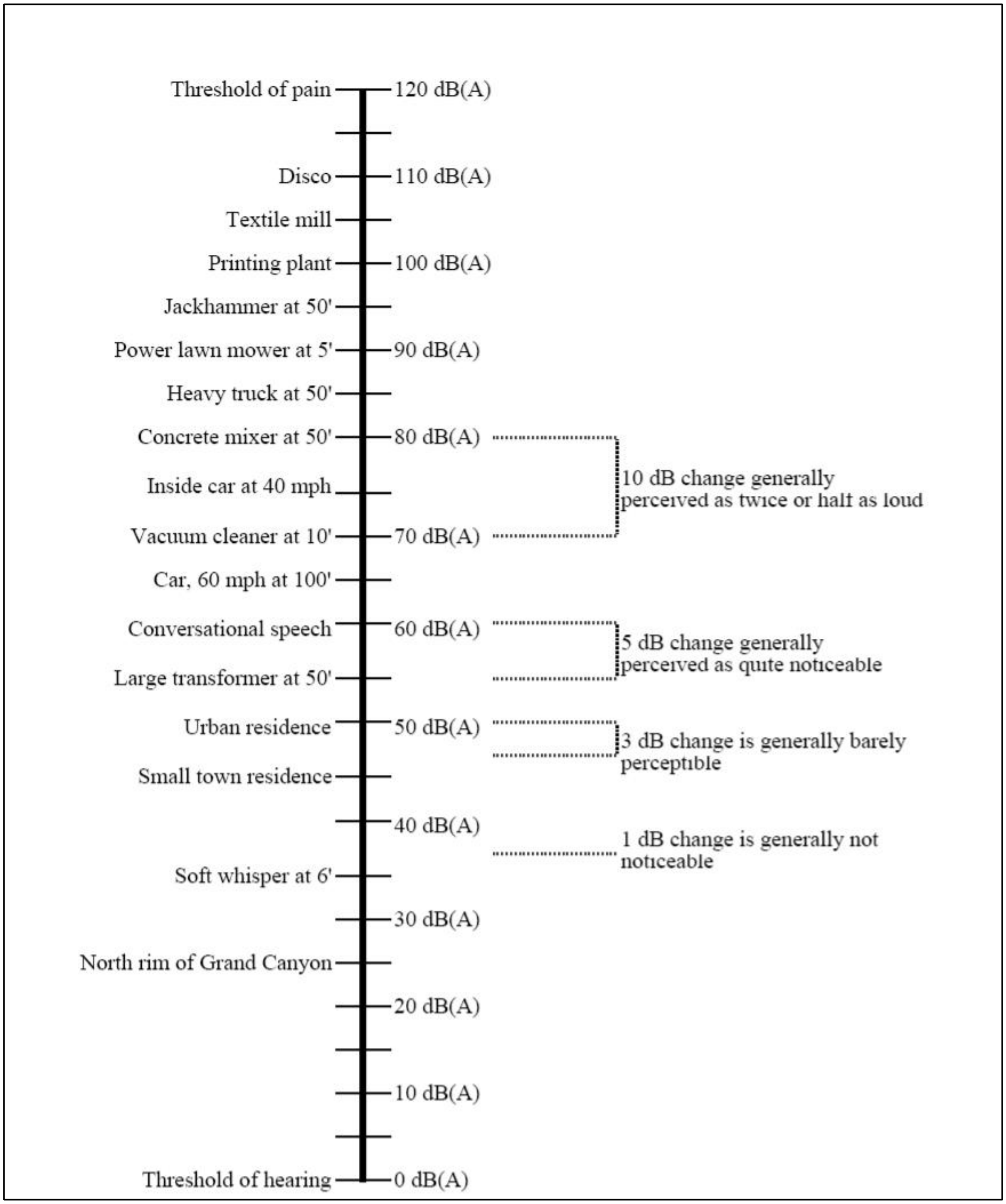
As decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces a sound pressure level of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB. In fact, they would combine to produce 73 dB. This same principle can be applied to other traffic quantities as well. In other words, doubling the traffic volume or speed of the traffic on a street will increase the traffic noise level by 3 dB. Conversely, halving the traffic volume or speed will reduce the traffic noise level by 3 dB.

<u>A-Weighting</u>

Sound pressure level alone is not a reliable indicator of loudness. The frequency or pitch of a sound also has a substantial effect on how humans will respond. While the intensity of the sound is a purely physical quantity, the loudness or human response depends on the characteristics of the human ear.

Human hearing is limited not only to the range of audible frequencies, but also in the way it perceives the sound pressure level in that range. In general, the healthy human ear is most sensitive to sounds between 1,000 Hertz (Hz) and 5,000 Hz, and is much less sensitive to both higher and lower frequency sounds. In order to approximate the frequency response of the human ear, a series of sound pressure level adjustments is usually applied to the sound measured by a sound level meter. The adjustments, or weighting network, are frequency dependent.

The A-scale approximates the frequency response of the average ear when listening to most ordinary everyday sounds. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. When a sound level is measured in decibels using the A-scale it is denoted as dB(A). A range of noise levels associated with common indoor and outdoor activities is shown in Figure 4.9-1.



Source: Wieland Associates, Inc. (2007).

Figure 4.9-1
Common Noise Sources and A-Weighted Noise Levels

The A-weighted sound level of traffic and other long-term noise-producing activities within and around a community varies considerably with time. Measurements of this varying noise level are accomplished by recording values of the A-weighted level during representative periods within a specified portion of the day.

Equivalent Sound Level (L_{eq})

Many noise sources produce levels that fluctuate over time; examples include mechanical equipment that cycles on and off, or construction work which can vary sporadically. The equivalent sound level (L_{eq}) describes the average acoustic energy content of noise for an identified period of time, commonly one hour. 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 over the duration of the exposure. For many noise sources, the L_{eq} will vary depending on the time of day – a primary example is traffic noise which rises and falls depending on the amount of traffic on a given street or freeway.

Community Noise Equivalent Level (CNEL)

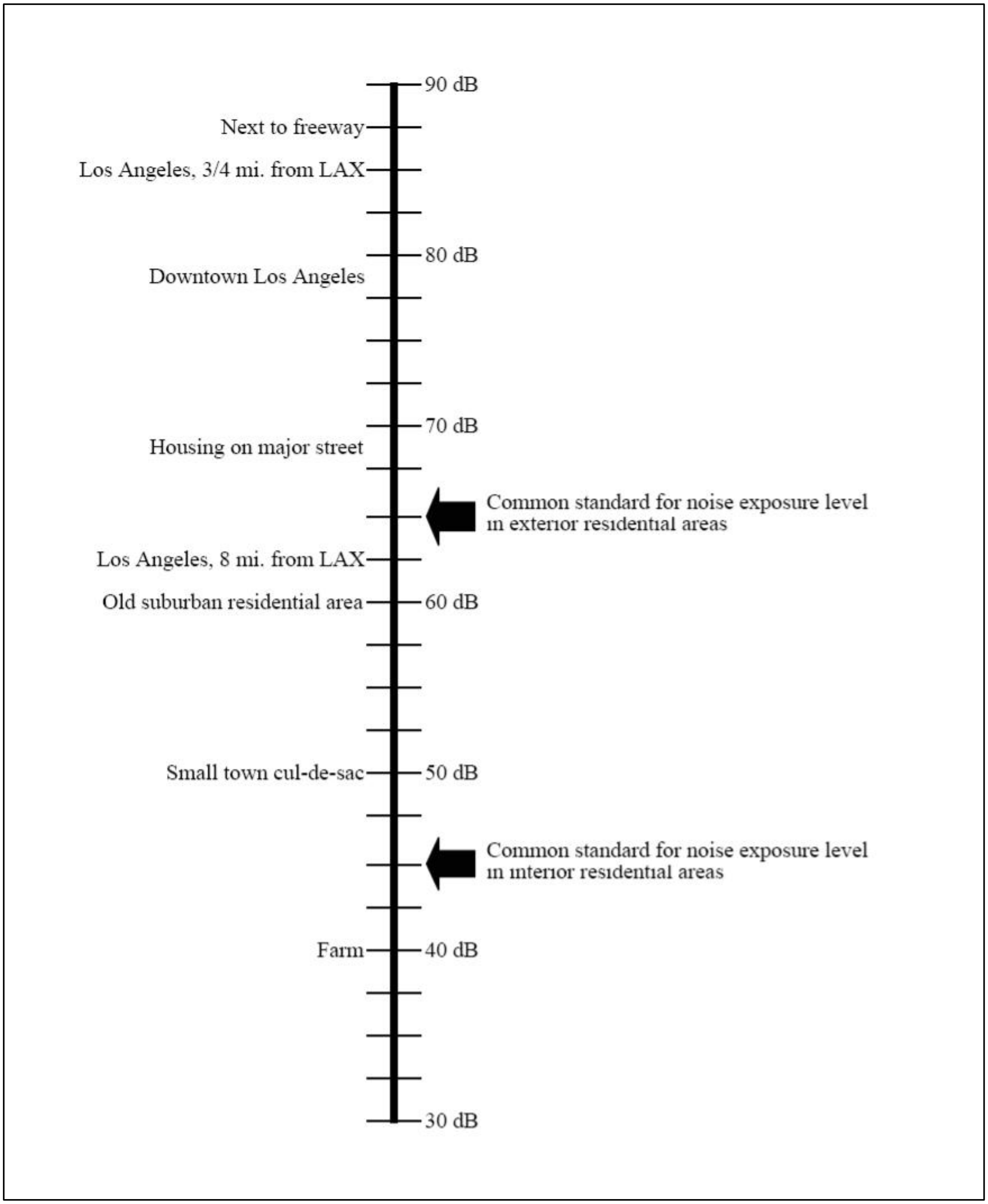
It is recognized that a given level of noise may be more or less tolerable depending on the duration of exposure experienced by an individual. There are numerous measures of noise exposure that consider not only the A-level variation of noise but also the duration of the disturbance. The State Department of Aeronautics and the California Commission on Housing and Community Development have adopted the CNEL. This measure weights the average noise levels for the evening hours (7:00 P.M. to 10:00 P.M.), increasing them by 5 dB, and weights the late evening and morning hour noise levels (10:00 P.M. to 7:00 A.M.) by 10 dB. The daytime noise levels are combined with these weighted levels and are averaged to obtain a CNEL value. Figure 4.9-2 indicates the outdoor CNEL at typical locations.

4.9.1.2 Regulatory Setting

This section describes the regulatory setting and various noise criteria that are relevant to the proposed project.

State of California Noise Insulation Standards

The Noise Insulation Standards (Title 24 of the CCR) states that the "interior CNEL attributable to exterior sources shall not exceed an annual CNEL of 45 dB in any habitable room." Additionally, the standards specify that multifamily residential buildings or structures to be located within exterior CNEL contours of 60 dB or greater of an existing or adopted freeway, expressway, parkway, major street, thoroughfare, railroad, rapid transit line, or industrial noise source shall require an acoustical analysis showing that the building has been designed to limit intruding noise to the level prescribed (interior CNEL of 45 dB). In addition, the State standards set minimum ratings for the sound and impact transmission of common wall and floor/ceiling separation assemblies between living units, or between a living unit and a common interior space.



Source: Wieland Associates, Inc. (2007).

Figure 4.9-2
Common CNEL Noise Exposure Levels at Various Locations

City of Santa Ana Municipal Code

The City of Santa Ana Municipal Code identifies noise level limits for noise intrusion from non-transportation sources onto residential properties, as shown in Table 4.9-1.

TABLE 4.9-1
CITY OF SANTA ANA MUNICIPAL CODE NON-TRANSPORTATION NOISE LEVEL LIMITS

NOISE LEVEL THAT MAY NOT BE EXCEEDED FOR MORE THAN…	DAYTIME (7 A.M. to 10 P.M.)	NIGHTTIME (10 P.M. to 7 A.M.)
30 minutes in any hour	55 dB(A)	50 dB(A)
15 minutes in any hour	60 dB(A)	55 dB(A)
5 minutes in any hour	65 dB(A)	60 dB(A)
1 minute in any hour	70 dB(A)	65 dB(A)
Anytime	75 dB(A)	70 dB(A)

Source: City of Santa Ana Municipal Code.

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 5 dB.

In the event the ambient noise level exceeds any of the first four noise limit categories in Table 4.9-1, the cumulative period applicable to the category shall be increased to reflect the ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under the category shall be increased to reflect the maximum ambient noise level.

The City of Santa Ana Municipal Code exempts noise sources associated with construction, repair, remodeling, or grading of any real property, provided these 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.

City of Santa Ana General Plan

The City of Santa Ana General Plan identifies the following exterior noise standards shown in Table 4.9-2 for various land use categories:

TABLE 4.9-2
CITY OF SANTA ANA EXTERIOR NOISE STANDARDS

Categories	Exterior[1]
Residential, Low Density	55/65 dB
Residential, Medium Density	60/65 dB
Residential, High Density	65/70 dB
Schools	60/70 dB
Commercial, Office	65/75 dB
Industrial	70/75 dB

Source: City of Santa Ana Development Code.
1. Desirable Maximum / Maximum Acceptable CNEL.

4.9.1.3 Existing Noise Environment

Traffic on the local streets is the predominant source of noise that currently affects the study area. The study area is defined as the project site plus land uses adjacent to all of the arterial segments considered in Section 4.13, Transportation and Traffic. Other noise sources include the commercial properties to the north of the project site. The following sections discuss the noise measurements and analyses that were conducted to identify the existing noise levels in the study area.

Noise Measurements

Measurements were obtained at three locations in the study area to document the existing noise environment, as shown on Figure 4.9-3. The locations are identified as follows:

1. Adjacent to Western Dental at 530 Main Street.
2. On the project site off Lawson Way.
3. Adjacent to the motel at 2222 Main Street.

Traffic Noise Exposures

The results of the noise measurements were used to calibrate a proprietary version of the highway traffic noise prediction model developed by the Federal Highway Administration (FHWA) (as described in report *FHWA-RD-77-108*). The results of the noise prediction model are summarized in Table 4.9-3.

TABLE 4.9-3
EXISTING TRAFFIC NOISE LEVELS

STREET SEGMENT	UNMITIGATED CNEL at 50 feet	DISTANCE TO CNEL CONTOUR LINE (feet) (dB)				
		60	**65**	**70**	**75**	**80**
Lawson Way						
Town & Country to Memory	59.0 dB	---	---	---	---	---
Main Street						
La Veta to Town & Country Road	71.5 dB	368	170	69	---	---
Town & Country to Memory Lane	68.5 dB	235	100	---	---	---
Memory Lane to Edgewood	68.5 dB	235	100	---	---	---
Edgewood to Santa Clara	68.0 dB	215	90	---	---	---
Santa Clara to Buffalo	69.0 dB	255	110	---	---	---
Memory Lane						
Main Street to Lawson Way	63.0 dB	90	---	---	---	---

Source: City of Santa Ana General Plan, 1998.

Commercial Activities

The noise sources associated with the commercial properties to the north of the project site include truck movements and loading dock activities, activities in the parking lots, rooftop mechanical equipment movements, and vehicle movements in the parking structure. These noise sources are very sporadic, occurring primarily during the daytime hours. It was assumed for the noise analysis that the owners of the commercial properties are operating in compliance with the City's Municipal Code standards.

4.9.2 THRESHOLDS OF SIGNIFICANCE RELATED TO NOISE

Based on Appendix G of the CEQA Guidelines, implementation of the proposed project would result in a significant adverse impact on the environment related to noise if the project would result in:

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

4.9.3 METHODOLOGY RELATED TO NOISE

In order to document the existing noise environment, measurements were obtained at three locations within the study area including the proposed project site. The ambient noise level measurements were obtained by positioning the sound level meter on the property at a height of 5 feet above the ground. The instrument was calibrated prior to obtaining the measurements. Extraneous noise sources (such as sirens) were excluded from the measurements by placing the sound level meter on "standby" until the noise event was concluded. The ambient noise measurements were obtained for a period of at least 20 minutes, by which time the measured noise levels had stabilized at constant values.

The instrumentation used to obtain the noise measurements consisted of an integrating sound level meter (Model 824) and an acoustical calibrator (Model CAL250) manufactured by Larson Davis Laboratories. The accuracy of the calibrator is maintained through a program established by the manufacturer and is traceable to the National Bureau of Standards. All instrumentation meets the requirements of the American National Standards Institute (ANSI) S1.4-1971.

A proprietary version of the highway traffic noise prediction model developed by the FHWA (as described in report *FHWA-RD-77-108*) was used to model existing traffic noise levels and to predict future year traffic noise levels. This model predicts noise levels based on traffic volumes, speeds, truck mix, site conditions, and distance from the roadway to the receptor. The California reference energy mean emission (Calveno) levels developed by Caltrans were used in the prediction model.

4.9.4 IMPACTS RELATED TO NOISE

4.9.4.1 Construction Noise Impacts

In compliance with the City of Santa Ana Municipal Code requirements, construction of the proposed project would occur only between 7:00 A.M. and 8:00 P.M. on Monday through Saturday. The Municipal Code exempts temporary construction, repair, and demolition activities from the noise level limits, providing the activity occurs between 7:00 A.M. and 8:00 P.M. on Monday through Saturday. There will be no construction activities on Sundays or legal holidays. As a result, the impact of construction noise would not be significant.

Construction noise levels on and near the project site would fluctuate depending on the particular type, number and duration of use of various pieces of construction equipment. The exposure of persons to the periodic increase in noise levels will be short-term. Table 4.9-4 shows typical noise levels associated with various types of construction-related machinery.

Groundborne vibration is measured in terms of the velocity of the vibration oscillations. As with noise, a logarithmic decibel scale (VdB) is used to quantify vibration intensity. When groundborne vibration exceeds 72 to 80 VdB, it is usually perceived as annoying to occupants of residential buildings. For commercial land uses, the threshold is 75 to 83 VdB. The degree of annoyance is dependent upon individual sensitivity to vibration and the frequency of the vibration events. Typically, vibration levels must exceed 100 VdB before building damage occurs.

The primary vibratory source during the construction of the project would be large bulldozers. Typical bulldozer activities generate an approximate vibration level of 87 VdB at a distance of 25 feet. It is possible that vibration will be perceived if bulldozers operate within about 56 to 140 feet of a residence, or within about 40 to 100 feet of a commercial building. However, the impact is not considered significant because of the short duration of the activity, and because the vibration levels would be well below the threshold of building damage.

TABLE 4.9-4
CONSTRUCTION EQUIPMENT NOISE LEVELS

EQUIPMENT TYPE	TYPICAL AVERAGE EQUIPMENT NOISE LEVEL AT 100 feet (dB(A))[1]
Air Compressor	75
Backhoe	75
Concrete Mixer	75
Concrete Pump	75
Dozer	75
Generator	75
Grader	75
Loader	75
Paver	80
Pneumatic Tools	80
Pump	75
Scraper	80
Trucks	75

Source: U. S. Environmental Protection Agency, 1971.
1. With noise controls applied. Obtainable by selecting quieter procedures or machines and implementing noise control features such as improved mufflers, use of silencers, shields, shrouds, ducts and engine enclosures.

4.9.4.2 Operational Noise Impacts

Implementation of the proposed project would result in the introduction of a number of new noise sources. These noise sources include traffic, activities in the parking structures, and mechanical equipment. Each of these sources is discussed in greater detail in the following sections. Operation of the proposed project would not generate groundborne vibration or ground-borne noise levels.

Traffic Noise Impacts

Analyses were conducted to identify the future traffic noise exposures that would occur in the study area, both with and without the proposed project. Some of the street segments in the following tables are adjacent to the project site, while most are outside the site. Table 4.9-5 provides the results of the analysis for near-term conditions (year 2010).

TABLE 4.9-5
TRAFFIC NOISE EXPOSURE LEVELS, YEAR 2010

STREET SEGMENT	AVERAGE DAILY TRAFFIC		CNEL AT 50 FEET FROM NEAR LANE CENTERLINE		CHANGE IN CNEL DUE TO PROJECT
	WITHOUT PROJECT	WITH PROJECT	WITHOUT PROJECT	WITH PROJECT	
	(vehicles)		(dB)		
Lawson Way					
Town & Country Road to Memory Lane	6,125	7,477	60.5	61.0	0.5
Main Street					
La Veta to Town & Country Road	53,719	54,280	72.5	72.5	0.0
Town & Country Road to Memory Lane	41,642	41,642	69.0	69.0	0.0
Memory Lane to Edgewood	46,512	47,136	69.5	69.5	0.0
Edgewood to Santa Clara	41,875	42,395	69.0	69.0	0.0
Santa Clara to Buffalo	46,458	46,874	69.5	69.5	0.0
Memory Lane					
Main Street to Lawson Way	9,838	10,566	64.0	64.5	0.5

Source: Wieland Associates, Inc., July 2007.

According to Table 4.9-5, it may be concluded that in the near term (by year 2010), implementation of the proposed project would result in an increase of at most 0.5 dB in the traffic-generated CNEL. This is not a substantial permanent increase in the ambient noise level. Therefore, the impact is less than significant.

According to Table 4.9-5, it may be concluded that in the near term (by year 2010), implementation of the proposed project would not result in an increase in the traffic-generated CNEL above the City of Santa Ana General Plan standards at any existing off-site receptor. Therefore, the impact is less than significant.

Table 4.9-6 provides the results of the analysis for the buildout year (2030).

According to Table 4.9-6, it may be concluded that by the year 2030, implementation of the proposed project would result in an increase of at most 0.5 dB in the traffic-generated CNEL. This is not a substantial permanent increase in the ambient noise level. Therefore, the impact is less than significant.

According to Table 4.9-6, it may be concluded that by the year 2030, implementation of the proposed project would not result in an increase in the traffic-generated CNEL above the City of Santa Ana General Plan standards at any existing off-site receptor. Therefore, the impact is less than significant.

TABLE 4.9-6
TRAFFIC NOISE EXPOSURE LEVELS, YEAR 2030

STREET SEGMENT	AVERAGE DAILY TRAFFIC		CNEL AT 50 FEET FROM NEAR LANE CENTERLINE		CHANGE IN CNEL DUE TO PROJECT
	WITHOUT PROJECT	WITH PROJECT	WITHOUT PROJECT	WITH PROJECT	
	(vehicles)		(dB)		
Lawson Way					
Town & Country to Memory	16,448	17,800	63.0	63.5	0.5
Main Street					
La Veta to Town & Country	49,338	49,900	72.0	72.5	0.5
Town & Country to Memory	52,100	52,100	70.0	70.0	0.0
Memory to Edgewood	34,576	35,200	68.5	68.5	0.0
Edgewood to Santa Clara	34,880	35,400	68.0	68.5	0.5
Santa Clara to Buffalo	33,484	33,900	68.0	68.5	0.5
Memory Lane					
Main to Lawson	11,572	12,300	64.5	65.0	0.5

Source: Wieland Associates, Inc., July 2007.

Table 4.9-7 provides the traffic noise contours for the buildout year of 2030 with the project.

TABLE 4.9-7
TRAFFIC NOISE CONTOURS, YEAR 2030 WITH PROJECT

STREET SEGMENT	UNMITIGATED CNEL AT 50 FEET	DISTANCE TO CNEL CONTOUR LINE (FEET) (dB)				
		60	65	70	75	80
Lawson Way						
Town & Country Road to Memory Lane	63.5 dB	100	---	---	---	---
Main Street						
La Veta to Town & Country Road	72.5 dB	428	200	83	---	---
Town & Country Road to Memory Lane	70.0 dB	300	130	50	---	---
Memory Lane to Edgewood	68.5 dB	235	100	---	---	---
Edgewood to Santa Clara	68.5 dB	235	100	---	---	---
Santa Clara to Buffalo	68.5 dB	235	100	---	---	---
Memory Lane						
Main Street to Lawson Way	65.0 dB	130	50	---	---	---

Source: Wieland Associates, Inc., July 2007.

As shown in Table 4.9-7, by the year 2030, the exterior CNEL is not expected to exceed the City of Santa Ana's General Plan residential standard of 65 dB at the proposed project site because the nearest exterior living area is more than 130 feet from Main Street, and more than 50 feet from Memory Lane. Standard building construction provides a noise reduction of at least 20 dB with windows and doors closed. The CNEL at the interior of the buildings is expected to be less than 45 dB. Therefore, the impact is less than significant.

4.9.4.3 Parking Noise Impacts

The predominant noise sources associated with parking structure activities include car doors slamming; cars starting; cars accelerating away from the parking stalls; car alarms being activated; brake squeal; and suspension squeal when vehicles pass over speed bumps. Ventilation fans are another noise source associated with the underground parts of parking structures.

To characterize the noise sources, measurements obtained at an existing parking structure as part of a previous study were utilized. The results of the measurements are summarized in Table 4.9-8.

TABLE 4.9-8
PARKING STRUCTURE ACTIVITY NOISE LEVELS

NOISE SOURCE	MAXIMUM NOISE LEVEL at 50 FEET FROM SOURCE
Suspension squeal	65 dB(A)
Keyless remote entry	64 dB(A)
Car door slam	57 dB(A)
Car starting	61 dB(A)
Car backing out	55 dB(A)
Car driving away	62 dB(A)
Brake squeal	59 dB(A)

Source: Wieland Associates, Inc., July 2007.

Activities at the proposed parking structure would be sporadic in nature, occurring throughout the day with the highest concentration of activities during the peak morning and afternoon periods. To estimate the average noise level that will be generated by these activities, an analysis was conducted using the measured data identified in Table 4.9-8, as well as the data provided in the traffic impact analysis report. The results of the analysis, as well as the assumptions used in the calculations, are provided in Table 4.9-9.

TABLE 4.9-9
ANALYSIS OF ESTIMATED PARKING STRUCTURE ACTIVITY NOISE LEVELS

NOISE SOURCE	MAX. LEVEL AT 50 FEET (dB(A))	ESTIMATED DURATION OF 1 EVENT (SECONDS)	ESTIMATED NO. OF EVENTS PER HOUR	ESTIMATED DURATION OF EVENTS (SECONDS)	CORRECTION FOR DURATION OF EVENTS (dB)	ESTIMATED HOURLY AVG. NOISE LEVEL AT 50 FEET (dB(A))
Suspension squeal	65	1	245	245	-12	53
Keyless remote entry	64	1	80	80	-17	47
Car door	57	0.1	245	24.5	-22	35
Car start	61	1	80	80	-17	44
Car backing out	55	5	80	400	-10	45
Car driving away	62	5	80	400	-10	52
Brake squeal	59	1	245	245	-12	47
Estimated Average Noise Level, dB(A):						**57**

Source: Wieland Associates, Inc., July 2007.

Based on an analysis of Table 4.9-9, it is estimated that parking structure activities will generate an average noise level of 57 dB(A) at a distance of 50 feet. Projecting this level to the distance of the nearest off-site residences to the south, west and east (at least 100 feet) yields an estimated noise level of 51 dB(A). The maximum noise level is estimated to be about 59 dB(A) at the same distance. These noise levels comply with the City Municipal Code standards of 55 dB(A) and 75 dB(A) for median and maximum noise levels, respectively. Therefore, the impact is less than significant at these locations.

4.9.4.4 Mechanical Equipment Noise Impacts

Mechanical equipment noise will be associated with the ventilation system for the underground portion of the parking structure, with the mechanical system for the residential tower, and with the outdoor amenities. Depending on the type of equipment and where it is located relative to the nearby properties, the unmitigated noise levels produced by the mechanical equipment may exceed the City of Santa Ana's Municipal Code standards at the adjacent off-site properties. Therefore, the impact is potentially significant at these locations.

4.9.5 MITIGATION RELATED TO NOISE

N-1 The final design of the mechanical systems will comply with the noise standards of the City of Santa Ana's Municipal Code. Compliance with these standards will be verified by an acoustical analysis conducted by a qualified acoustical consultant during the final design phase of the project. If this analysis indicates that the mechanical systems, as designed, will fail to meet the noise standards, further noise control measures shall be incorporated into the design to provide compliance. This may include such measures as: selection of quieter mechanical equipment, relocation of mechanical equipment and its associated intakes and exhausts, use of parapet walls or other acoustical shielding, and use of silencers or acoustical louvers.

4.9.6 LEVEL OF SIGNIFICANCE AFTER MITIGATION RELATED TO NOISE

Implementation of the mitigation measure N-1 listed above would reduce potential noise impacts to a level that is less than significant.