Sunburst Avenue Bike Trail Project

Noise Impact Assessment

San Bernardino County, California

Prepared For:

COUNTY OF SAN NERNARDINO
DEPARTMENT OF PUBLIC WORKS
825 E. THIRD STREET
SAN BERNARDINO, CA 92415

June 2019

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1.0 INTRODUCTION

This report documents the results of a Noise Impact Assessment completed for the proposed Sunburst Avenue Bike Trail Project (Project). This includes the design and rehabilitation of an existing Class I bike path along with the design and construction of two new Class II bike lanes spanning two miles, from the intersection of Sunburst Avenue and State Route 62, in the unincorporated community of Joshua Tree, San Bernardino County (County). This report was prepared as a comparison of predicted Project noise levels to noise standards promulgated by the County of San Bernardino Development Code and the County's General Plan Noise Element. The purpose of this report is to estimate Project-generated noise and to determine the level of impact the Project would have on the environment.

1.1 Project Description and Location

The Project Site is located in the unincorporated community of Joshua Tree, located in southern San Bernardino County. The County proposes rehabilitation and construction of approximately 2 miles of bike lanes and paths spanning Sunburst Avenue from the intersection of Calle Los Amigos to State Route 62 (SR 62) for the purpose of accommodating an identified need for a non-vehicle trail to serve local residents in the community. Specifically, the Proposed Project would include the rehabilitation of the existing Class I bike path located along the east side of Sunburst Avenue from SR 62 north to Oleander Avenue, construction a new Class II bike lane on the east side of Sunburst Avenue from Oleander Avenue north to Calle Los Amigos, and constructing a new Class II bike lane on the west side of Sunburst Avenue from SR 62 north to Calle Los Amigos. The rehabilitation of the existing Class I bike path on the east side of Sunburst Avenue would include a 6.5-foot shoulder between Sunburst Avenue and the bike path, an 8-foot paved concrete bike path, and a two-foot shoulder along the eastern edge of the bike path. The new Class II bike lanes would be approximately four to five feet wide with two-foot shoulders on each side.

In general, construction activities associated with development of the trail would include excavation and grading; installation of signage; and painting of pavement striping and pavement markings.

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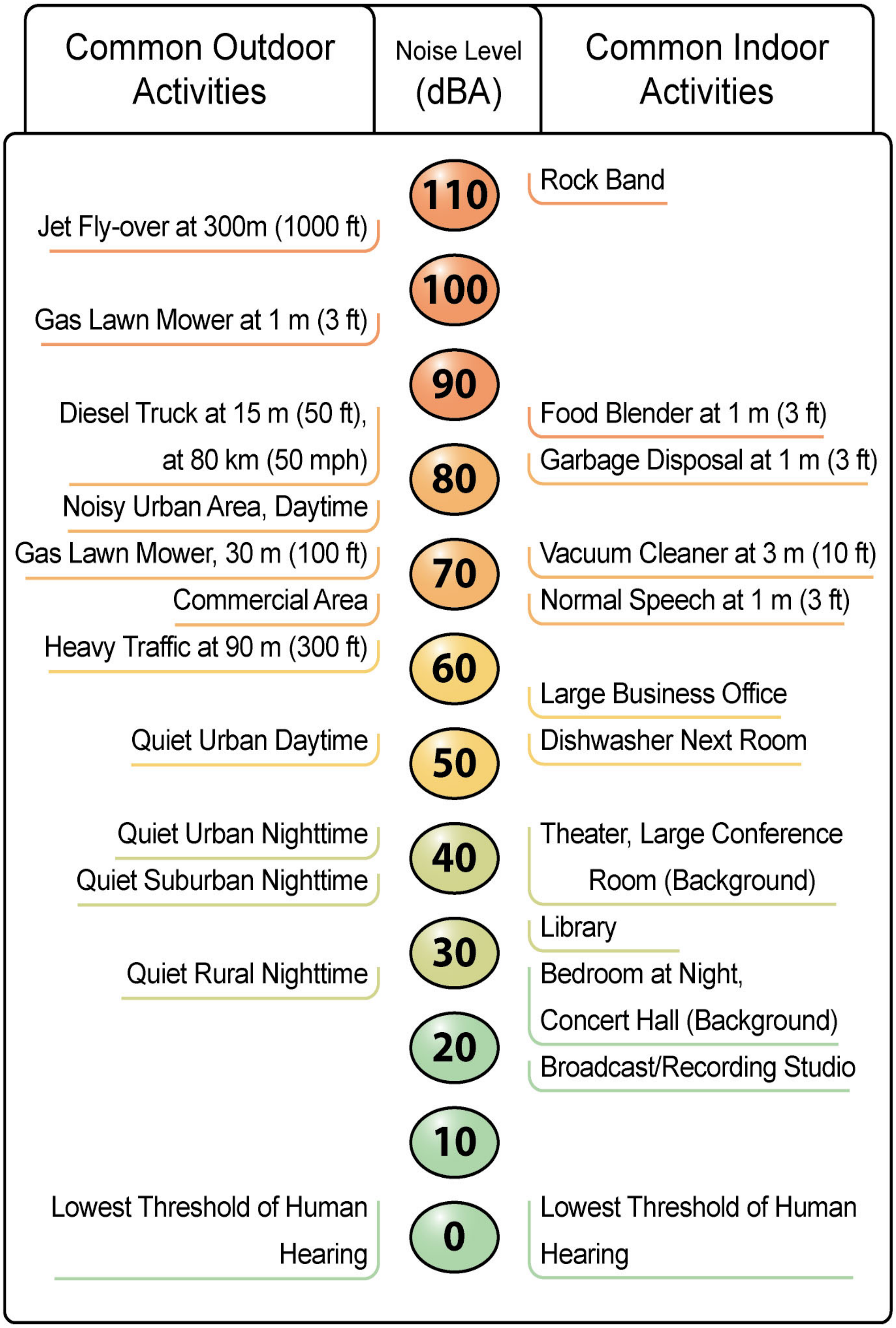
2.0 NOISE BACKGROUND

2.1 Fundamentals of Sound and Environmental Noise

Addition of Decibels

The decibel (dB) scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted (dBA), an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound. When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions (FTA 2018). For example, a 65-dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Under the decibel scale, three sources of equal loudness together would produce an increase of 5 dB.

Typical noise levels associated with common noise sources are depicted in **Figure 1**.



Source: Caltrans 2012

FIGURE 1. COMMON NOISE LEVELS

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Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources, such as automobiles, trucks and airplanes, and stationary sources, such as construction sites, machinery, and industrial operations. Sound spreads (propagates) uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a stationary or point source. Sound from a line source, such as a highway, propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics (FHWA 2011). No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. For line sources, an overall attenuation rate of 3 dB per doubling of distance is assumed (FHWA 2011).

Noise levels may also be reduced by intervening structures; generally, a single row of detached buildings between the receptor and the noise source reduces the noise level by about 5 dBA (FHWA 2006), while a solid wall or berm generally reduces noise levels by 10 to 20 dBA (FHWA 2011). However, noise barriers or enclosures specifically designed to reduce site-specific construction noise can provide a sound reduction 35 dBA or greater (WEAL 2000). To achieve the most potent noise-reducing effect, a noise enclosure/barrier must physically fit in the available space, must completely break the "line of sight" between the noise source and the receptors, must be free of degrading holes or gaps, and must not be flanked by nearby reflective surfaces. Noise barriers must be sizable enough to cover the entire noise source, and extend length-wise and vertically as far as feasibly possible to be most effective. The limiting factor for a noise barrier is not the component of noise transmitted through the material, but rather the amount of noise flanking around and over the barrier. In general, barriers contribute to decreasing noise levels only when the structure breaks the "line of sight" between the source and the receiver.

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.

Noise Descriptors

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. 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 on people is largely dependent on 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 (Community Noise Equivalent Level) are measures of community noise. Each is applicable to this analysis and defined as follows:

- **L_{eq} (Equivalent 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} (Day-Night Average**) 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 (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.

The A weighted decibel sound level scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends on the distance between the receptor and the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels.

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 with noise levels as low as 20 dBA and quiet, suburban, residential streets with 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 noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in A-weighted noise levels (dBA), the following relationships should be noted in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in level of at least 5-dBA is required before any noticeable change in community response would be expected. An increase of 5 dBA is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Effects of Noise on People

Hearing Loss

While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise.

The Occupational Safety and Health Administration (OSHA) has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over 8 hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. For ground vehicles, a noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance.

2.2 Fundamentals of Environmental Groundborne Vibration

Sources of earthborne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g., factory machinery) or transient (e.g., explosions).

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

Table 1 displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Ground vibration can be a concern in instances where buildings shake and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible. Common sources for groundborne vibration are planes, trains, and construction activities such as earth-moving which requires the use of heavy-duty earth moving equipment.

Table 1. Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibration Levels

Peak Particle Velocity (inches/second)	Approximate Vibration Velocity Level (VdB)	Human Reaction	Effect on Buildings
0.006–0.019	64–74	Range of threshold of perception	Vibrations unlikely to cause damage of any type
0.08	87	Vibrations readily perceptible	Recommended upper level to which ruins and ancient monuments should be subjected
0.1	92	Level at which continuous vibrations may begin to annoy people, particularly those involved in vibration sensitive activities	Virtually no risk of architectural damage to normal buildings
0.2	94	Vibrations may begin to annoy people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings
0.4–0.6	98–104	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Architectural damage and possibly minor structural damage

Source: Caltrans 2004

2.3 Existing Environmental Noise Setting

Noise Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses.

The Project site traverses numerous noise-sensitive land uses including multiple single-family residences and Joshua Tree Elementary School. The nearest noise-sensitive receptor to the Project site is a single-family residence located 25 feet to the west near the intersection of Sunburst Avenue and Commercial Street. However, there are numerous other residences existing directly adjacent to the Project site.

Existing Ambient Noise Environment

The noise environment in the Proposed Project area is impacted by various noise sources. Mobile sources of noise, especially cars and trucks traveling on Sunburst Avenue and SR 62, are the most common and significant sources of noise in Project area. Other sources of noise are typical activities associated with residential neighborhoods (barking dogs, lawnmowers, neighborhood automobile movements). The nearest active airport to the Project site is the Twentynine Palms Strategic Expeditionary Landing Field located approximately 12.5 miles northeast of the Project site.

3.0 REGULATORY FRAMEWORK

Federal

Occupational Safety and Health Act of 1970

The Federal Occupational Safety and Health Administration (OSHA) regulates on-site noise levels and protects workers from occupational noise exposure. To protect hearing, worker noise exposure is limited to 90 decibels with A-weighting (dBA) over an 8-hour work shift (29 Code of Regulations [CFR] 1910.95). Employers are required to develop a hearing conservation program when employees are exposed to noise levels exceeding 85 dBA. These programs include provision of hearing protection devices and testing employees for hearing loss on a periodic basis.

State

State of California General Plan Guidelines

The State of California regulates vehicular and freeway noise affecting classrooms, sets standards for sound transmission and occupational noise control, and identifies noise insulation standards and airport noise/land-use compatibility criteria. The State of California General Plan Guidelines (State of California

2003), published by the Governor's Office of Planning and Research (OPR), also provides guidance for the acceptability of projects within specific CNEL/L_{dn} contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

State Office of Planning and Research Noise Element Guidelines

The State Office of Planning and Research Noise Element Guidelines include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The Noise Element Guidelines contain a land use compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL. **Table 2** presents guidelines for determining acceptable and unacceptable community noise exposure limits for various land use categories. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Table 2. Land Use Compatibility for Community Noise Environments				
Land Use Category	**Community Noise Exposure (CNEL)**			
	Normally Acceptable	**Conditionally Acceptable**	**Normally Unacceptable**	**Clearly Unacceptable**
Residential – Low Density, Single-Family, Duplex, Mobile Homes	50 – 60	55 – 65	65 – 75	75 – 85
Residential – Multiple Unit, Mixed Use	50 – 65	60 – 70	70 – 75	75 – 85
Lodging – Hotels	50 – 65	60 – 70	70 – 80	80 – 85
Schools, Libraries, Community Centers, Religious Institutions, Hospitals, Nursing Homes	50 – 70	60 – 70	70 – 80	80 – 85
Auditoriums, Concert Halls, Amphitheaters	NA	50 – 70	65 – 85	NA
Sports Arenas, Outdoor Spectator Sports	NA	50 – 75	70 – 85	NA
Playgrounds, Neighborhood Parks	50 – 70	NA	67.5 –75	72.5 – 85
Outdoor Recreation (Commercial and Public)	50 – 75	NA	70 – 80	80 – 85
Office, Retail, and Commercial	50 – 70	67.5 – 77.5	N/A	75 – 85
Industrial, Manufacturing, Utilities, Agriculture	50 – 75	70 – 80	N/A	75 – 85

Source: Office of Planning and Research, California, General Plan Guidelines

Notes:

NA: Not Applicable; CNEL: Community Noise Equivalent Level

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 systems or air conditioning will normally suffice. Outdoor environment will seem noisy.*

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. Outdoor areas must be shielded.*

Clearly Unacceptable – *New construction or development should generally not be undertaken. Construction costs to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable.*

Local

County of San Bernardino 2007 General Plan

The purpose of the San Bernardino County General Plan Noise Element is to limit the exposure of the community to excess noise levels. The Noise Element contains goals, policies, and programs the must be used to guide decisions concerning land uses that are common sources of excessive noise levels. The General Plan policies most applicable to the Proposed Project are included below.

Policy N 1.6: Limit truck traffic in residential and commercial areas to designated truck routes; limit construction, delivery, and through-traffic to designated routes; and distribute maps of approved truck routes to County traffic officers.

Policy N 2.1: The County will require appropriate and feasible on-site noise attenuation measures that may include noise walls, enclosure of noise generated equipment, site planning to locate noise sources away from sensitive receptors, and other comparable features.

County of San Bernardino Development Code

The County's Municipal Code (Title 8, Development Code; Division 3, Countywide Development Standards; Chapter 83.01, General Performance Standards, Section 83.01.080) sets interior and exterior noise standards for specific land users by type of noise source, stationary sources and mobile sources. Noise standards for stationary noise sources are summarized in **Table 3.** As shown, the noise standards for residential properties is 55 dBA L_{eq} from 7 a.m. to 10 p.m. and 45 dBA L_{eq} from 10 p.m. to 7 a.m. Areas exposed to noise levels exceeding these standards are considered noise impact areas.

Table 3. Noise Standards for Stationary Noise Sources

Affected Land Uses (Receiving Noise)	7 a.m.- 10 p.m. L_{eq}	10 p.m. to 7 a.m. L_{eq}
Residential	55 dB(A)	45 dB(A)
Professional Services	55 dB(A)	55 dB(A)
Other Commercial	60 dB(A)	60 dB(A)
Industrial	70 dB(A)	70 dB(A)

Source: *County of San Bernardino Development Code, Section 83.01.080, Table 83-2.*

Notes:

L_{eq} = (Equivalent Energy Level). The sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period, typically one, eight or 24 hours.

dB(A) = (A-weighted Sound Pressure Level). The sound pressure level, in decibels, as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear.

L_{dn} = (Day-Night Noise Level). The average equivalent A-weighted sound level during a 24-hour day obtained by adding 10 decibels to the hourly noise levels measured during the night (from 10:00 p.m. to 7:00 a.m.). In this way L_{dn} takes into account the lower tolerance of people for noise during nighttime periods.

The County's Development Code exempts noise from construction provided that construction is limited between the hours of 7 a.m. and 7 p.m. Monday through Saturday. Construction noise occurring on Sundays or federal holidays is not exempt.

4.0 IMPACT ASSESSMENT

Thresholds of Significance

Criteria for determining the significance of noise impacts were developed based on information contained in the CEQA Guidelines Appendix G. According to the guidelines, a project may have a significant effect on the environment if it would result in the following conditions:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

b) Generation of excessive groundborne vibration or groundborne noise levels.

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

For purposes of this analysis and where applicable, the County of San Bernardino noise standards were used for evaluation of Project-related noise impacts.

Methodology

This analysis of the existing and future noise environments is based on noise prediction modeling and empirical observations. In order to estimate the worst-case construction noise levels that may occur at the nearest noise-sensitive receptors in the Project vicinity, predicted construction noise levels were calculated utilizing the Federal Highway Administration's Roadway Construction Model (2008).

Groundborne vibration levels associated with construction-related activities for the Project were evaluated utilizing typical groundborne vibration levels associated with construction equipment, obtained from the Caltrans guidelines set forth above. Potential groundborne vibration impacts related to structural damage and human annoyance were evaluated, taking into account the distance from construction activities to nearby land uses.

Impact Analysis

PROJECT CONSTRUCTION NOISE

Would the Project Result in Short-Term Construction-Generated Noise in Excess of Noise Standards?

Construction noise associated with the Proposed Project would be temporary and would vary depending on the nature of the activities being performed. Noise generated would primarily be associated with the operation of off-road equipment for on-site construction activities as well as construction vehicle traffic on area roadways. Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g., demolition, grading, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 to 4 minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts). During construction, exterior noise levels could negatively affect sensitive receptors in the vicinity of the construction site.

Table 4 indicates the anticipated noise levels of construction equipment. The average noise levels presented in **Table 4** are based on the quantity, type, and acoustical use factor for each type of equipment that is anticipated to be used.

Table 4. Maximum Noise Levels Generated by Construction Equipment

Type of Equipment	Maximum Noise (L_{max}) at 50 Feet (dBA)	Maximum 8-Hour Noise (L_{eq}) at 50 Feet (dBA)
Crane	80.6	72.6
Dozer	81.7	77.7
Excavator	80.7	76.7
Generator	80.6	77.6
Grader	85.0	81.0
Paver	77.2	74.2
Roller	80.0	73.0
Tractor	84.0	80.0
Dump Truck	76.5	72.5
Concrete Pump Truck	81.4	74.4
Welder	74.0	70.0

Source: Federal Highway Administration, Roadway Construction Noise Model (FHWA-HEP-05-054), dated December 2008.

The nearest noise-sensitive land user to the Project site is a single-family residence located 25 feet to the west. Due to the close proximity, the residence will experience noise levels in excess of what is presented in **Table 4**.

The County does not promulgate numeric thresholds pertaining to the noise associated with construction but instead limits the time that construction can take place. Specifically, Section 83.01.080 expects noise form temporary construction, maintenance, repair or demolition activates between 7 a.m. and 7 p.m., except Sundays and Federal holidays. It is typical to regulate construction noise in this manner since construction noise is temporary, short term, intermittent in nature, and would cease on completion of the

Project. Therefore, noise generated during construction activities, as long as conducted within the permitted hours, would not exceed County noise standards.

PROJECT OPERATIONAL NOISE

Would the Project Result in a Substantial Permanent Increase in Ambient Noise Levels in Excess of Standards During Operations?

The Proposed Project consists of rehabilitation and construction of a bike path and lane. It would not be a source of mobile or stationary noise sources and thus would not be a source of operational noise.

PROJECT GROUNDBORNE VIBRATION

Would the Project Expose Structures to Substantial Groundborne Vibration During Construction?

Excessive groundborne vibration impacts result from continuously occurring vibration levels. Increases in groundborne vibration levels attributable to the Proposed Project would be primarily associated with short-term construction-related activities. Construction on the Project site would have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and the operations involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance.

Construction-related ground vibration is normally associated with impact equipment such as pile drivers, jackhammers, and the operation of some heavy-duty construction equipment, such as dozers and trucks (pile drivers are not necessary for the completion of the Project). Vibration decreases rapidly with distance and it is acknowledged that construction activities would occur throughout the Project site and would not be concentrated at the point closest to sensitive receptors. Groundborne vibration levels associated with construction equipment are summarized in **Table 5**.

Table 5. Representative Vibration Source Levels for Construction Equipment

Equipment Type	Peak Particle Velocity at 25 Feet (inches per second)
Large Bulldozer	0.089
Caisson Drilling	0.089
Rock Breaker	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozer/Tractor	0.003

Source: Caltrans 2004

The nearest structure to the Project site is approximately 25 feet away. Based on the vibration levels presented in **Table 5**, groundborne vibration generated by construction equipment would not be anticipated to exceed 0.089 in/sec PPV at 25 feet. The County's Development Code Section 83.01.090 prohibits the operation of any device that creates vibration greater than or equal to 0.2. inches per second measured beyond the property line. The use of any construction equipment listed above would not result in a groundborne vibration velocity level above County standards. The predicted vibration levels at the nearest structures would not exceed County standards.

Would the Project Expose Structures to Substantial Groundborne Vibration During Operations?

Project operations would not include the use of any stationary equipment that would result in excessive vibration levels. Therefore, the Project would result in no groundborne vibration impacts during operations.

AIRPORT NOISE

Would the project Expose People Residing or Working in the Project Area to Excessive Airport Noise Levels?

The Project site is located approximately 12.5 miles northeast of the Twentynine Palms Strategic Expeditionary Landing Field. It is not within two miles of a public or private airport. Implementation of the Proposed Project would not affect airport operations nor result in increased exposure of noise-sensitive receptors to aircraft noise.

CUMULATIVE NOISE IMPACTS

Cumulative Construction Noise Impacts

Construction activities associated with the Proposed Project and other construction projects in the area may overlap, resulting in cumulative construction noise in the area. However, construction noise impacts primarily affect the areas immediately adjacent to the construction site. Construction noise for the Proposed Project was determined to be less than significant following compliance with the City's Municipal Code and General Plan Safety and Noise Chapter. Cumulative development in the vicinity of the Project site could result in elevated construction noise levels at sensitive receptors in the Project area. However, each project would be required to comply with the applicable County's limitations on allowable construction noise limits. Therefore, the Project would not contribute to cumulative impacts and impacts in this regard are not cumulatively considerable.

Cumulative Operational Noise Impacts

As previously discussed, once operational the Project would not be a source of operational noise.

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5.0 REFERENCES

California Governor's Office of Planning and Research. 2003. State of California General Plan Guidelines.

Caltrans (California Department of Transportation). 2002. *Transportation Related Earthborne Vibrations.*

———. 2004. *Transportation- and Construction-Induced Vibration Guidance Manual.*

———. 2012. *IS/EA Annotated Outline.* http://www.dot.ca.gov/ser/vol1/sec4/ch31ea/chap31ea.htm.

———. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol.*

FHWA (Federal Highway Administration). 2008. *Roadway Construction Noise Model.*

———. 2011. *Effective Noise Control During Nighttime Construction.* http://ops.fhwa.dot.gov/wz/workshops/accessible/schexnayder_paper.htm.

FTA (Federal Transit Administration). 2018. *Transit Noise and Vibration Impact Assessment.*

San Bernardino, County of. 2007. *General Plan*
———. 2016. Development Code.

WEAL (Western Electro-Acoustic Laboratory, Inc.). 2000. Sound Transmission Sound Test Laboratory Report No. TL 96-186.