Acoustical Assessment
Hume SoCal Camp Expansion Project
County of San Bernardino, California

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LIST OF ABBREVIATED TERMS

ADT	average daily traffic
dBA	A-weighted sound level
CEQA	California Environmental Quality Act
CNEL	community equivalent noise level
L_{dn}	day-night noise level
dB	decibel
L_{eq}	equivalent noise level
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating ventilation and air conditioning
Hz	hertz
in/sec	inches per second
L_{max}	maximum noise level
µPa	micropascals
L_{min}	minimum noise level
PPV	peak particle velocity
RMS	root mean square
VdB	vibration velocity decibels

1 INTRODUCTION

This report documents the results of an Acoustical Assessment completed for the Hume SoCal Camp Expansion Project ("Project" or "Proposed Project"). The purpose of this Acoustical Assessment is to evaluate the potential construction and operational noise and vibration levels associated with the Project and determine the level of impact the Project would have on the environment.

1.1 Project Location and Setting

The Project site is approximately 251 acres located in an unincorporated mountain region of San Bernardino County, along Green Valley Lake Road and approximately 0.4 miles northwest of State Route 18 (SR-18); refer to **Exhibit 1: Regional Location Map**. Surrounding the Project site is the Green Valley Lake Community to the north, the Running Springs to the southwest, and the City of Big Bear to the east, as shown in **Exhibit 2: Local Vicinity Map**.

A portion of the Project site is currently developed with improvements related to the existing Hume SoCal campground facilities. The remaining surrounding areas are vacant and contain forest land. The Project land use designation is Rural Living (RL) per the San Bernardino County General Plan (Countywide Plan). The RL land use area primarily allows for the development of residential development. Typical uses within RL land use areas also include public and quasi-public facilities such as parks, religious facilities and schools. The Project area is also located within the Hilltop Community Plan which allows for larger-scale master planned developments which can include a combination of residential, commercial, and/ or manufacturing activities that maximizes the utilization of natural and human-generated resources in rural areas.

1.2 Project Description

The Project involves the expansion of campground uses for the existing Southern California Hume Lake Christian Camp (Hume SoCal) campground to accommodate up to an additional 3,000 occupants. This would be accomplished with existing campground structures as well as the development of additional campground and recreational facilities and uses within a 251-acre area of the Green Valley Lake community, refer to **Exhibit 3: Conceptual Site Plan**. New campground structures proposed for the Project would be developed in five phases.

Each phase of the Project would include the development of expanded infrastructure, additional amenities, support structures, and buildings necessary to accommodate expanded camper capacity as well as paved parking areas and paved access roadways.

Phase 1 of the Project would involve the development of facilities to be used as a Junior High Camp. Proposed residential structures within the Phase 1 area include an expanded welcome center, private administration and guest speaker residences, staff housing, and student dormitories. Phase 1 also includes the development of a gymnasium, bus parking, a snack shop, a chapel, converting an existing chapel to a small meeting space, an expansion to the existing dining hall, a maintenance building, an amphitheater, and restrooms. Outdoor recreation facilities include grass quads. Existing and proposed facilities within Phase 1 would accommodate up to 784 occupants.

Phase 2 of the Project would involve the development of facilities to be used as a High School Camp. Proposed residential structures within the Phase 2 area include staff housing buildings and student dormitories. Phase 2 also includes the development of a large dining hall, gymnasium, a chapel, amphitheater, and restrooms. Outdoor recreation facilities include grass quads, a swimming pool, and a recreation pond. Existing and proposed facilities within Phase 2 would accommodate up to 1,000 occupants.

Phase 3 of the Project proposes the development of an Adult Lodge. Phase 3 would include the development of one adult lodge with included access road. Existing and proposed facilities within Phase 3 would accommodate up to 140 occupants.

Phase 4 of the Project would include the development of an Elementary Age Camp and associated facilities. Proposed residential structures within Phase 4 include student yurt tents. Phase 4 also includes the development of restroom facilities with showers and an amphitheater. Outdoor recreation facilities include grass quads, a dining canopy, a swimming pool, and a recreation pond. Existing and proposed facilities within Phase 4 would accommodate up to 500 occupants.

Phase 5 of the Project proposes the creation of a tent-based youth camp, Wildwood Camp. Residential structures proposed for this phase consist of yurt tents. Phase 5 also includes the development of restroom facilities with showers and an amphitheater. Outdoor recreation facilities include grass quads, a dining canopy, a swimming pool, and a recreation pond. Existing and proposed facilities within Phase 5 would accommodate up to 130 occupants.

Project Phasing and Construction

Although the Project is anticipated to be constructed in five phases, to analyze a worst-case scenario, construction modeling assumed all five phases of the Project would be constructed simultaneously and completed within two years, beginning in June 2025 and finishing in June 2027.

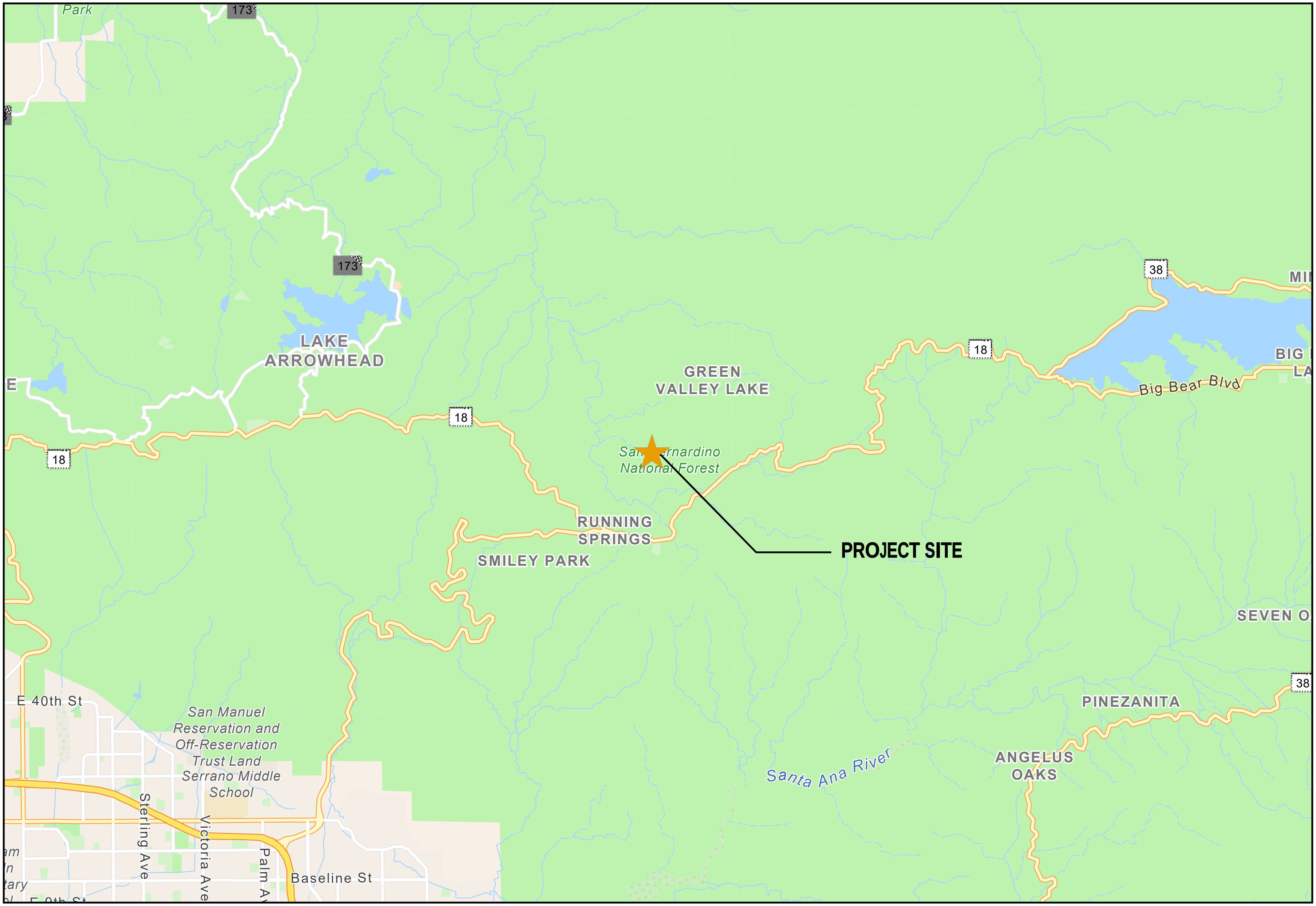
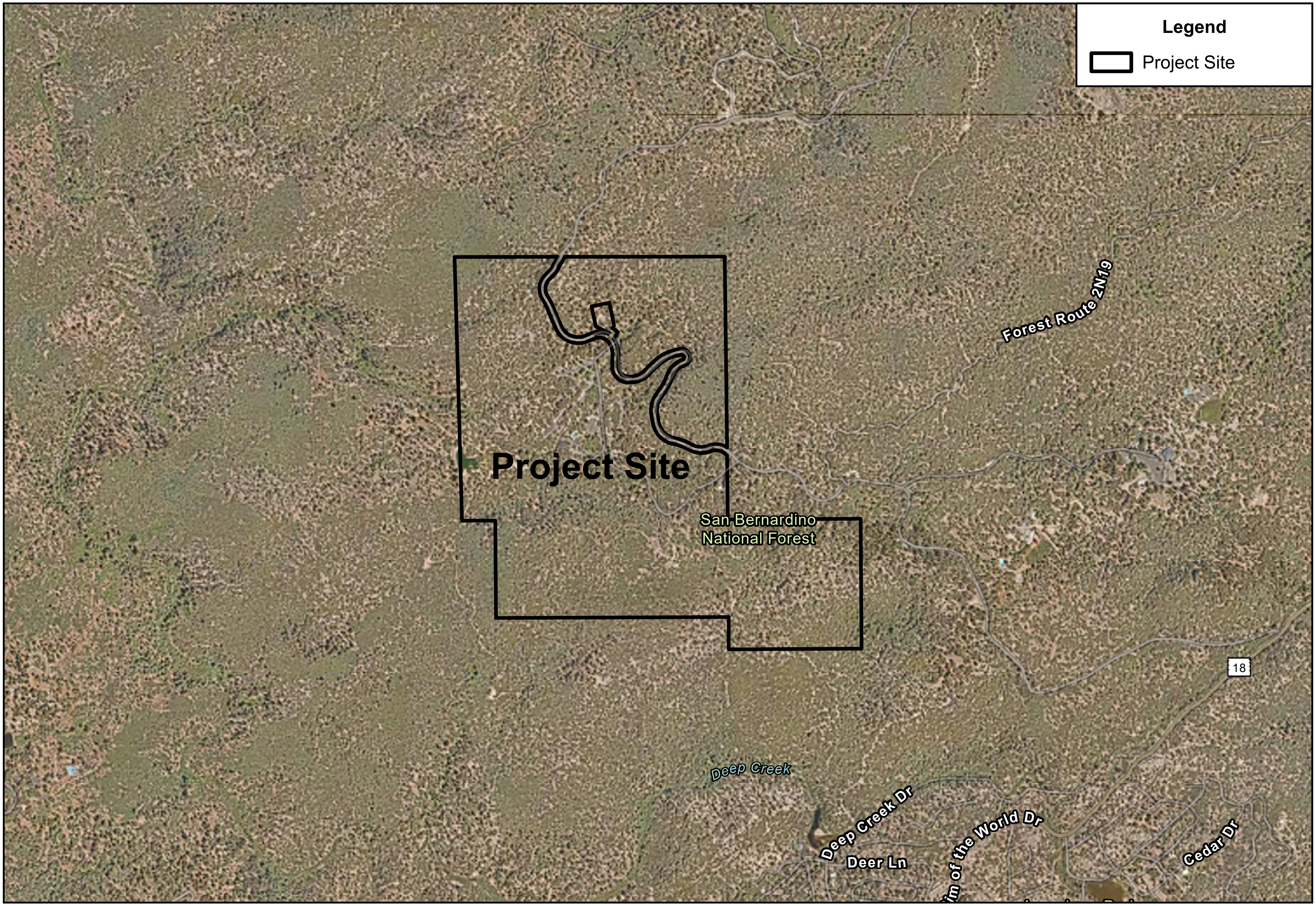


Exhibit 1: Regional Location Map

Hume SoCal Campground Expansion Project

San Bernardino County

Not to scale



Source: Nearmap, 2023.

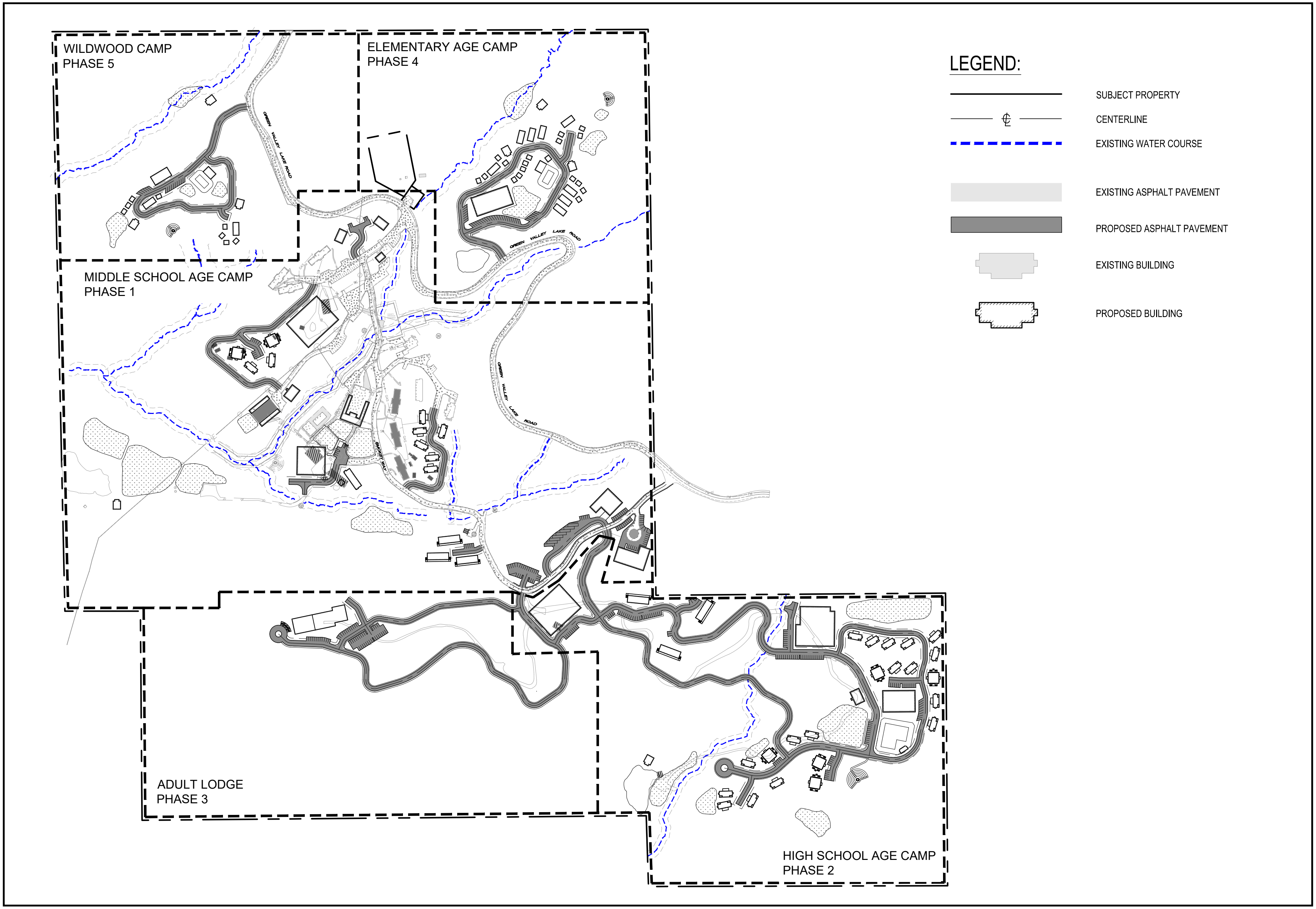
Exhibit 2: Local Vicinity Map

Hume SoCal Campground Expansion Project

San Bernardino County

Not to scale

Kimley»Horn



Source: Kimley-Horn, 2025.

Exhibit 3: Conceptual Site Plan

Hume SoCal Campground Expansion Project

San Bernardino County

Not to scale

2 ACOUSTIC FUNDAMENTALS

2.1 Sound and Environmental Noise

Acoustics is the science of sound. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a medium (e.g., air) to human (or animal) ear. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or hertz (Hz).

Noise is defined as loud, unexpected, or annoying sound. The fundamental acoustics model consists of a noise source, a receptor, and the propagation path between the two. The loudness of the noise source, obstructions, or atmospheric factors affecting the propagation path, determine the perceived sound level and noise characteristics at the receptor. Acoustics deal primarily with the propagation and control of sound. A typical noise environment consists of a base of steady background noise that is the sum of many distant and indistinguishable noise sources. The sound from individual local sources is superimposed on this background noise. These sources can vary from an occasional aircraft or train passing by to continuous noise from traffic on a major highway. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a large range of numbers. To avoid this, the decibel (dB) scale was devised. The dB scale uses the hearing threshold of 20 micropascals (μPa) as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The dB scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels correspond closely to human perception of relative loudness. **Table 1: Typical Noise Levels** provides typical noise levels.

Table 1: Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	– 110 –	Rock Band
Jet fly-over at 1,000 feet		
	– 100 –	
Gas lawnmower at 3 feet		
	– 90 –	
Diesel truck at 50 feet at 50 miles per hour		Food blender at 3 feet
	– 80 –	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	**– 70 –**	Vacuum cleaner at 10 feet
Commercial area		Normal Speech at 3 feet
Heavy traffic at 300 feet	**– 60 –**	
		Large business office
Quiet urban daytime	**– 50 –**	Dishwasher in next room
Quiet urban nighttime	**– 40 –**	Theater, large conference room (background)
Quiet suburban nighttime		
	– 30 –	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	– 20 –	
		Broadcast/recording studio
	– 10 –	
Lowest threshold of human hearing	**– 0 –**	Lowest threshold of human hearing

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.

Noise Descriptors

The dB 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. Most commonly, environmental sounds are described in terms of equivalent noise level (L_{eq}) that has the same acoustical energy as the summation of all the time-varying events. While L_{eq} represents the continuous sound pressure level over the measurement period, the day-night noise level (L_{dn}) and Community Equivalent Noise Level (CNEL) are measures of energy average during a 24-hour period, with dB weighted sound levels from 7:00 p.m. to 7:00 a.m. Each is applicable to this analysis and defined in **Table 2: Definitions of Acoustical Terms**.

Table 2: Definitions of Acoustical Terms

Term	Definitions
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in μPa (or 20 micronewtons per square meter), where 1 pascal is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in dB as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 μPa). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in dB 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 in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level (L_{eq})	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.
Maximum Noise Level (L_{max}) Minimum Noise Level (L_{min})	The maximum and minimum dBA during the measurement period.
Exceeded Noise Levels (L_{01}, L_{10}, L_{50}, L_{90})	The dBA values that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day-Night Noise Level (L_{dn})	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 at 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}.
Community Noise Equivalent Level (CNEL)	A 24-hour average L_{eq} with a 5 dBA weighting during the hours of 7:00 a.m. to 10:00 a.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.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

Table 2: Definitions of Acoustical Terms	
Term	**Definitions**
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Because sound levels can vary markedly over a short period of time, a method for describing either the sound's average character (L_{eq}) or the variations' statistical behavior (L_{XX}) must be utilized. 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 predicted models' accuracy depends on various factors, such as the distance between the noise receptor and the noise source, the character of the ground surface (e.g., hard or soft), and the presence or absence of structures (e.g., walls or buildings) or topography, and how well model inputs reflect these conditions.

A-Weighted Decibels

The perceived loudness of sounds is dependent on many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by dBA values. There is a strong correlation between dBA and the way the human ear perceives sound. For this reason, the dBA has become the standard tool of environmental noise assessment. All noise levels reported in this document are in terms of dBA, but are expressed as dB, unless otherwise noted.

Addition of Decibels

The 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.[1] When the standard logarithmic dB is A-weighted, 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.[2] When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions.[3] Under the dB scale, three sources of equal loudness together would produce an increase of approximately 5 dBA.

Sound Propagation and Attenuation

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. 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.[4] No excess attenuation is assumed for hard

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1 California Department of Transportation, Technical Noise Supplement to the Traffic Noise Analysis Protocol, September 2013.

2 *Noise Sources and Their Effects*. Available at: https://www.chem.purdue.edu/chemsafety/Training/PPETrain/dblevels.htm

3 FHWA, *Noise Fundamentals,* 2017. Available at: https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

4 California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, Page 2-29, September 2013.

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 in this report.

Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the noise receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm can reduce noise levels by 5 to 15 dBA.[5] The way 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.

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.[6] 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 dBA, the following relationships should be noted[7]:

- Except in carefully controlled laboratory experiments, a 1-dBA change cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A minimum 5-dBA change is required before any noticeable change in community response would be expected. A 5-dBA increase 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.

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5 Federal Highway Administration, Highway Traffic and Construction Noise - Problem and Response**,** April 2006.
6 Compiled from James P. Cowan, *Handbook of Environmental Acoustics,* 1994 and Cyril M. Harris, Handbook of Noise Control, 1979.
7 Compiled from California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013, and FHWA, *Noise Fundamentals,* 2017.

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 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.[8]

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. A noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance.[9]

2.2 Groundborne Vibration

Sources of groundborne 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 or heavy equipment use during construction). 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 and is expressed in terms of inches-per- second (in/sec). The RMS velocity is defined as the average of the squared amplitude of the signal and is expressed in terms of velocity decibels (VdB). The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations, 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 individual's sensitivity. 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.

8 U.S. Department of Labor, Occupational Safety and Health Standards, *29 CFR 1910* (Occupational Noise Exposure).
9 Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Analysis Issues, August 1992.

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. For the purposes of this analysis, a PPV descriptor with units of inches per second (in/sec) is used to evaluate construction-generated vibration for building damage and human complaints.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations

Maximum PPV (in/sec)	Vibration Annoyance Potential Criteria	Vibration Damage Potential Threshold Criteria	FTA Vibration Damage Criteria
0.008	--	Extremely fragile historic buildings, ruins, ancient monuments	--
0.01	Barely Perceptible	--	--
0.04	Distinctly Perceptible	--	--
0.1	Strongly Perceptible	Fragile buildings	--
0.12	--	--	Buildings extremely susceptible to vibration damage
0.2	--	--	Non-engineered timber and masonry buildings
0.25	--	Historic and some old buildings	--
0.3	--	Older residential structures	Engineered concrete and masonry (no plaster)
0.4	Severe	--	--
0.5	--	New residential structures, Modern industrial/commercial buildings	Reinforced-concrete, steel or timber (no plaster)

PPV = peak particle velocity; in/sec = inches per second; FTA = Federal Transit Administration

Source: California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2020 and Federal Transit administration, Transit Noise and Vibration Assessment Manual, 2018.

3 REGULATORY SETTING

To limit population exposure to physically or psychologically damaging as well as intrusive noise levels, the federal government, the State of California, various county governments, and most municipalities in the State have established standards and ordinances to control noise.

3.1 Federal

Federal Transit Administration Noise and Vibration Guidance

The Federal Transit Administration (FTA) has published the Transit Noise and Vibration Impact Assessment Report to provide guidance on procedures for assessing impacts at different stages of transit Project development. The report covers both construction and operational noise impacts and describes a range of measures for controlling excessive noise and vibration. The report establishes a threshold of 80 dBA (8-hour L_{eq}) for residential uses and 85 dBA (8-hour L_{eq}) for non-residential uses to evaluate construction noise impacts.[10] In general, the primary concern regarding vibration relates to potential damage from construction. The guidance document establishes criteria for evaluating the potential for damage for various structural categories from vibration.

3.2 State of California

California Government Code

California Government Code Section 65302(f) mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines established by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of “normally acceptable”, “conditionally acceptable”, “normally unacceptable”, and “clearly unacceptable” noise levels for various land use types. Single-family homes are “normally acceptable” in exterior noise environments up to 60 CNEL and “conditionally acceptable” up to 70 CNEL. Multiple-family residential uses are “normally acceptable” up to 65 CNEL and “conditionally acceptable” up to 70 CNEL. Schools, libraries, and churches are “normally acceptable” up to 70 CNEL, as are office buildings and business, commercial, and professional uses.

Title 24 – Building Code

The State’s noise insulation standards are codified in the California Code of Regulations, Title 24: Part 1, Building Standards Administrative Code, and Part 2, California Building Code. These noise standards are applied to new construction in California for interior noise compatibility from exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residential buildings, schools, hotel rooms, or hospitals, are located near major transportation noise sources, and where such noise sources create an exterior noise level of 65 dBA CNEL or higher. Acoustical studies that accompany building plans must demonstrate that the structure has been designed to limit interior noise in habitable rooms to acceptable noise levels. For new multi-family residential buildings and habitable rooms (including hotels), the acceptable interior noise limit for new construction is 45 dBA CNEL.

[10] Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, Table 7-2, Page 179, September 2018.

3.3 Local

County of San Bernardino General Plan

The San Bernardino County Countywide Plan was adopted in October 2020. The Hazards Element aims to protect life, property, and commerce from impacts associated with natural hazards, human-generated hazards, and increased risk due to climate change. The following policies are applicable to the Project:

Goal HZ-2: Human-Generated Hazards

Policy HZ-2.8: Proximity to noise generating uses. We limit or restrict new noise sensitive land uses in proximity to existing conforming noise generating uses and planned industrial areas.

Policy HZ-2.9: Control sound at the source. We prioritize noise mitigation measures that control sound at the source before buffers, soundwalls, and other perimeter measures.

County of San Bernardino Development Code

The County implements and enforces noise control through the San Bernardino County Development Code (SBCDC). The County's Noise Ordinance is included in SBCDC Chapter 83.01.080, Noise. The following sections of the SBCDC are relevant to the analysis:

Section 83.01.080(B), *Noise Impacted Areas*, identifies noise-sensitive land uses as residential uses, schools, hospitals, nursing homes, religious institutions, libraries, and similar uses.

Section 83.01.080(C)(1), *Noise Standards*, provides noise standards for stationary noise sources as shown in as shown in **Table 4: Noise Standards for Stationary Noise Sources**.

Table 4: Noise Standards for Stationary Noise Sources

Affected Land Uses (Receiving Noise)	7:00 a.m. – 10:00 p.m. L_{eq}	10:00 p.m. – 7:00 a.m. L_{eq}
Residential	55 dBA	45 dBA
Professional Services	55 dBA	55 dBA
Other Commercial	60 dBA	60 dBA
Industrial	70 dBA	70 dBA

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. dBA = (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.
Source: San Bernardino County Development Code Section 83.01.080(C)(1)

Section 83.01.080(C)(2), *Noise Limit Categories*, provides noise limit categories. No person shall operate or cause to be operated a source of sound at a location or allow the creation of noise on property owned, leased, occupied, or otherwise controlled by the person, which causes the noise level, when measured on another property, either incorporated or unincorporated, to exceed any one of the following:

a) The noise standard for the receiving land use as specified in Section 83.01.080(B), above, for a cumulative period of more than 30 minutes in any hour.

b) The noise standard plus five dB(A) for a cumulative period of more than 15 minutes in any hour.

c) The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour.

d) The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour.

e) The noise standard plus 20 dB(A) for any period of time.

Section 83.01.080(D), *Noise Standards for Adjacent Mobile Noise Sources*, provides noise standards for adjacent mobile noise sources as shown in **Table 5: Noise Standards for Adjacent Mobile Noise Sources**. Noise from mobile sources that affects adjacent properties adversely shall be mitigated for any new development to a level that shall not exceed the standards described in **Table 5**.

Table 5: Noise Standards for Adjacent Mobile Noise Sources

Land Use		L_{dn} (or CNEL) dBA	
Categories	**Uses**	**Interior**	**Exterior**
Commercial	Hotel, motel, transient housing	45	60
Open Space	Park	N/A	65

CNEL = (Community Noise Equivalent Level). The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m. dBA = (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. Source: San Bernardino County Development Code Section 83.01.080(D)

Section 83.01.080(G), *Exempt Noise*, identifies noise sources that are exempt from the noise standards discussed above. Temporary construction, maintenance, repair, or demolition activities that occur between the hours of 7:00 a.m. and 7:00 p.m., except on Sundays and Federal holidays, are exempt from the noise standards.

Section 83.01.090(A), *Vibration Standard*, states that no ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to two-tenths inches per second measured at or beyond the lot line.

4 EXISTING CONDITIONS

4.1 Existing Noise Sources

The Project area is characterized as a rural environment. The area is dominated by forest with scattered campgrounds and residential communities. Noise levels within the Project area depend on the proximity to roadways and various camp activities. Transportation related noise is the primary noise source in the area.

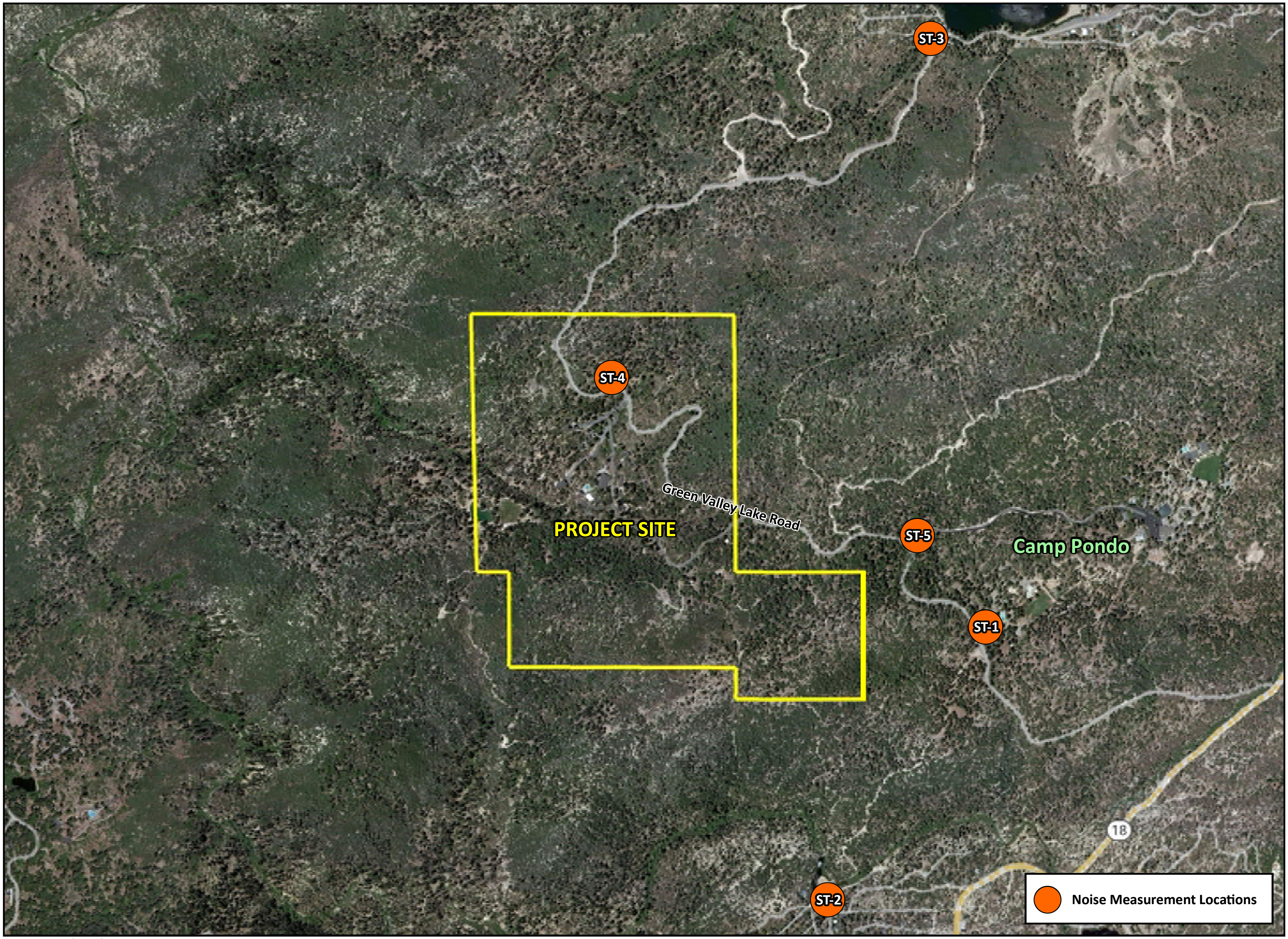
4.2 Noise Measurements

The Project area is primarily occupied by commercial (campground) uses. To quantify existing ambient noise levels in the Project area, Kimley-Horn conducted five short-term noise measurements on November 1, 2023; see **Appendix A: Existing Ambient Noise Measurements**. The noise measurement sites were representative of typical existing noise exposure within and immediately adjacent to the Project site. The 10-minute measurements were taken between 9:19 a.m. and 10:45 a.m. on a Wednesday. Measurements of L_{eq} are considered representative of the noise levels throughout the day. The average noise levels and sources of noise measured at each location are listed in **Table 6: Existing Noise Measurements** and shown on **Exhibit 4: Noise Measurement Locations**.

Table 6: Existing Noise Measurements

Site	Location	Measurement Period	Duration	L_{eq} (dBA)
Short-Term Noise Measurements				
ST-1	Northeast corner of Green Valley Lake Road and Camp Pondo entrance	9:19 – 9:29 a.m.	10 Minutes	57.8
ST-2	Northwest corner of Badger Lane and Deep Creek Drive	10:35 – 10:45 a.m.	10 Minutes	42.8
ST-3	Near overhead transformer	10:11 – 10:21 a.m.	10 Minutes	51.8
ST-4	Southeast corner of private driveway on Green Valley Lake Road	9:52 – 10:02 a.m.	10 Minutes	50.3
ST-5	Southeast corner of Camp Cedar Road and Green Valley Lake Road	9:35 – 9:45 a.m.	10 Minutes	60.3

Source: Noise measurements taken by Kimley-Horn, November 1, 2023. See **Appendix A** for noise measurement results.



Source: Google Earth

EXHIBIT 4: Noise Measurement Locations
Hume SoCal Camp Expansion Project

Not To Scale

Kimley»Horn

4.3 Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. Noise sensitive uses typically include residences, hospitals, schools, childcare facilities, and places of assembly. Vibration sensitive receivers are generally similar to noise sensitive receivers but may also include businesses, such as research facilities and laboratories that use vibration-sensitive equipment. The Project site is surrounded by natural forests with a mix of campgrounds and residential developments. Noise sensitive land uses nearest to the Project site are listed in **Table 7: Sensitive Receptors**.

Table 7: Sensitive Receptors

Receptor Description	Distance and Direction from the Project
Camp Pondo	1,200 feet to the east
Single-family Residences	1,540 feet to the south
Single-family Residences	3,000 feet to the northeast

Source: Google Earth

5 SIGNIFICANCE CRITERIA AND METHODOLOGY

5.1 CEQA Thresholds

State CEQA Guidelines Appendix G contains analysis guidelines related to noise and vibration. These guidelines have been used by the County to develop thresholds of significance for this analysis. A project would create a significant environmental impact if it would:

- Generate 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;
- Generate excessive groundborne vibration or groundborne noise levels; and
- 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, expose people residing or working in the Project area to excessive noise levels.

Thresholds

Construction Noise

The San Bernardino Countywide Plan and Development Code does not establish maximum numerical construction noise levels for potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes as the generation of noise levels in excess of standards or as a substantial temporary or periodic noise increase. To evaluate whether the Project will generate potentially significant temporary construction noise levels at sensitive receiver locations, a construction-related noise level threshold has been adopted from the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual*. Due to the lack of standardized construction noise thresholds, the FTA provides guidelines that can be considered reasonable criteria for evaluating construction noise impacts. Therefore, this analysis conservatively uses the FTA's threshold of 80 dBA (8-hour L_{eq}) for residential uses and 85 dBA (8-hour L_{eq}) for non-residential uses (campgrounds).[11]

Operational Noise

Non-Transportation Noise

Non-transportation related noise generators are commonly called "stationary," "fixed," "area," or "point" sources of noise. Industrial processing, mechanical equipment, pumping stations, and heating, ventilating, and air conditioning (HVAC) equipment are examples of fixed location, non-transportation noise sources. Stationary noise is evaluated based on the standards within the County's Noise Ordinance, Section 83.01.080(C)(1). A significant impact may exist if exterior noise levels exceed the County's 55 dBA daytime (7:00 a.m. to 10:00 p.m.) and 45 dBA nighttime (10:00 p.m. to 7:00 a.m.) standards (see **Table 4**).

[11] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, Table 7-3, Page 179, September 2018.

Mobile Noise

Traffic generated noise impacts are evaluated based on standards within the General Plan. A project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas. Most people can detect changes in sound levels of approximately 3 dBA under normal, quiet conditions, and changes of 1 to 3 dBA are detectable under quiet, controlled conditions. Changes of less than 1 dBA are usually indiscernible. A change of 5 dBA is readily discernible to most people in an exterior environment.

Vibration

The County has defined a vibration standard in the development code. Section 83.01.090(A) states that no particle velocity greater than or equal to two-tenths inches per second measured at or beyond the lot line.

5.2 Methodology

Construction

Construction noise levels were based on typical noise levels generated by construction equipment published by the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA). Construction noise is assessed in dBA L_{eq}. This unit is appropriate because L_{eq} can be used to describe noise level from operation of each piece of equipment separately, and levels can be combined to represent the noise level from all equipment operating during a given period.

Construction noise modeling was conducting using the FHWA Roadway Construction Noise Model (RCNM). Reference noise levels are used to estimate operational noise levels at nearby noise-sensitive receptors based on a standard noise attenuation rate of 6 dB per doubling of distance (line-of-sight method of sound attenuation for point sources of noise). Noise level estimates do not account for the presence of intervening structures or topography, which may reduce noise levels at receptor locations. Therefore, the noise levels presented herein represent a conservative, reasonable worst-case estimate of actual temporary construction noise. The County does not have establish quantitative construction noise standards. As noted above, this analysis conservatively uses the FTA's threshold of 80 dBA (8-hour L_{eq}) for residential uses and 85 dBA (8-hour L_{eq}) for commercial/non-residential uses to evaluate construction noise impacts.

Operations

Project implementation would generate increased traffic volumes along Green Valley Lake Road and Project area roadways. According to the trip generation analysis, the Project would result in 100 average daily vehicle trips. The Project's increase in traffic would result in noise increases on Project area roadways. In general, a 3-dBA increase in traffic noise is barely perceptible to people, while a 5-dBA increase is readily noticeable. Traffic volumes on Project area roadways would have to approximately double for the resulting traffic noise levels to generate a 3-dBA increase.[12]

[12] According to the California Department of Transportation, *Technical Noise Supplement to Traffic Noise Analysis Protocol* (September 2013), it takes a doubling of traffic to create a noticeable (i.e., 3 dBA) noise increase.

Vibration

Groundborne vibration levels associated with Project construction-related activities were evaluated utilizing typical groundborne vibration levels associated with construction equipment, obtained from FTA published data for construction equipment. Potential groundborne vibration impacts related to building/structure damage and interference with sensitive existing operations were evaluated, considering the distance from construction activities to nearby land uses and typically applied criteria. Project construction would not include pile driving.

6 POTENTIAL IMPACTS AND MITIGATION

6.1 Acoustical Impacts

Threshold 6.1 Would the Project generate 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?

Construction

Construction noise typically occurs intermittently and varies depending on the construction activity's nature or phase (e.g., land clearing, grading, excavation, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. During construction, exterior noise levels could affect noise-sensitive receptors near the construction site. However, the nearest sensitive receptors to the Project site construction area is existing campground, Camp Pondo, with the nearest building located approximately 1,200 feet east of the Project. However, it is noted that construction activities would occur throughout the Project site and would not be concentrated at a single point near noise-sensitive receptors.

Construction activities would include demolition, site preparation, grading, building construction, paving, and architectural coating. Such activities would require:

- Industrial saws, excavators, and dozers during demolition;
- Dozers and tractors during site preparation;
- Excavators, graders, dozers, scrapers, and tractors during grading;
- Cranes, forklifts, generators, tractors, and welders during building construction;
- Pavers, rollers, and paving equipment during paving; and
- Air compressors during architectural coating.

Typical noise levels associated with individual construction equipment are listed in **Table 8: Typical Construction Equipment Noise Levels**.

Table 8: Typical Construction Equipment Noise Levels

Equipment	Typical Noise Level (dBA) at 50 feet from Source	Typical Noise Level (dBA) at 1,200 feet from Source[1]
Air Compressor	80	52
Backhoe	80	52
Compactor	82	54
Concrete Mixer	85	57
Concrete Pump	82	54
Concrete Vibrator	76	48
Crane, Mobile	83	55
Dozer	85	57
Generator	82	54
Grader	85	57
Impact Wrench	85	57
Jack Hammer	88	60

Table 8: Typical Construction Equipment Noise Levels		
Equipment	**Typical Noise Level (dBA) at 50 feet from Source**	**Typical Noise Level (dBA) at 1,200 feet from Source[1]**
Loader	80	52
Paver	85	57
Pneumatic Tool	85	57
Pump	77	49
Roller	85	57
Saw	76	48
Scraper	85	57
Shovel	82	54
Truck	84	56
1. Calculated using the inverse square law formula for sound attenuation: $dBA_2 = dBA_1 + 20Log(d_1/d_2)$ Where: dBA_2 = estimated noise level at receptor; dBA_1 = reference noise level; d_1 = reference distance; d_2 = receptor location distance		
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.		

Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four 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).

Although the construction equipment noise levels in **Table 8** are from FTA's 2018 *Transit Noise and Vibration Impact Assessment Manual*, the noise levels are based on measured data from a U.S. Environmental Protection Agency report which uses data from the 1970s,[13] the FHWA Roadway Construction Noise Model which uses data from the early 1990s, and other measured data. Since that time, construction equipment has been required to meet more stringent emissions standards and the additional necessary exhaust systems also reduce noise from what is shown in the table.

Section 83.01.080(G) (Exempt Noise) of the San Bernardino County Development Code exempts noise sources associated with construction activities from the County's established noise standards as long as the activities only take place between the hours of 7:00 a.m. to 7:00 p.m. on weekdays and Saturdays, excluding Federal holidays. While the County establishes limits to the hours during which construction activity may take place, it does not identify specific noise level limits for construction noise levels. However, this analysis conservatively uses the FTA's threshold of 80 dBA and 85 dBA (8-hour L_{eq}) to evaluate construction noise impacts for residential and commercial uses, respectively.[14]

Project Construction Noise Levels

The noise levels calculated in **Table 9: Construction Noise Levels** show estimated exterior construction noise. Construction noise levels drop off at a rate of about 6 dBA per doubling of distance between the noise source and receptor. Construction equipment would operate throughout the Project site and the associated noise levels would not occur at a fixed location for extended periods of time. The nearest sensitive receptors are located at Camp Pondo, approximately 1,200 feet to the east. There are also single-

13 U.S. Environmental Protection Agency, *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances, NTID300.1*, December 31, 1971.

14 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, Table 7-2, Page 179, September 2018.

family residential uses located approximately 1,540 feet to the south, however these residential uses are located on the opposite side of a hill and would be shielded from Project noise. It is noted that construction equipment would move around on-site and not all equipment would operate at the closest point to sensitive receptors to the center of the construction activity area. Therefore, the analysis assumed simultaneous operation of the two loudest pieces of equipment closest to sensitive receptors (1,200 feet) and the remaining equipment at an average distance (1,840 feet). The construction area would encompass a large area and would not concentrate all equipment at the construction area boundary. The nature of construction is such that all equipment is not (1) used simultaneously and (2) not used at the exact same location (because equipment serves different purpose) and equipment is spread across the construction area. This analysis assumes that the noisiest equipment would operate concurrently at the construction boundary closest to the nearest sensitive receptor reflects a conservative analysis. Construction noise levels shown in **Table 9** focus on the closest receptors. Noise levels at receptors further away would be lower.

Table 9 shows that construction noise levels would not exceed the 85-dBA threshold.[15] Additionally, compliance with Section 83.01.080(G) (Exempt Noise) of the County of San Bernardino Development Code would minimize impacts from construction noise, as construction would be limited to daytime hours. Therefore, construction activities would result in a less than significant noise impact.

Table 9: Construction Noise Levels

Construction Activities	Modeled Exterior Construction Noise Level at Nearest Receptor (dBA L_{eq})	Noise Threshold (dBA L_{eq})	Exceed Threshold?	Ambient Noise Level (dBA L_{eq})	Construction + Ambient Combined Noise Level (dBA L_{eq})	Exceed Threshold?
Demolition	57.5	85	No	57.8	60.7	No[1]
Site Preparation	58.0		No		60.9	No[1]
Grading	58.1		No		61.7	No[1]
Construction	58.5		No		61.2	No[1]
Paving	51.7		No		58.8	No[1]
Architectural Coating	46.1		No		58.1	No[1]
Combined Activities[2]	64.7		No		65.5	No[1]

1. Combined construction noise and ambient noise levels remain below the 85 dBA construction noise threshold for commercial/non-residential uses.
2. Although the Project construction schedule states that all construction activities will overlap during the early stages of construction, these activities could not all occur in the same geographic location. However, to model a worst-case scenario, this analysis assumes all construction activities would occur simultaneously nearest to the closest receptor.

Source: Federal Highway Administration, *Roadway Construction Noise Model,* 2006. Refer to ***Appendix B*** for noise modeling results.

Construction Traffic Noise

Construction noise may be generated by large trucks moving materials to and from the Project site. Grading would require approximately 157,415 cubic yards of export which would result in approximately 224 roundtrip truck hauling trips per day during the grading phase. Construction would result in approximately 171 worker trips per day. Noise generated from construction traffic would increase short-

[15] The nearest receptor, Camp Pondo, located 1,200 feet to the east is considered a commercial use. The nearest residential use is located approximately 1,540 feet to the south. Therefore, the FTA threshold of 85 dBA for commercial uses is appropriate.

term noise; however, these noise levels are temporary and would cease once construction is complete. The trucks associated with construction would occur during the allowable hours for construction specified in the Development Code (7:00 a.m. to 7:00 p.m. on weekdays and Saturdays, excluding Federal holidays). Trucks (including trucks hauling excavated material) would also occur during the allowable daytime hours only. Delivery trucks, haul trucks, and worker vehicles associated with the construction of the proposed Project would vary from day to day, with the highest volumes generally occurring during construction initiation.

Green Valley Lake Road, the access road to the Project is identified in the Countywide Plan as a Mountain Secondary Highway. Although traffic for Green Valley Lake Road is not addressed in the Transportation Impact Analysis prepared for the Countywide Plan EIR, other Mountain Secondary Highways range between 656 and 11,534 average daily traffic trips (ADT), with an average ADT of 3,575. In general, a 3-dBA increase in traffic noise is barely perceptible to people, while a 5-dBA increase is readily noticeable. Traffic volumes on Project area roadways would have to approximately double for the resulting traffic noise levels to generate a 3-dBA increase.[16] Assuming Green Valley Lake Road traffic is comparable to the lower end of other Mountain Secondary Highways, construction traffic could result in a barely perceptible 3-dBA increase in traffic noise. This 3-dBA increase when combined with the ambient noise levels recorded on November 1 at a location nearest to a sensitive receptor (refer to **Table 6**, ST-1) would increase noise to 60.8 dBA. Exterior noise levels at the nearest sensitive receptor, approximately 160 feet from the centerline of the road, were calculated using the following calculation for line source distance attenuation:

$$Lp(R2) = Lp(R1) - 10 \times Log_{10}(R2/R1)$$

Where:
Lp(R1) = Known sound pressure level at the first location (typically measured data) (60.8)
Lp(R2) = Unknown sound pressure level at the second location
R1 = Distance from the noise source to location of known sound pressure level (20 feet)
R2 = Distance from noise source to the second location (160 feet)

As noted previously in **Table 5**, the exterior noise standards for mobile sources near commercial land uses (Camp Pondo) is 60 dBA CNEL. Based on the above calculation, construction traffic noise would attenuate to 51.8 dBA.[17] Therefore, although construction traffic may result in a barely perceptible increase to traffic noise, noise levels would not exceed the County's standard for mobile sources. As a result, construction traffic noise would be less than significant.

Operations

The Project would expand the existing Hume SoCal campground to accommodate up to 2,854 occupants within a 251-acre site. Recreational activities at the Project site would include varied outdoor activities (e.g., zip line, climbing, hiking, craft projects, recreational games, etc.) that would produce nominal noise at the nearest sensitive receptors (Camp Pondo campers located approximately 1,200 feet to the east of the Project boundary and single-family residents located approximately 1,540 feet to the south. Although the nearest single-family residential property is located 1,540 feet as a crow flies, it is located on the

[16] According to the California Department of Transportation, *Technical Noise Supplement to Traffic Noise Analysis Protocol* (September 2013), it takes a doubling of traffic to create a noticeable (i.e., 3 dBA) noise increase.
[17] Noise attenuation calculation does not take into account shielding from trees or the difference in elevation of the noise source and receiver, both of which would reduce noise levels further.

opposite side of the hill and would be shielded from Project noises). The primary noise sources associated with the campground would be an outdoor public address (PA) system, live music, campground noise, and off-site traffic noise.

Public Address System

Operations at the campground would include occasional announcements from the PA system, presented through a distributed loudspeaker system located throughout the park. A typical PA system can produce noise levels of approximately 87.5 dBA at 20 feet from the source.[18] The nearest sensitive receptors would be located approximately 1,200 feet from the boundary of the Project site. At this distance, the noise levels generated by the PA system would result in a noise level of approximately 51.9 dBA at the nearest sensitive receptor. As a result, the proposed PA system for announcements, music, etc. would not exceed the County's 60 dBA threshold (daytime and nighttime) for commercial uses (Camp Pondo) from stationary noise sources. Furthermore, additional noise attenuation would be provided by surrounding intervening terrain between the Project site and sensitive receptors. A less than significant impact would occur in this regard.

Live Music

The campground would provide occasional live music events on the Project site. Live music typically generates noise levels of 88 dBA at 20 feet from the source.[19] The nearest sensitive receptors are located approximately 1,200 feet from the boundary of the Project site. At this distance, the noise levels generated by live music would result in a noise level of approximately 52.4 dBA based on distance attenuation alone. As a result, live music at the Project site would not exceed the County's 60 dBA threshold for commercial uses from stationary noise sources. A less than significant impact would occur in this regard.

Campground Activities

Noise associated with the campground would include crowd noise from various outdoor activities. Noise associated with activities at the campground would include conversations, children playing, music, people walking along trails, and periodic maintenance, etc. These activities would generally produce low to moderate levels of noise. Campground noise is approximately 85 dBA at a distance of 20 feet.[20] As the nearest sensitive receptors are approximately 1,200 feet from the campground, noise levels would be approximately 49.4 dBA. As such, campground noise would be below the San Bernardino County's 60 dBA standard for commercial uses from stationary noise sources. A less than significant impact would occur in this regard.

Off-Site Traffic Noise

Project implementation would generate increased traffic volumes along Green Valley Lake Road and Project area roadways. According to the *Scope for the Traffic Study* and *Vehicle Miles Traveled (VMT) Screening Assessment* prepared by Kimley Horn and Associates (June 2023) (Trip Generation Analysis), the

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[18] Edward L. Pack Associates, Inc., Noise Assessment Study for the Planned Pavilion, Boulder Ridge Country Club, Santa Clara County, May 2, 2008.
[19] Ibid.
[20] Dudek & Associates, *Malibu Parks Public Access Enhancement Plan-Public Works Plan Final Environmental Impact Report*, August 2010.

Project would result in 700 average daily vehicle trips per week, with 225 trips occurring on Sundays, and 7-day average of 100 trips per day. The Project's increase in traffic would result in noise increases on Project area roadways.

As discussed previously under construction traffic noise, Green Valley Lake Road, the access road to the Project is identified in the Countywide Plan as a Mountain Secondary Highway. Although traffic for Green Valley Lake Road is not addressed in the Transportation Impact Analysis prepared for the Countywide Plan EIR, other Mountain Secondary Highways range between 656 and 11,534 ADT. In general, a 3-dBA increase in traffic noise is barely perceptible to people, while a 5-dBA increase is readily noticeable. Traffic volumes on Project area roadways would have to approximately double for the resulting traffic noise levels to generate a 3-dBA increase.[21] Assuming Green Valley Lake Road traffic is comparable to the lower end of other Mountain Secondary Highways, the maximum traffic generated by the Project, 225 ADT on Sundays, would not be sufficient to result in a permanent 3-dBA increase in ambient noise levels. Therefore, noise impacts associated with traffic would be less than significant.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.2 Would the Project generate excessive groundborne vibration or groundborne noise levels?

Construction Vibration

Construction can generate varying degrees of ground vibration, depending on the construction procedures and equipment. Operation of construction equipment generates vibrations that spread through the ground and diminish with distance from the source. 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.

The FTA has published standard vibration velocities for construction equipment operations. As previously noted, County Development Code Section 83.01.090(A), Vibration Standard, sets a ground vibration standard of 0.2 in/sec PPV. No ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to .2 in/sec PPV measured at or beyond the lot line.

Table 10: Typical Construction Equipment Vibration Levels, lists vibration levels at 25 feet for typical construction equipment. Based on preliminary site plans, construction nearest to the Project boundary would occur in the southeast portion of the Project Site, approximately 25 feet from the Project boundary. As indicated in **Table 10**, based on FTA data, vibration velocities from typical heavy construction equipment operations that would be used during Project construction range from 0.003 to 0.089 in/sec PPV at 25 feet from the source of activity.

[21] According to the California Department of Transportation, *Technical Noise Supplement to Traffic Noise Analysis Protocol* (September 2013), it takes a doubling of traffic to create a noticeable (i.e., 3 dBA) noise increase.

Table 10: Typical Construction Equipment Vibration Levels	
Equipment	**Peak Particle Velocity at 25 Feet (in/sec)**
Large Bulldozer	0.089
Caisson Drilling	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozer/Tractors	0.003
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.	

Table 10 shows that at the lot line, 25 feet from construction activity, the vibration velocities from construction equipment would not exceed 0.089 in/sec PPV, which is below the County's 0.2 in/sec PPV threshold. It is also acknowledged that construction activities would occur throughout the project site and would not only be located at the boundary closest to other properties. Therefore, vibration impacts associated with Project construction would be less than significant.

Operational Vibration

Once operational, the Project would not be a significant source of groundborne vibration. Groundborne vibration surrounding the Project currently result from heavy-duty vehicular travel (e.g., refuse trucks, heavy duty trucks, delivery trucks, and transit buses) on the nearby local roadways. Operations of the Project would include activities associated with campgrounds that typically would not cause excessive ground-borne vibrations. Due to the rapid drop-off rate of groundborne vibration and the short duration of the associated events, vehicular traffic-induced groundborne vibration is rarely perceptible beyond the roadway right-of-way, and rarely results in vibration levels that cause damage to buildings in the vicinity. According to the FTA Noise and Vibration Manual, trucks rarely create vibration levels that exceed 0.012 in/sec PPV when they are on roadways. Therefore, automobiles accessing the project site or traveling along surrounding roadways would not exceed the County's vibration threshold. Impacts would be less than significant in this regard.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.3 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?

The nearest airport to the project site is the Redlands Municipal Airport located approximately 10 miles to the southwest. The Project is not within 2.0 miles of a public airport or within an airport land use plan. Additionally, there are no private airstrips located within the Project vicinity. Therefore, the Project would not expose people residing or working in the Project area to excessive airport- or airstrip-related noise levels and no mitigation is required.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

7 REFERENCES

1. California Department of Transportation, *California Vehicle Noise Emission Levels*, 1987.
2. California Department of Transportation, *Traffic Noise Analysis Protocol*, 2020.
3. California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.
4. California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2020.
5. Cowan, James P., *Handbook of Environmental Acoustics*, 1994.
6. Federal Highway Administration, *Noise Fundamentals*, 2017.
7. Federal Highway Administration, *Noise Measurement Handbook – Final Report*, 2018.
8. Federal Highway Administration, *Roadway Construction Noise Model*, 2006.
9. Federal Highway Administration, *Roadway Construction Noise Model User's Guide Final Report*, 2006.
10. Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, 1992.
11. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.
12. Linscott Law & Greenspan Engineers, *Traffic Circulation Analysis Scope of Work for Related Bristol Project*, 2022.
13. San Bernardino County, Development Code, 2023
14. San Bernardino County, General Plan, 2020
15. United States Environmental Protection Agency, *Protective Noise Levels (EPA 550/9-79-100)*, 1979.

Appendix A

Existing Ambient Noise Measurements

Noise Measurement Field Data

Project:	Hume SoCal	**Job Number:**	
Site No.:	ST-1	**Date:**	11/1/2023
Analyst:	Eric Wang & Tori Bucy	**Time:**	9:19 - 9-29 AM
Location:	NEC Green Valley Lake Rd, Camp Pondo entrance		
Noise Sources:	Traffic (autos), general nature		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
57.8	25.9	77.6	91.8

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	50
Wind (mph):	<5
Sky:	Clear
Bar. Pressure:	30.01
Humidity:	15%

Photo:

Summary

File Name on Meter	ST-1.030.s
File Name on PC	LxTse_0007061-20231101 091932-ST-1.(
Serial Number	0007061
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2023-11-01 09:19:32
Stop	2023-11-01 09:29:32
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre-Calibration	2023-11-01 08:51:15
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamplifier	Direct
Microphone Correction	FF:90 2116
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	A Weighting
OBA Max Spectrum	At LMax
Overload	122.4
	A
Under Range Peak	**78.6**
Under Range Limit	**14.5**
Noise Floor	5.4
	First
Instrument Identification	

Results	
LAeq	57.8
LAE	85.6
EA	40.171
LApeak (max)	2023-11-01 09:23:16
LASmax	2023-11-01 09:23:17
LASmin	2023-11-01 09:25:22
SEA	-99.9

	Exceedance Counts
LAS > 85.0 dB	0
LAS > 115.0 dB	0
LApeak > 135.0 dB	0
LApeak > 137.0 dB	0
LApeak > 140.0 dB	0

Community Noise	**Ldn**
	57.8

LCeq	62.2
LAeq	57.8
LCeq - LAeq	4.4
LAIeq	60.7
LAeq	57.8
LAIeq - LAeq	2.9

	dB
Leq	57.8
LS(max)	77.6
LS(min)	25.9
LPeak(max)	91.8

Overload Count	0
Overload Duration	0.0
OBA Overload Count	0
OBA Overload Duration	0.0

Noise Measurement Field Data

Project:	Hume SoCal	**Job Number:**	
Site No.:	ST-2	**Date:**	11/1/2023
Analyst:	Eric Wang & Tori Bucy	**Time:**	10:35 - 10:45 AM
Location:	NWC Badger Ln and Deep Creek Dr		
Noise Sources:	Breaker box, nature, traffic (ped and auto)		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
42.8	35.5	57.6	75.8

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	57
Wind (mph):	>5
Sky:	Clear
Bar. Pressure:	30.08
Humidity:	10%

Photo:

Kimley»Horn

Summary	
File Name on Meter	ST-1.034.s
File Name on PC	LxTse_0007061-20231101 103513-ST-1.(
Serial Number	0007061
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement	
Description	
Start	2023-11-01 10:35:13
Stop	2023-11-01 10:45:13
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre-Calibration	2023-11-01 08:51:15
Post-Calibration	None
Calibration Deviation	---

Overall Settings	
RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamplifier	Direct
Microphone Correction	FF:90 2116
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	A Weighting
OBA Max Spectrum	At LMax
Overload	122.4
	A
Under Range Peak	**78.6**
Under Range Limit	**14.5**
Noise Floor	5.4
	First
Instrument Identification	

Results	
LAeq	42.8
LAE	70.6
EA	1.270
LApeak (max)	2023-11-01 10:42:34
LASmax	2023-11-01 10:35:13
LASmin	2023-11-01 10:44:12
SEA	-99.9
	Exceedance Counts
LAS > 85.0 dB	0
LAS > 115.0 dB	0
LApeak > 135.0 dB	0
LApeak > 137.0 dB	0
LApeak > 140.0 dB	0
Community Noise	**Ldn**
	42.8
LCeq	57.0
LAeq	42.8
LCeq - LAeq	14.2
LAIeq	47.0
LAeq	42.8
LAIeq - LAeq	4.2
	dB
Leq	42.8
LS(max)	57.6
LS(min)	35.5
LPeak(max)	75.8
Overload Count	0
Overload Duration	0.0
OBA Overload Count	0
OBA Overload Duration	0.0

Noise Measurement Field Data

Project:	Hume SoCal	**Job Number:**	
Site No.:	ST-3	**Date:**	11/1/2023
Analyst:	Eric Wang & Tori Bucy	**Time:**	10:11-10:21 AM
Location:	By overhead transformer		
Noise Sources:	Nature, dogs, traffic (autos)		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
51.8	21.8	69.3	87.1

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	50
Wind (mph):	<5
Sky:	Clear
Bar. Pressure:	30.01
Humidity:	15%

Photo:

Kimley»Horn

Summary	
File Name on Meter	ST-1.033.s
File Name on PC	LxTse_0007061-20231101 101154-ST-1.(
Serial Number	0007061
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement	
Description	
Start	2023-11-01 10:11:54
Stop	2023-11-01 10:21:54
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre-Calibration	2023-11-01 08:51:15
Post-Calibration	None
Calibration Deviation	---

Overall Settings	
RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamplifier	Direct
Microphone Correction	FF:90 2116
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	A Weighting
OBA Max Spectrum	At LMax
Overload	122.4
	A
Under Range Peak	**78.6**
Under Range Limit	**14.5**
Noise Floor	5.4
	First
Instrument Identification	

Results	
LAeq	51.8
LAE	79.6
EA	10.090
LApeak (max)	2023-11-01 10:16:39
LASmax	2023-11-01 10:13:36
LASmin	2023-11-01 10:21:13
SEA	-99.9

	Exceedance Counts
LAS > 85.0 dB	0
LAS > 115.0 dB	0
LApeak > 135.0 dB	0
LApeak > 137.0 dB	0
LApeak > 140.0 dB	0

Community Noise	**Ldn**
	51.8

LCeq	56.1
LAeq	51.8
LCeq - LAeq	4.3
LAIeq	54.3
LAeq	51.8
LAIeq - LAeq	2.5

	dB
Leq	51.8
LS(max)	69.3
LS(min)	21.8
LPeak(max)	87.1

Overload Count	0
Overload Duration	0.0
OBA Overload Count	0
OBA Overload Duration	0.0

Noise Measurement Field Data

Project:	Hume SoCal	**Job Number:**	
Site No.:	ST-4	**Date:**	11/1/2023
Analyst:	Eric Wang & Tori Bucy	**Time:**	9:52 - 10:02 AM
Location:	SEC of private driveway on Green Valley Lake Rd		
Noise Sources:	Landscaping, nature, traffic (autos)		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
50.3	21.9	70.4	85.0

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	50
Wind (mph):	<5
Sky:	Clear
Bar. Pressure:	30.01
Humidity:	15%

Photo:

Kimley»Horn

Summary	
File Name on Meter	ST-1.032.s
File Name on PC	LxTse_0007061-20231101 095223-ST-1.(
Serial Number	0007061
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement	
Description	
Start	2023-11-01 09:52:23
Stop	2023-11-01 10:02:23
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre-Calibration	2023-11-01 08:51:15
Post-Calibration	None
Calibration Deviation	---

Overall Settings	
RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamplifier	Direct
Microphone Correction	FF:90 2116
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	A Weighting
OBA Max Spectrum	At LMax
Overload	122.4
	A
Under Range Peak	**78.6**
Under Range Limit	**14.5**
Noise Floor	5.4
	First
Instrument Identification	

Results	
LAeq	50.3
LAE	78.1
EA	7.143
LApeak (max)	2023-11-01 09:59:52
LASmax	2023-11-01 09:59:53
LASmin	2023-11-01 09:56:27
SEA	-99.9

	Exceedance Counts
LAS > 85.0 dB	0
LAS > 115.0 dB	0
LApeak > 135.0 dB	0
LApeak > 137.0 dB	0
LApeak > 140.0 dB	0

Community Noise	**Ldn**
	50.3

LCeq	57.7
LAeq	50.3
LCeq - LAeq	7.4
LAIeq	52.8
LAeq	50.3
LAIeq - LAeq	2.5

	dB
Leq	50.3
LS(max)	70.4
LS(min)	21.9
LPeak(max)	85.0

Overload Count	0
Overload Duration	0.0
OBA Overload Count	0
OBA Overload Duration	0.0

Noise Measurement Field Data

Project:	Hume SoCal	**Job Number:**	
Site No.:	ST-5	**Date:**	11/1/2023
Analyst:	Eric Wang & Tori Bucy	**Time:**	9:35 - 9:45 AM
Location:	SEC of Camp Cedar Crest Rd and Green Valley Lake Rd		
Noise Sources:	Traffic (auto and trucks), general nature, woodpecker		
Comments:			

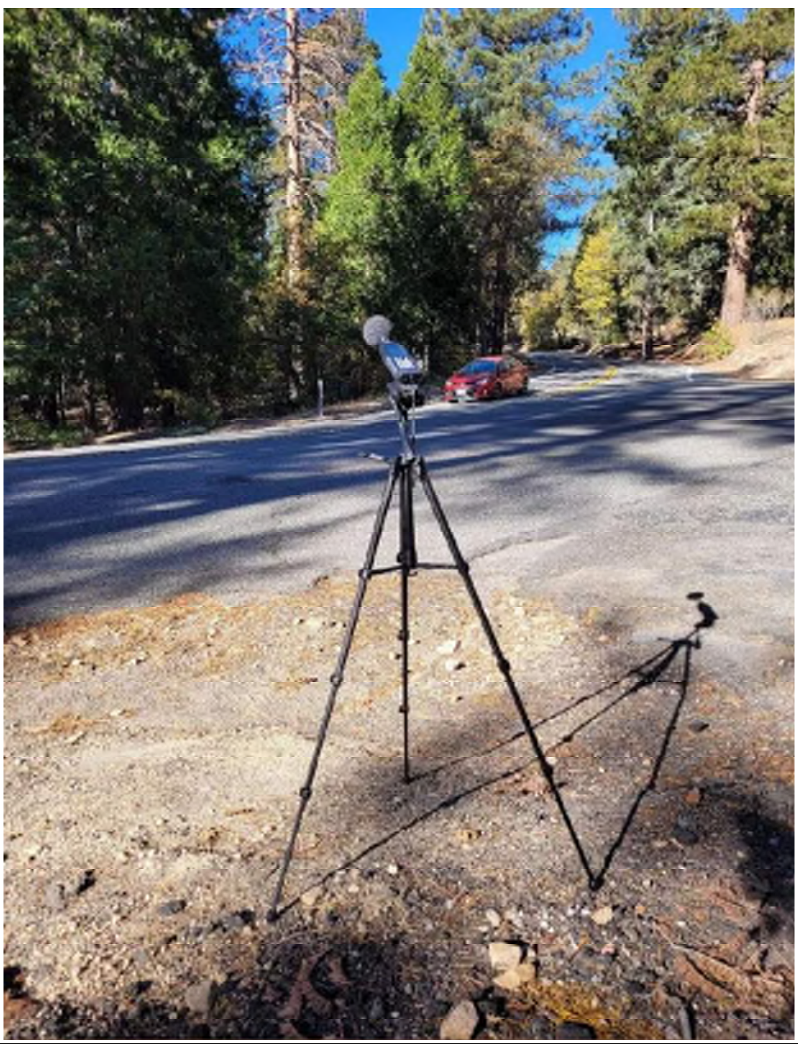
Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
60.3	22.3	78.7	90.4

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	50
Wind (mph):	<5
Sky:	Clear
Bar. Pressure:	30.01
Humidity:	15%

Photo:



Kimley»Horn

Summary	
File Name on Meter	ST-1.031.s
File Name on PC	LxTse_0007061-20231101 093522-ST-1.(
Serial Number	0007061
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement	
Description	
Start	2023-11-01 09:35:22
Stop	2023-11-01 09:45:22
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre-Calibration	2023-11-01 08:51:15
Post-Calibration	None
Calibration Deviation	---

Overall Settings	
RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamplifier	Direct
Microphone Correction	FF:90 2116
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	A Weighting
OBA Max Spectrum	At LMax
Overload	122.4
	A
Under Range Peak	**78.6**
Under Range Limit	**14.5**
Noise Floor	5.4
	First
Instrument Identification	

Results	
LAeq	60.3
LAE	88.1
EA	71.435
LApeak (max)	2023-11-01 09:42:11
LASmax	2023-11-01 09:42:12
LASmin	2023-11-01 09:43:43
SEA	-99.9
	Exceedance Counts
LAS > 85.0 dB	0
LAS > 115.0 dB	0
LApeak > 135.0 dB	0
LApeak > 137.0 dB	0
LApeak > 140.0 dB	0
Community Noise	**Ldn**
	60.3
LCeq	66.4
LAeq	60.3
LCeq - LAeq	6.1
LAIeq	61.3
LAeq	60.3
LAIeq - LAeq	1.0
	dB
Leq	60.3
LS(max)	78.7
LS(min)	22.3
LPeak(max)	90.4
Overload Count	0
Overload Duration	0.0
OBA Overload Count	0
OBA Overload Duration	0.0

Appendix B

Noise Modeling Data

Project: **Hume SoCal Campground Expansion**

Construction Noise Impact on Sensitive Receptors

Parameters

Construction Hours:	Daytime hours (7 am to 7 pm)	8
	Evening hours (7 pm to 10 pm)	0
	Nighttime hours (10 pm to 7 am)	0
Leq to L10 factor		3

	Receptor (Land Use)	Distance to: Closest Receptor (feet)	Avg Dist. (feet)	Shielding	Direction
1	Campground (Commercial)	1200	1,840	0	E

Construction Phase	Equipment Type	No. of Equip.	Acoustical Usage Factor	Reference Noise Level at 50ft per Unit, Lmax	Distance	RECEPTOR 1 Noise Level at Receptor 1, Lmax	Noise Level at Receptor 1, Leq
Demolition							
	Concrete Saw	1	20%	90	1200	62.0	55.0
	Excavator	3	40%	81	1840	54.2	50.2
	Dozer	1	40%	82	1840	50.4	46.4
	Dozer	1	40%	82	1200	54.1	50.1
Combined LEQ							**57.5**
Site Preparation							
	Tractor	1	40%	84	1200	56.4	52.4
	Tractor	1	40%	84	1200	56.4	52.4
	Tractor	2	40%	84	1840	55.7	51.7
	Dozer	3	40%	82	1840	55.2	51.2
Combined LEQ							**58.0**
Grading							
	Tractor	1	40%	84	1200	56.4	52.4
	Grader	1	40%	85	1200	57.4	53.4
	Dozer	1	40%	82	1840	50.4	46.4
	Scraper	2	40%	84	1840	55.3	51.3
	Tractor	1	40%	84	1840	52.7	48.7
Combined LEQ							**58.1**
Building Construction							
	Tractor	2	40%	84	1200	59.4	55.4
	Tractor	4	40%	84	1840	58.7	54.7
	Generator	1	50%	81	1840	49.3	46.3
	Crane	1	16%	81	1840	49.3	41.3
	Welder/Torch	1	40%	74	1840	42.7	38.7
Combined LEQ							**58.5**
Paving							
	Roller	2	20%	80	1200	55.4	48.4
	Paver	4	50%	77	1840	51.9	48.9
Combined LEQ							**51.7**
Architectural Coating							
	Compressor (air)	1	40%	78	1200	50.1	46.1
Combined LEQ							**46.1**

Source for Ref. Noise Levels: RCNM, 2005