

4.4 NOISE AND VIBRATION

This section evaluates noise and vibration levels associated with implementation of the proposed projects. The noise and vibration analysis in this section assesses: existing noise and vibration conditions at the project site and its vicinity, as well as short-term construction and long-term operational noise and vibration levels associated with the proposed projects. Mitigation measures for significant impacts are recommended, when appropriate, to reduce noise and vibration levels.

REGULATORY FRAMEWORK

Noise Regulations

Los Angeles Municipal Code (LAMC). The City of Los Angeles has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise sensitive land uses. Regarding construction, Section 41.40 (Noise Due to Construction, Excavation Work – When Prohibited) of LAMC indicates that no construction or repair work shall be performed between the hours of 9:00 p.m. and 7:00 a.m., since such activities would generate loud noises and disturb persons occupying sleeping quarters in any adjacent dwelling, hotel, apartment or other place of residence. No person, other than an individual home owner engaged in the repair or construction of his/her single-family dwelling, shall perform any construction or repair work of any kind or perform such work within 500 feet of land so occupied before 8:00 a.m. or after 6:00 p.m. on any Saturday or on a federal holiday, or at any time on Sunday. Under certain conditions, the City may grant a waiver to allow limited construction activities to occur outside of the limits described above.

Section 112.05 (Maximum Noise Level of Powered Equipment or Powered Hand Tools) of the LAMC also specifies the maximum noise level of powered equipment or powered hand tools. Any powered equipment or hand tool that produces a maximum noise level exceeding 75 dBA at a distance of 50 feet is prohibited. However, this noise limitation does not apply where compliance is technically infeasible. Technically infeasible means the above noise limitation cannot be met despite the use of mufflers, shields, sound barriers and/or any other noise reduction device or techniques during the operation of equipment.


Noise Element of the General Plan. The City has developed a Noise Element of the General Plan to guide in the development of noise regulations.¹ It addresses noise mitigation regulations, strategies and programs and delineates federal, State and city jurisdiction relative to rail, automotive, aircraft and nuisance noise. Programs included in the Noise Element that are relevant to the proposed projects include:


- Continue to encourage the California Department of Transportation, the Los Angeles County Metropolitan Transportation Authority, or their successors, and other responsible agencies, to plan and construct transportation systems so as to reduce potential noise impacts on adjacent land uses, consistent with the standards and guidelines contained in the noise element.
- Continue to enforce, as applicable, federal, State, and city regulations intended to abate or eliminate disturbances of the peace and other intrusive noise.


¹City of Los Angeles, *Noise Element of the Los Angeles City General Plan*, February 3, 1999.


City of Los Angeles CEQA Thresholds Guide. The City of Los Angeles has published CEQA significance thresholds to be used in noise analyses.² The City of Los Angeles CEQA Thresholds Guide includes a community noise exposure table that addressed land use consistency (**Table 4.4-1**). Specific significance thresholds are discussed below and include thresholds for construction and operational noise levels.

TABLE 4.4-1: GUIDELINES FOR NOISE COMPATIBLE LAND USE						
Land Use Category	Community Noise Exposure (dBA, CNEL)					
	55	60	65	70	75	80
Residential - Low Density Single-Family, Duplex, Mobile Homes	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential - Multi-Family	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Transient Lodging - Motels Hotels	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Schools, Libraries, Churches, Hospitals, Nursing Homes	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Auditoriums, Concert Halls, Amphitheaters	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Sports Arena, Outdoor Spectator Sports	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Playgrounds, Neighborhood Parks	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Golf Courses, Riding Stables, Water Recreation, Cemeteries	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Office Buildings, Business Commercial and Professional	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Industrial, Manufacturing, Utilities, Agriculture	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable

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

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

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

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

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

²City of Los Angeles, *City of Los Angeles CEQA Thresholds Guide*, 2006.

Vibration Characteristics and Effects

Characteristics of Vibration. Vibration is an oscillatory motion through a solid medium in which the motion’s amplitude can be described in terms of displacement, velocity, or acceleration. Vibration can be a serious concern, causing buildings to shake and rumbling sounds to be heard. In contrast to noise, vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of vibration are trains, buses on rough roads, and construction activities, such as blasting, pile driving, and heavy earth-moving equipment.

Vibration Definitions. There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is most frequently used to describe vibration impacts to buildings and is usually measured in inches per second. The PPV is defined as the maximum instantaneous peak of the vibration signal. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (Vdb) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration.³

Effects of Vibration. High levels of vibration may cause physical personal injury or damage to buildings. In addition, ground-borne vibration levels rarely affect human health. Instead, most people consider ground-borne vibration to be an annoyance that can affect concentration or disturb sleep. High levels of ground-borne vibration can damage fragile buildings or interfere with equipment that is highly sensitive to ground-borne vibration (e.g., electron microscopes).

Existing Noise and Vibration Levels

Noise Levels. The LAMC, Section 111.03 (Minimum Ambient Noise Level) has set forth the presumed ambient noise levels for various land uses (Table 4.4-2). The daytime and nighttime ambient noise levels for residential areas are presumed to be 50 and 40 dBA, respectively. However, urban areas typically experience ambient noise levels higher than the conservative levels presented in the table.

TABLE 4.4-2: PRESUMED EXISTING AMBIENT NOISE LEVEL			
Zone		dBA	
		Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Residential	A1, A2, RA, RE, RS, RD, RW1, RW2, R1, R2, R3, R4, and R5	50	40
Commercial	P, PB, CR, C1, C1.5, C2, C4, C5, and CM	60	55
Manufacturing	M1, MR1, and MR2	60	55
Heavy Manufacturing	M2 and M3	65	65

SOURCE: LAMC, Section 111.03.

Vibration Levels. The vibration environment is dominated by vehicular movement. Heavy trucks can generate vibrations that vary depending on vehicle type, weight, and pavement conditions. As trucks typically operate on major streets, existing vibration in the project area is largely related to truck traffic on the surrounding roadway network.

³City of Los Angeles, *City of Los Angeles CEQA Thresholds Guide*, 2006.

Sensitive Receptors

Some land uses are considered more sensitive to changes in noise and vibration levels than others, depending on the population groups and the activities involved. Noise- and vibration-sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise- and vibration-sensitive and may warrant unique measures for protection from intruding noise.

The study area for the First Year of the Five Year Implementation Strategy project consists of approximately 40 miles bicycle network in the communities of Hollywood, Westside, Central Los Angeles, and Northeast Los Angeles. The study area for the My Fig Project consists of approximately 3.5 miles along Figueroa Street. These urbanized areas include all of noise- and vibration-sensitive land uses discussed above.

EXISTING SETTING

Noise Characteristics and Effects

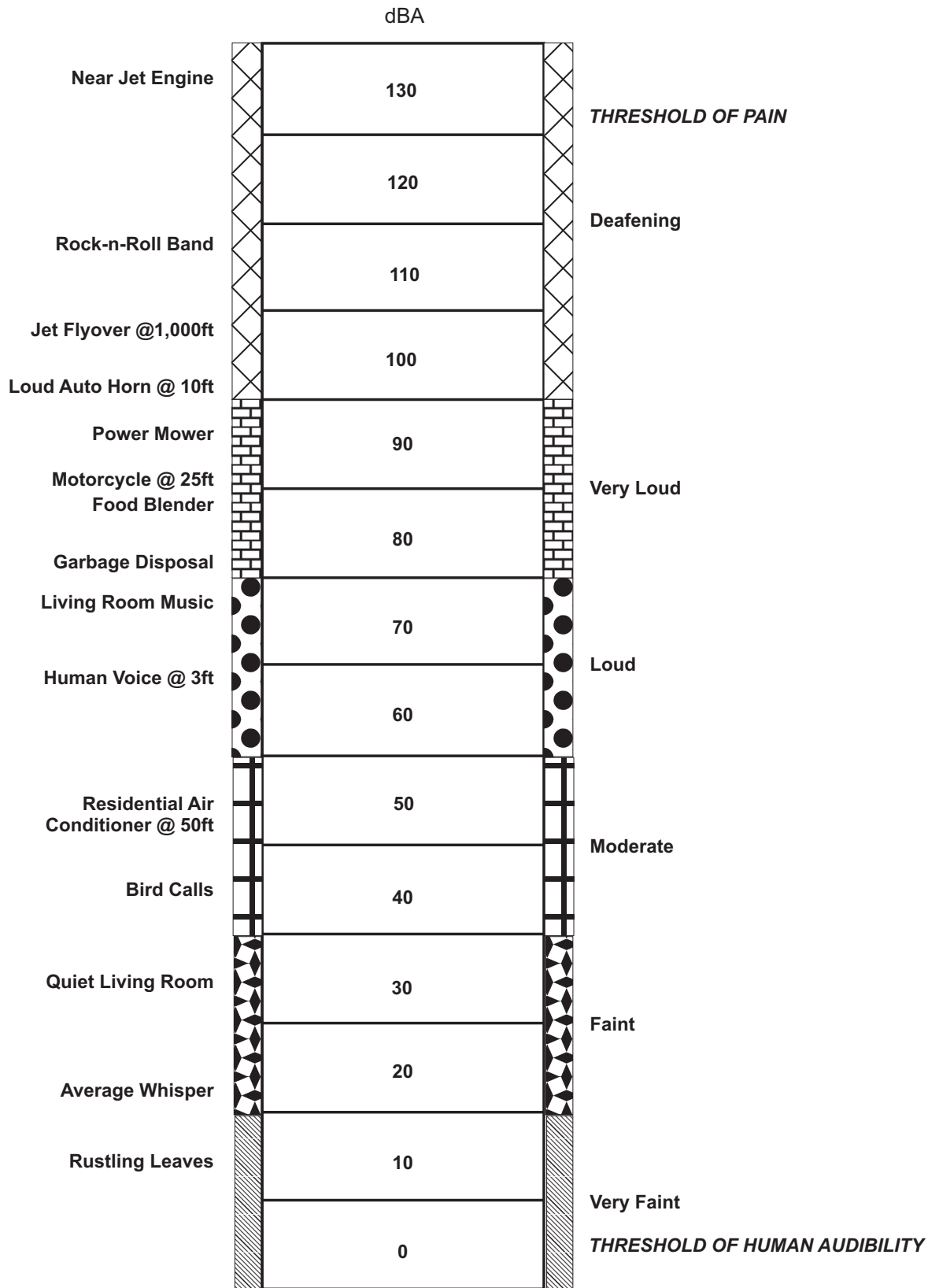
Characteristics of Sound. Sound is technically described in terms of the loudness (amplitude) and frequency (pitch) of the sound. The standard unit of measurement for sound is the decibel (dB). The human ear is not equally sensitive to sound at all frequencies. The “A-weighted scale,” abbreviated dBA, reflects the normal hearing sensitivity range of the human ear. On this scale, the range of human hearing extends from approximately 3 to 140 dBA. **Figure 4.4-1** provides examples of A-weighted noise levels from common sounds.

Noise Definitions. This noise analysis discusses sound levels in terms of Community Noise Equivalent Level (CNEL) and Equivalent Noise Level (L_{eq}).

Community Noise Equivalent Level. CNEL is an average sound level during a 24-hour period. CNEL is a noise measurement scale, which accounts for noise source, distance, single event duration, single event occurrence, frequency, and time of day. Human reaction to sound between 7:00 p.m. and 10:00 p.m. is as if the sound were actually 5 dBA higher than if it occurred from 7:00 a.m. to 7:00 p.m. From 10:00 p.m. to 7:00 a.m., humans perceive sound as if it were 10 dBA higher due to the lower background level. Hence, the CNEL is obtained by adding an additional 5 dBA to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and 10 dBA to sound levels in the night from 10:00 p.m. to 7:00 a.m. Because CNEL accounts for human sensitivity to sound, the CNEL 24-hour figure is always a higher number than the actual 24-hour average.

Equivalent Noise Level. L_{eq} is the average noise level on an energy basis for any specific time period. The L_{eq} for one hour is the energy average noise level during the hour. The average noise level is based on the energy content (acoustic energy) of the sound. L_{eq} can be thought of as the level of a continuous noise which has the same energy content as the fluctuating noise level. The equivalent noise level is expressed in units of dBA.

Effects of Noise. Noise is generally defined as unwanted sound. The degree to which noise can impact the human environment range from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects). Human response to noise is subjective and can vary greatly from person to person. Factors that influence individual response include the intensity, frequency, and pattern of noise, the amount of background noise present before the intruding noise, and the nature of work or human activity that is exposed to the noise source.



SOURCE: Cowan, James P., *Handbook of Environmental Acoustics*



FIGURE 4.4-1

A-WEIGHTED DECIBEL SCALE

Audible Noise Changes. Studies have shown that the smallest perceptible change in sound level for a person with normal hearing sensitivity is approximately 3 dBA. A change of at least 5 dBA would be noticeable and would likely evoke a community reaction. A 10-dBA increase is subjectively heard as a doubling in loudness and would cause a community response.

Noise levels decrease as the distance from the noise source to the receiver increases. Noise generated by a stationary noise source, or “point source,” will decrease by approximately 6 dBA over hard surfaces (e.g., reflective surfaces such as parking lots or smooth bodies of water) and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance. For example, if a noise source produces a noise level of 89 dBA at a reference distance of 50 feet, then the noise level would be 83 dBA at a distance of 100 feet from the noise source, 77 dBA at a distance of 200 feet, and so on. Noise generated by a mobile source will decrease by approximately 3 dBA over hard surfaces and 4.8 dBA over soft surfaces for each doubling of the distance.

Generally, noise is most audible when traveling by direct line-of-sight.⁴ Barriers, such as walls, berms, or buildings, that break the line-of-sight between the source and the receiver greatly reduce noise levels from the source since sound can only reach the receiver by bending over the top of the barrier. Sound barriers can reduce sound levels by up to 20 dBA. However, if a barrier is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

THRESHOLDS OF SIGNIFICANCE

In accordance with Appendix G of the State CEQA Guidelines, the proposed projects would have a significant impact related to noise if it would:

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

Noise

Construction. The proposed projects would have a significant impact related to construction activity if:

- Construction activities lasting more than one day would exceed existing ambient noise levels by 10 dBA or more at a noise sensitive use;
- Construction activities lasting more than ten days in a three-month period would exceed existing ambient noise levels by 5 dBA or more at a noise sensitive use; and/or
- Construction activities would exceed the ambient noise level by 5 dBA at a noise sensitive use between the hours of 9:00 p.m. and 7:00 a.m. Monday through Friday, before 8:00 a.m. or after 6:00 p.m. on Saturday, or anytime on Sunday.

⁴Line-of-sight is an unobstructed visual path between the noise source and the noise receptor.

Operational. The proposed projects would have a significant impact related to operational activity if:

- Ambient noise level measured at the property line of the affected uses increase by 3 decibels CNEL to or within the “normally unacceptable” or “clearly unacceptable” categories, as shown in **Table 4.4-1**, or any 5 dBA or more increase in noise level.

Vibration

There are no adopted City standards for vibration. Based on Federal Transit Administration (FTA) guidelines, the proposed projects would have a significant impact related to vibration if:

- Vibration levels would exceed the damage criteria listed in **Table 4.4-3**.

TABLE 4.4-3: VIBRATION DAMAGE CRITERIA	
Building Category	PPV (Inches Per Second)
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12
SOURCE: FTA, <i>Transit Noise and Vibration Impact Assessment</i> , May 2006.	

IMPACTS

Construction

Proposed installation of the bicycle lanes is anticipated to begin in 2013 and would take less than 12 months to complete. Minor construction including excavation and construction of streetscape improvements anticipated in connection with the My Fig Project is expected to also be completed within approximately 20 months. While the total construction time would extend for this duration, the project is comprised of approximately 39.5 miles and construction in front of any one business or residence would only require a few days to a few weeks for the My Fig Project.

Noise. Construction of the proposed projects would result in temporary increases in ambient noise levels on an intermittent basis. The increase in noise would occur during the approximate 12-month construction schedule. Noise levels would fluctuate depending on the construction phase, equipment type and duration of use, distance between the noise source and receptor, and presence or absence of noise attenuation barriers.

Construction activity would mainly include reconfiguration of roadway striping and would not include excavation or construction. The My Fig Project would include minor excavation and construction of streetscape improvements. The operation of heavy-duty construction equipment is not anticipated during construction activity other than occasional trucks for asphalt, if necessary. Typical noise levels are listed in **Table 4.4-4** for noise levels at distances of 50 and 100 feet from the construction noise source.

TABLE 4.4-4: MAXIMUM NOISE LEVELS OF COMMON CONSTRUCTION MACHINES			
Noise Source	Noise Level (dBA)		
	50 Feet /a/	100 Feet /a/	400 Feet /a/
Trucks	89	83	71
Roller	74	68	56

/a/ Assumes a 6-dBA drop-off rate for noise generated by a "point source" and traveling over hard surfaces. Actual measured noise levels of the equipment listed in this table were taken at distances of 10 and 30 feet from the noise source.
SOURCE: USEPA, *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*, PB 206717, 1971.

It is anticipated that pavement markings would be performed in segments and moved along the length of the bike plan at a given period to minimize long-term disruption at adjacent commercial and residential areas. Although striping activities could result in infrequent periods of high noise, this noise would not be sustained and would occur only during the temporary construction period. No pile driving or other construction activity that would generate very high noise would occur. The proposed projects construction would comply with Section 41.40 of the LAMC, which regulates the hours of construction activities. Construction activities would be restricted to the hours of 7:00 a.m. to 9:00 p.m. In addition, construction activities within 500 feet of residential areas would not occur before 8:00 a.m. or after 6:00 p.m., unless otherwise approved by the City. Therefore, the proposed projects would result in a less-than-significant impact related to construction noise.

Vibration. Table 4.4-5 shows construction equipment vibration levels based on various reference distances. Construction vibration is a localized event and is typically only perceptible to a receptor that is in close proximity to the vibration source. As shown in Table 4.4-5, construction vibration levels would not exceed the FTA criteria of 0.2 inches per second for a non-engineered timber and masonry buildings (typical of residential buildings and institutional buildings). Therefore, the proposed projects would not result in a significant impact related to construction vibration.

TABLE 4.4-5: VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT				
Equipment	PPV at 25 feet (Inches/Second) /a/	PPV at 50 feet (Inches/Second) /a/	PPV at 100 feet (Inches/Second) /a/	PPV at 400 feet (Inches/Second) /a/
Small Bulldozer	0.003	0.0001	0.0004	0.00005

/a/ Non-engineered timber and masonry buildings can be exposed to ground-borne vibration levels of 0.2 inches per second without experiencing structural damage.
SOURCE: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, May 2006.

Operation

Mobile Noise. By converting automobile users to bicycle uses, the proposed projects would result in decreased noise levels due to automobile volume reduction. Hence, the adjacent land uses would benefit from the proposed projects. Moreover, by incorporating the proposed bicycle lanes within the local roadway networks, the proposed projects would reduce horn and braking noises associated with bicycle and motor vehicle conflicts.

Reconfiguration of roadway striping would include the loss of one or more vehicular travel lanes. In addition to, and in some cases, as an alternative to the loss of vehicular travel lanes, loss of existing parking lanes could occur (as described in Section 3 Project Description). For instance, existing westbound vehicular travel lanes would be reduced along six blocks of 11th Street in Downtown Los Angeles (currently a one-way westbound street), from Broadway to Figueroa Street, from two lanes to one lane. As a result, some

segments would experience longer peak period due to traffic delay. Traffic delay would lead to lower vehicle speeds and would not result in a distinguishable increase in ambient noise levels. For example, an automobile vehicle traveling at a speed of 35 miles per hour would generate approximately 64 dBA, whereas, an automobile traveling at a slower speed of 25 miles per hour would generate approximately 59 dBA. The 10 miles per hour speed difference would result in a 5-dBA reduction. Therefore, the proposed projects would result in a less-than-significant impact related to mobile noise.

Moreover, the removal of one or more vehicular travel lanes has the potential to change the existing noise environment by shifting the location of traffic on the roadway to adjacent parallel routes. For instance, vehicles travelling along 7th Street of South Figueroa Street could potentially be redistributed throughout multiple streets in the downtown area. A doubling of traffic volumes would be required to increase noise levels by an audible 3dBA.⁵ Traffic diversion is not anticipated to result in a doubling of traffic volumes at adjacent parallel routes. Therefore, the proposed projects would result in a less-than-significant impact related to mobile noise due to traffic diversion.

Vibration. The proposed projects would not include stationary sources of vibration, such as heavy equipment operations. Operational vibration in the project vicinity would be generated by vehicular travel on the local roadways. However, project-related traffic vibration levels would not be perceptible by sensitive receptors. Therefore, the proposed projects would result in a less-than-significant impact related to vibration.

MITIGATION MEASURES

Construction

Construction impacts related to noise and vibration would be less than significant. No mitigation measures are required.

Operation

Operational impacts related to noise and vibration would be less than significant. No mitigation measures are required.

SIGNIFICANCE OF IMPACTS AFTER MITIGATION

Construction

Construction impacts related to noise and vibration were determined to be less than significant without mitigation.

Operation

Operational impacts related to noise and vibration were determined to be less than significant without mitigation.

⁵California Department of Transportation, *Technical Noise Supplement*, October 1998.

CUMULATIVE IMPACTS

Construction

The proposed bicycle lanes are located within the City of Los Angeles. It is likely that other project construction could occur concurrently within the project area. Concurrent construction activities from nearby related projects would generate noise at each site and cumulative construction noise may exceed ambient noise and vibration levels at the nearest noise-sensitive land uses between the proposed projects and the related project sites. However, similar to the proposed projects, construction-related noise and vibration levels from the related projects would be intermittent, temporary, and would comply with the time restrictions and other relevant provisions in the LAMC. Therefore, the proposed projects would not contribute to a cumulatively considerable impact related to construction.

Operation

The proposed projects and other related development in the surrounding area would generate operational noise and vibration (i.e., off-site mobile sources) that would contribute to cumulative operational noise and vibration. Since noise and vibration from the proposed projects' off-site mobile sources would be less than significant at adjacent sensitive land uses, off-site mobile sources noise and vibration impacts attributable to cumulative development of related projects and the proposed projects would not result in an adverse impact. Therefore, the proposed projects would not contribute to a cumulatively considerable impact related to operation.