E. NOISE

This section assesses the effects of the project on the noise environment within and around the study area of the Larkspur SMART Station Area Plan (Plan) area. The following discussion describes the general characteristics of sound and the categories of audible noise. The regulatory framework related to noise issues at the City, State and federal levels is then described. Lastly, potential noise impacts associated with implementation of the Station Area Plan are evaluated, and mitigation measures are recommended as necessary.

1. Setting

This section begins with an introduction to several key concepts and terms that are used in evaluating noise. It then explains the various agencies that regulate the noise environment in the City of Larkspur, and summarizes the applicable key standards. This setting section concludes with a description of current key noise sources that affect the City and the noise conditions that are experienced within the Plan area.

a. Characteristics of Sound. Noise is generally defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is the number of complete vibrations or cycles per second of a wave that results in the range of tone from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment, and it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments.

(1) Measurement of Sound. Sound is characterized by various parameters that describe the rate of oscillation (frequency) of sound waves, the distance between successive troughs or crests in the wave, the speed that it travels, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness (or amplitude) of an ambient sound, and the decibel (dB) scale is used to quantify sound intensity. A decibel (dB) is a unit of measurement which indicates the relative intensity of a sound. The 0 point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3 dB or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Increases of 5 dB or more are generally considered the smallest increase in noise levels to be readily perceptible in suburban or urban outdoor environments.

Because sound can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale[1] is used to keep sound intensity numbers at a convenient and manageable

[1] Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. The logarithmic decibel scale allows an extremely wide range of acoustic energy to be characterized in a manageable notation.

level. Thus, a 10 dBA increase in the level of a continuous noise represents a perceived doubling of loudness, while a 20 dBA increase is 100 times more intense, and a 30 dBA increase is 1,000 times more intense. As noise spreads from a source, it loses energy so that the farther away the noise receiver is from the noise source, the lower the perceived noise level. Noise levels diminish or attenuate as distance from the source increases based on an inverse square rule, depending on how the noise source is physically configured. Noise levels from a single-point source, such as a single piece of construction equipment at ground level, attenuate at a rate of 6 dB for each doubling of distance (between the single-point source of noise and the noise-sensitive receptor of concern). Heavily traveled roads with few gaps in traffic behave as continuous line sources and attenuate roughly at a rate of 3 dB per doubling of distance.

Since the human ear is not equally sensitive to all pitches (sound frequencies) within the entire spectrum, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity in a process called "A-weighting," expressed as "dBA." The dBA or A-weighted decibel refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. Table IV.E-1 contains a list of typical acoustical terms and definitions. Figure IV.E-1 shows representative noise sources and their corresponding noise levels in dBA.

Table IV.E-1: Definitions of Acoustical Terms

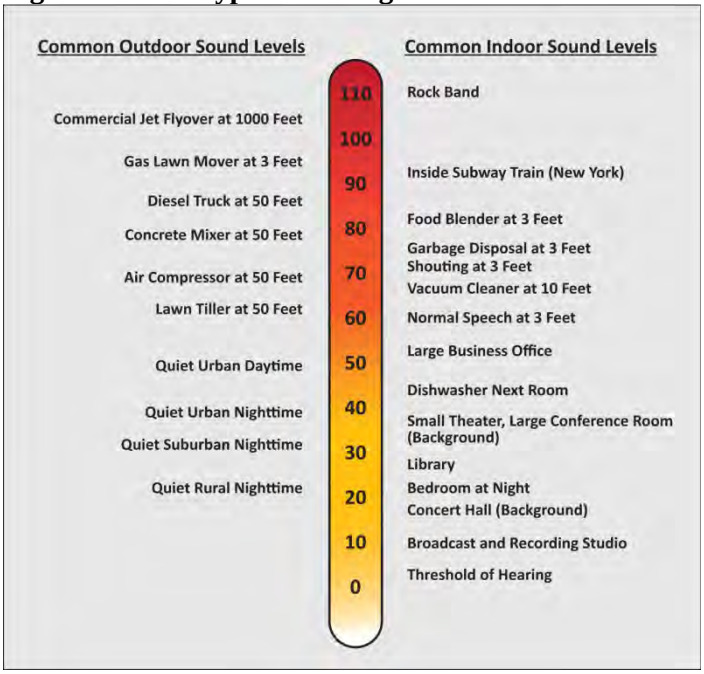
Term	Definitions
Decibel, dB	A unit of level that denotes the ratio between two quantities proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. 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. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period.
Equivalent Sound Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of five decibels to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.

Source: Harris, C.M., 1998. *Handbook of Acoustical Measurements and Noise Control.*

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time varying noise over a sample period. However, the predominant

rating scales for communities in the State of California are the Leq, the community noise equivalent level (CNEL), and the day-night average level (L_{dn}) based on A-weighted decibels (dBA). CNEL is the time varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly Leq for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale, but without the adjustment for events occurring during the evening relaxation hours. CNEL and L_{dn} are within one dBA of each other and are normally inter-changeable. The noise adjustments are added to the noise events occurring during the more sensitive hours. Typical A-weighted sound levels from various sources are described in Figure IV.E-1.

Figure IV.E-1: Typical A-Weighted Sound Levels



Source: Compiled by LSA Associates, Inc., 2013.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions, and addresses the annoying aspects of intermittent noise.

Noise impacts can be described in three categories. The first is audible impacts that refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3.0 dBA or greater, since, as described earlier, this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1.0 and 3.0 dBA. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise levels of less than 1.0 dBA that are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

(2) Psychological and Physiological Effects of Noise. According to the U.S. Department of Housing and Urban Development's 1985 Noise Guidebook, permanent physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 to 90 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, and thereby affecting blood pressure, functions of the ear, and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell

damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. To avoid adverse effects on human physical and mental health in the workplace or in communities, the U.S. Department of Labor, Occupation Health and Safety Administration (OSHA) requires the protection of workers from hearing loss when the noise exposure equals or exceeds an 8-hour time-weighted average of 85 dBA.[2]

Unwanted community effects of noise occur at levels much lower than those that cause hearing loss and other health effects. Noise annoyance occurs when it interferes with sleeping, conversation, noise-sensitive work, including learning or listening to radio, television, or music. According to the World Health Organization (WHO) noise studies, few people are seriously annoyed by daytime activities with noise levels below 55 dBA, or are only moderately annoyed with noise levels below 50 dBA.[3] Exposure to high noise levels is thought to affect the entire human system. In addition to hearing loss, WHO identified other potential health effects such as hypertension and heart disease (after many years of constant exposure to high noise levels in excess of 75 dBA). Noise can also adversely affect the nervous system, as well as trigger emotional reactions like anger, depression, and anxiety.

b. Characteristics of Groundborne Vibration. Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings. As the vibration propagates from the foundation throughout the remainder of the building, the vibration of floors and walls may cause perceptible vibration from the rattling of windows or a rumbling noise. The rumbling sound caused by the vibration of room surfaces is called groundborne noise. When assessing annoyance from groundborne noise, vibration is typically expressed as root mean square (rms) velocity in units of decibels of 1 micro-inch per second. To distinguish vibration levels from noise levels, the unit is written as "VdB." However, vibration impacts on building structures are generally assessed in terms of peak particle velocity (PPV). Human perception to vibration starts at levels as low as 67 VdB and sometimes lower. Annoyance due to vibration in residential settings starts at approximately 70 VdB. Groundborne vibration is almost never annoying to people who are outdoors. Although the motion of the ground may be perceived, without the effects associated with the shaking of the building, the motion does not provoke the same adverse human reaction.

In extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings. Common sources of groundborne vibration include trains and construction activities such as blasting, pile driving and operating heavy earthmoving equipment. Typical vibration source levels from construction equipment are shown in Table IV.E-2. Although the table gives one level for each piece of equipment, it should be noted that there is a considerable variation in reported ground vibration levels from construction activities. The data provides a reasonable estimate for a wide range of soil conditions.

[2] Occupational Safety & Health Administration, 2008. *Regulations, Standards 29 CFR, Occupational Noise Exposure 1910.95*. Website: www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9735.

[3] World Health Organization, 1999. *Guidelines for Community Noise, Geneva*. Website: www.who.int/docstore/peh/noise/guidelines2.html.

Factors that influence groundborne vibration include the:

- **Vibration Source**: Type of activity or equipment, such as impact or mobile, and depth of vibration source;
- **Vibration Path**: Soil type, rock layers, soil layering, depth to water table, and frost depth; and
- **Vibration Receiver**: Foundation type, building construction, and acoustical absorption.

Among these factors that influence groundborne vibration, there are significant differences in the vibration characteristics when the source is underground compared to at the ground surface. In addition, soil conditions are known to have a strong influence on the levels of groundborne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Vibration propagation is more efficient in stiff clay soils than in loose sandy soils, and shallow rock seems to concentrate the vibration energy close to the surface and can result in groundborne vibration problems at large distances from the source. Factors such as layering of the soil and depth to the water table can have significant effects on the propagation of groundborne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils.

Table IV.E-2: Typical Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft (in/sec)	Approximate VdB at 25 feet
Pile Driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	In soil	0.008	66
	In rock	0.017	75
Vibratory roller		0.210	94
Hoe ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Federal Transit Administration, 2006. *Transit Noise and Vibration Impact Assessment.* May.

c. Noise Regulatory Framework. The following section summarizes the regulatory framework related to noise, including federal, State and City of Larkspur plans, policies and standards.

(1) U.S. Environmental Protection Agency (EPA). In 1972, Congress enacted the Noise Control Act. This act authorized the EPA to publish descriptive data on the effects of noise and establish levels of sound "requisite to protect the public welfare with an adequate margin of safety." These levels are separated into health (hearing loss levels) and welfare (annoyance levels), as shown in Table IV.E-3. The EPA cautions that these identified levels are not standards because they do not take into account the cost or feasibility of the levels.

For protection against hearing loss, 96 percent of the population would be protected if sound levels are less than or equal to an $L_{eq}(24)$ of 70 dBA. The "(24)" signifies an L_{eq} duration of 24 hours. The EPA activity and interference guidelines are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. For outdoor and indoor environments, interference with activity and annoyance should not occur if levels are below 55 dBA and 45 dBA, respectively.

The noise effects associated with an outdoor L_{dn} of 55 dBA are summarized in Table IV.E-4. At 55 dBA L_{dn}, 95 percent sentence clarity (intelligibility) may be expected at 11 feet, and no community reaction. However, 1 percent of the population may complain about noise at this level and 17 percent may indicate annoyance.

(2) State of California. The State of California has established regulations that help prevent adverse impacts to occupants of buildings located near noise sources. Referred to as the "State Noise Insulation Standard," it requires buildings to meet performance standards through design and/or building materials that would offset any noise source in the vicinity of the receptor. State construction regulations include requirements that are intended to limit the extent of noise transmitted into habitable spaces of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings.

These requirements are found in the California Code of Regulations, Title 24 (known as the Building Standards Administrative Code), Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor ceiling assemblies must block or absorb sound. For limiting noise from exterior noise sources, the noise insulation standards set an interior standard of 45 dBA L_{dn} in any habitable room with all doors and windows closed. In addition, the standards require preparation of an acoustical analysis demonstrating the manner in which dwelling units have been designed to meet this interior standard, where such units are proposed in an area with exterior noise levels greater than 60 dBA L_{dn}.

Table IV.E-3: Summary of EPA Noise Levels

Effect	Level	Area
Hearing loss	$L_{eq}(24) \leq 70$ dB	All areas.
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq}(24) \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{eq} \leq 45$ dB	Indoor residential areas.
	$L_{eq}(24) \leq 45$ dB	Other indoor areas with human activities such as schools, etc.

Source: U.S. Environmental Protection Agency, 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. March.

Table IV.E-4: Summary of Human Effects in Areas Exposed to 55 dBA L_{dn}

Type of Effects	Magnitude of Effect
Speech – Indoors	100 percent sentence intelligibility (average) with a 5 dB margin of safety.
Speech – Outdoors	100 percent sentence intelligibility (average) at 1.4 feet. 99 percent sentence intelligibility (average) at 3.2 feet. 95 percent sentence intelligibility (average) at 11.5 feet.
Average Community Reaction	None evident; 7 dB below level of significant complaints and threats of legal action and at least 16 dB below "vigorous action."
Complaints	1 percent dependent on attitude and other non-level related factors.
Annoyance	17 percent dependent on attitude and other non-level related factors.
Attitude Towards Area	Noise essentially the least important of various factors.

Source: U.S. Environmental Protection Agency, 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. March.

The State has also established land use compatibility guidelines for determining acceptable noise levels for specified land uses.[4] The City has adopted and modified the State's land use compatibility guidelines as shown in Table IV.E-5 and discussed below.

(3) City of Larkspur. The City of Larkspur addresses noise in the Health & Safety Chapter of the General Plan[5] and in Chapter 9.54 of the Municipal Code.[6]

Applicable goals, policies and programs from the Health and Safety Element are listed below:

Health and Safety Element

Goal 11: Reduce the adverse effects of noise upon persons living or working in Larkspur.

- Policy u: Ensure that all new living and work areas are developed with acceptable noise environments.
    - Action Program [38]: Maintain the following standards for noise levels in new residential developments.

        a. Indoor noise levels should not exceed 45 dBA.

        b. Outdoor noise levels should not exceed 55 dBA.

      Noise can be reduced through site planning, architectural layout, noise barriers, and construction modifications.

      - Site Planning. By taking advantage of the natural shape and contours of the site, it is often possible to arrange buildings and other facilities to reduce and possibly eliminate noise impacts. Planned unit developments are particularly conducive to site planning techniques.
      - Architectural Layout. Bedrooms will be considerably quieter if placed on the side of the house facing away from a roadway. Similarly, balconies facing roadways should be avoided. Quiet outdoor spaces can be provided by creating a U-shaped development that faces away from the roadway.
      - Noise Barriers. Noise barriers must be massive enough to prevent significant noise transmission through them and high enough to shield the receiver from the noise source. While effective - because of their massiveness - noise walls are not appropriate in all locations. They work well along freeways and in larger developments. Access doors should be placed in the walls at regular intervals for use during emergencies.
      - Construction Modifications. In general, windows and doors are the acoustical "weak links" in a building. If other noise reduction measures are not sufficient, sealed windows on the noisy side of the building and an alternate means of ventilating the building may help. Beyond this, thicker window panes or double-glazed windows will be required. Doors should face away from the noise source. They should be solid-core and equipped with an appropriate acoustical door gasket.

[4] California, State of, 1998. Governor's Office of Planning and Research, *General Plan Guidelines, (Appendix A, Figure 2)*.

[5] Larkspur, City of, 1990. *California General Plan, Chapter 7.*

[6] Larkspur, City of, 2012. Larkspur Municipal Code, Chapter 9.54. May 2.

- Policy v: For non-residential projects, use the "Land Use Compatibility Standards," Figure 7-9 (of the General Plan), to evaluate their suitability in particular locations.
    - Action Program [39]: Require acoustical studies for all projects that would be exposed to noise levels in excess of those deemed normally acceptable, as defined in Figure 7-9 (of the General Plan).
    - Action Program [40]: Require thorough noise assessments in all environmental analyses of major projects.

The City's land use compatibility standards for new development are shown in Table IV.E-5. The standards show that environments with ambient noise levels of up to 55 dBA L_{dn} are considered normally acceptable for new residential development. Interior noise levels should be maintained so as to not exceed 45 dBA L_{dn} for new residential development. Project specific acoustical studies are required for all new development projects that would be exposed to noise levels in excess of the established normally acceptable noise standards for the indicated land use.

The City has established exterior noise limits in the Noise Ordinance of the Municipal Code. These standards restrict persons from creating, or causing to be created, noise that exceeds 50 dBA between 7:00 a.m. and 10:00 p.m. or exceeding 40 dBA between the hours of 10:00 p.m. and 7:00 a.m. for more than 30 minutes within any hour as measured at any receiving residential land use. In addition, noise levels are not permitted to exceed 60 dBA at any time for more than 30 minutes within any hour as measured at a receiving commercial land use. However, noise from construction, demolition, or paving activities are exempt from these exterior noise standards provided such activities occur between the hours of 7:00 a.m. and 6:00 p.m. on weekdays (excluding holidays), and between 9:00 a.m. and 5:00 p.m. on Saturdays, Sundays, and legal holidays. This exemption is granted provided that all powered construction equipment is equipped with intake and exhaust mufflers recommended by the manufacturers thereof. Pavement breakers and jackhammers shall also be equipped with acoustical attenuating shields or shrouds recommended by the manufacturers.

d. Existing Noise Environment. The ambient noise environment within the Plan area is impacted by a variety of noise sources. Dominant noise sources throughout the City include freeway, traffic, railroad, and stationary noise sources.

(1) Existing Ambient Noise Levels. LSA conducted ambient noise monitoring surveys on January 24, 2013. A Larson-Davis Model 720 sound level meter was used to conduct the ambient noise survey. Short-term, 15-minute, ambient noise level measurements were taken at six locations within the Plan area.

Figure IV.E-2, Noise Monitoring Locations, shows the locations of all six noise monitoring sites. Table IV.E-6 lists the six short-term noise monitoring results, and Table IV.E-7 describes each noise monitoring location and the audible noise sources at each location.

LSA

FIGURE IV.E-2

Noise Monitoring Location

0 500 1000
FEET

SOURCE: LSA ASSOCIATES, INC., 2013.

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City of Larkspur SMART Station Area Plan EIR

Noise Monitoring Locations

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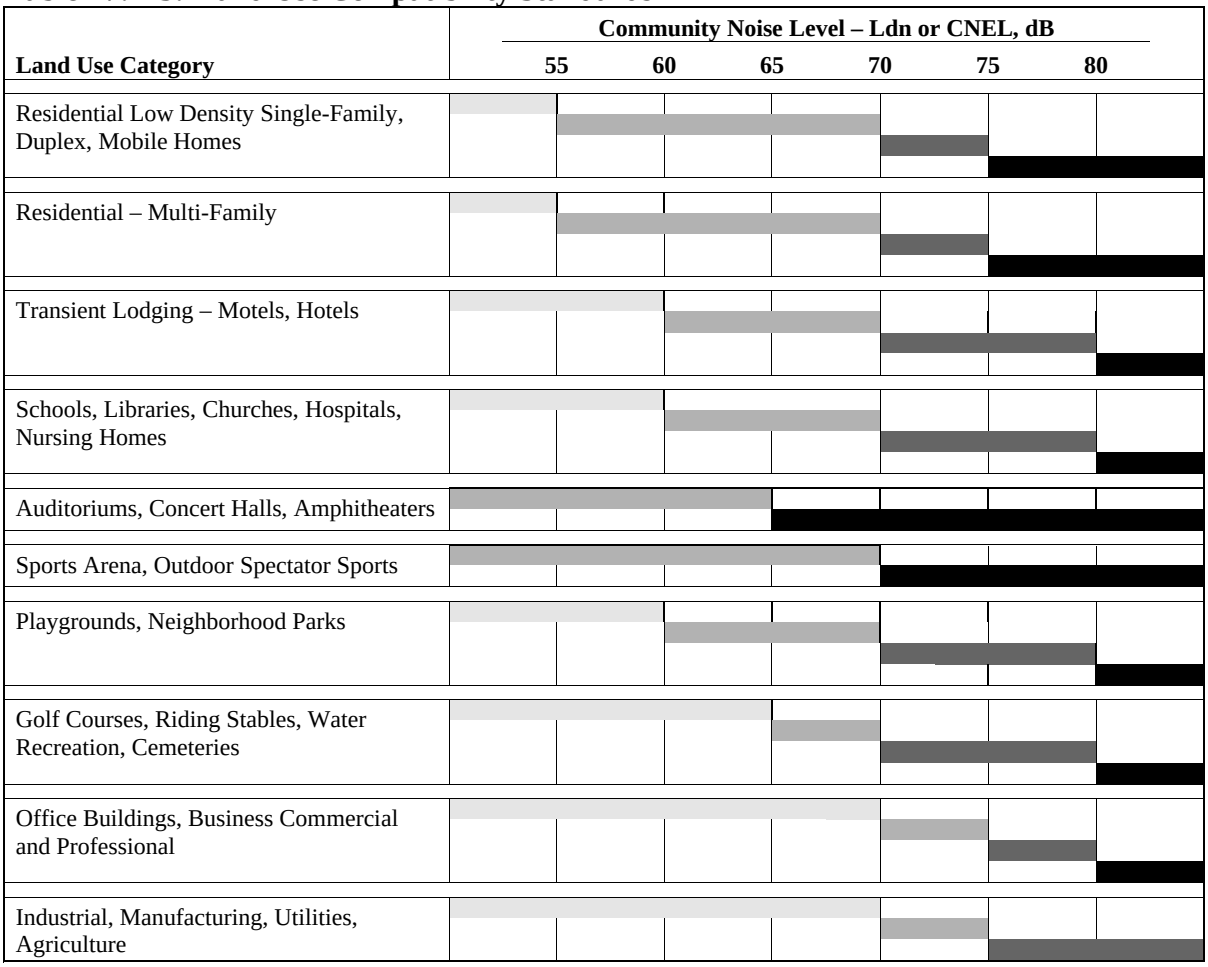
Table IV.E-5: Land Use Compatibility Standards



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.

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

CLEARLY UNACCEPTABLE
New construction or development clearly should not be undertaken.

Noise Source Characteristics
The land use/noise compatibility recommendations should be viewed in relation to the specific source of the noise. For example, aircraft and railroad noise is normally made up of higher single noise events than auto traffic, but occurs less frequently. Therefore, different sources yielding the same composite noise exposure do not necessarily create the same noise environment.

Suitable Interior Environments
One objective of locating both single and multi-family residential units relative to a known noise source is to maintain a suitable interior noise environment at no greater than 45 dB CNEL or Ldn. This requirement, coupled with the measured or calculated noise reduction performance of the type of structure under consideration, should govern the minimum acceptable distance to a noise source.

Source: State of California, Office of Noise Control, 1975, as modified by City of Larkspur, 1982.

Table IV.E-6: Short-Term (15-minute) Ambient Noise Monitoring Results Thursday, January 24, 2013

Site Number	Start Time	dBA L_{eq}	dBA L_{max}	dBA L_{min}
ST-1	11:31 a.m.	65.1	79.3	60.3
ST-2	1:53 p.m.	51.9	72.3	43.7
ST-3	10:53 a.m.	50.4	73.9	40.5
ST-4	12:39 p.m.	45.9	73.5	39.9
ST-5	3:17 p.m.	57.9	76.8	43.8
ST-6	12:08 p.m.	56.1	89.5	47.2

Source: LSA Associates, Inc., January 2013.

Table IV.E-7: Noise Monitoring Locations and Noise Sources

Site Number	Location Description	Noise Sources
ST-1	Marin RV Park pool deck	Traffic on U.S. 101
ST-2	Plaza between dwelling units	Delivery vehicles, HVAC on nearby commercial building
ST-3	Greenbrae School Park	Leaf blower 100 yards away, traffic on local streets
ST-4	Open courtyard by Building 19	Water feature, traffic on local streets, people conversing
ST-5	Neighborhood park adjacent to day care	Traffic on Larkspur Landing Road, distant freeway noise
ST-6	Outdoor use area of office complex	Traffic on U.S. 101 and local streets, people conversing, HVAC system

Source: LSA Associates, Inc., January 2013.

The noise monitoring results show that existing noise levels throughout the Plan area range from 45.9 to 65.1 dBA L_{eq}. In addition to vehicular traffic, other documented audible noise sources that contribute to the ambient noise environment include delivery loading/unloading operations, HVAC systems, lawn maintenance equipment, people conversing and children playing.

(2) Existing Traffic Noise Levels. Motor vehicles with their distinctive noise characteristics are a dominant noise source in Larkspur. The amount of noise varies according to many factors, such as volume of traffic, vehicle mix (percentage of cars and trucks), average traffic speed, and distance from the observer. Major contributing roadway noise sources in the vicinity of the Plan area include vehicular traffic on U.S. 101 and Sir Francis Drake Boulevard.

Existing traffic noise levels along local roadway segments throughout the Plan area were calculated using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA RD-77-108). This model data input requirements include traffic volumes, vehicle mix, vehicle speed, and roadway geometry to compute typical equivalent noise levels during daytime, evening, and nighttime hours. Traffic data used in the noise prediction model were obtained from the traffic analysis prepared by Fehr & Peers in the Traffic and Circulation section of this Draft EIR. The resultant noise levels were weighted and summed over 24-hour periods to determine the day-night average level (L_{dn}) values. L_{dn} is the 24 hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between

10:00 p.m. and 7:00 a.m. Existing traffic noise contours and noise levels along modeled roadway segments are shown in Table IV.E-8.

Table IV.E-8: Existing Traffic Noise Levels

Roadway Segment	Average Daily Trips	Centerline to 70 dBA L_{dn} (feet)	Centerline to 65 dBA L_{dn} (feet)	Centerline to 60 dBA L_{dn} (feet)	Centerline to 60 dBA L_{dn} (feet)	L_{dn} (dBA) 50 Feet From Centerline of Outermost Lane
Sir Francis Drake Boulevard – La Cuesta Drive to Eliseo Drive	41,200	72	148	316	679	69.8
Sir Francis Drake Boulevard – Eliseo Drive to U.S. 101 SB Ramps	47,900	79	163	349	750	70.5
Sir Francis Drake Boulevard – U.S. 101 NB Ramps to Larkspur Landing Circle	37,100	70	139	295	633	69.0
Sir Francis Drake Boulevard – Larkspur Landing Circle to Larkspur Landing Circle	23,700	< 50 [a]	104	219	470	67.4
Sir Francis Drake Boulevard – Larkspur Landing Circle to Drakes Cove Road	25,700	< 50	108	231	496	68.2
Eliseo Drive – Sir Francis Drake Boulevard to Bretano Way	4,100	< 50	< 50	< 50	71	55.9
Larkspur Landing Circle – Sir Francis Drake Boulevard to Old Quarry Road S.	8,900	< 50	< 50	57	118	58.7
Larkspur Landing Circle – Drakes Way to Sir Francis Drake Boulevard	7,100	< 50	< 50	< 50	102	57.8

[a] Traffic noise within 50 feet of roadway centerline requires site specific analysis.

Source: LSA Associates, Inc., 2013.

(3) Existing Aircraft Noise Levels. The San Francisco International Airport is located approximately 22 miles south of the Plan area and the Oakland International Airport is located approximately 21 miles southeast of the Plan area. The project site is located outside of the 65-CNEL noise contours for both the San Francisco International Airport and the Oakland International Airport. The San Rafael Private Heliport is located approximately 1.2 miles east of the Plan area.

(4) Railroad Noise Levels. Rail operations are a source of noise within cities with existing rail networks. While there are currently no active rail lines within the City of Larkspur, future build-out of the approved SMART rail line would include construction of the Larkspur SMART Station and the associated expanded rail line service that would occur within the Plan area. This rail line is expected to be located along the east side of U.S. 101 within the Plan area. Potential noise impacts from this rail line were analyzed in the *Sonoma-Marin Area Rail Transit (SMART) Final Environmental Impact Report*.[7] According to this report, cumulative daily noise exposure from passenger and freight rail operations at distances greater than 50 feet from the tracks would be less than 60 dBA L_{dn}. At a distance of 100 feet from the centerline of the railroad tracks, these noise levels

[7] Parsons Brinckerhoff, 2006. *Sonoma-Marin Area Rail Transit Project Final Environmental Impact Report*. June.

would attenuate to below 55 dBA L_{dn}, the level considered normally acceptable for outdoor use in residential areas.

(5) Existing Stationary Noise Sources. As summarized above in the regulatory discussion, stationary noise sources are regulated under Chapter 9.54, Noise Control Regulations, of the City's Municipal Code, which states that no person shall create, or cause to be created, any noise that exceeds the applicable exterior noise standards for the receiving land use.

Existing stationary noise sources throughout the Plan area include mechanical systems such as heating ventilation and cooling (HVAC) systems, delivery truck idling and loading/unloading activities, boat/ferry launching activities, recreational activities, and parking lot activities (such as slamming car doors and talking). Of these noise sources, noise generated by delivery truck activity typically generate the highest maximum noise levels. Delivery truck loading and unloading activities can result in maximum noise levels from 75 dBA to 85 dBA Lmax at 50 feet. Typical parking lot activities, such as people conversing or doors slamming, generates approximately 60 dBA to 70 dBA L_{max} at 50 feet.

2. Impacts and Mitigation Measures

This section analyzes the potential noise impacts that could result from implementation of the Station Area Plan. This section begins with a listing of criteria of significance, which establish the thresholds for determining whether an impact is significant. The latter part of this section presents the potential noise impacts associated with implementation of the project. Mitigation measures are recommended, as appropriate.

a. Criteria of Significance. Based on the CEQA Guidelines, a project would have a significant effect on the environment related to noise if it would substantially increase the ambient noise levels for adjoining areas or conflict with adopted environmental plans and goals of the community in which it is located. The following are the criteria of significance established by the City of Larkspur.

The project would have a significant effect pertaining to noise if it would:

- Expose persons to or generate noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive groundborne vibration and noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- Be located within 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, so that the project would result in exposure of people residing or working in the project area to excessive noise levels; or
- Be located within the vicinity of a private airstrip, so that the project would expose people residing or working in the project area to excessive noise levels.

b. Impacts Analysis. Noise impacts related to implementation of the Station Area Plan are discussed as follows.

(1) Noise Levels in Excess of Standards. Potential noise impacts could occur with implementation of the Station Area Plan including excessive noise associated with stationary, railroad, and traffic noise sources throughout the Plan area.

Stationary Noise Sources. Development associated with implementation of the Station Area Plan may include installation or creation of new stationary sources of noise. For commercial uses, these noise sources could include loading/unloading operations, generators, and outdoor speakers. For residential uses, stationary noise sources may include air conditioners or pool pumps. Of the on-site stationary noise sources, noise generated by delivery truck activity would generate the highest maximum noise levels. Delivery truck loading and unloading activities can result in maximum noise levels from 75 dBA to 85 dBA L_{max} at 50 feet. Representative parking activities, such as people conversing or doors slamming, would generate approximately 60 dBA to 70 dBA L_{max} at 50 feet. These stationary sources of noise would have the potential to disturb adjacent sensitive receptors. However, stationary noise sources within the City are regulated by the standards in the Noise Ordinance of the Municipal Code. Ordinance 9.54.040 Exterior Noise Limits establishes exterior noise limit standards that restrict persons from creating, or causing to be created, noise that exceeds 50 dBA between 7:00 a.m. and 10:00 p.m. or exceeding 40 dBA between the hours of 10:00 p.m. and 7:00 a.m. for more than 30 minutes within any hour as measured at any receiving residential land use. In addition, noise levels are not permitted to exceed 60 dBA at any time for more than 30 minutes within any hour as measured at a receiving commercial land use.

Implementation of the Station Area Plan could also result in the development of new sensitive land uses in the vicinity of existing stationary noise sources. However, the City's Land Use Compatibility Standards (shown in Table IV.E-5) require project-by-project environmental review to ensure that noise impacts from stationary sources are considered and mitigated for specific projects. Environments with ambient noise levels of up to 55 dBA L_{dn} are considered normally acceptable for new residential development and no mitigation would be required. However, new construction or development of residential land uses in environments with ambient noise levels above 55 dBA and up to 70 dBA L_{dn} would require detailed analysis of noise reduction requirements and noise insulation features to be included in the design to ensure that interior noise level standards are maintained. The noise monitoring results, shown in Table IV.E-6, show that existing noise levels throughout the Plan area range from 45.9 dBA to 65.1 dBA L_{eq}. A significant impact would occur if development of noise sensitive land uses occurred in locations within the Plan area that have documented ambient noise levels in excess of 55 dBA L_{dn}. Therefore, in order to reduce this impact to less-than-significant, the following mitigation measure shall be implemented.

<u>Impact NOISE-1</u>: Development associated with implementation of the Station Area Plan could expose persons to noise levels from stationary noise sources that are in excess of normally acceptable land use compatibility standards. (S)

<u>Mitigation Measure NOISE-1</u>: The following language shall be included as a Condition of Approval for new projects associated with implementation of the Station Area Plan:

- All proposed new development within the Plan area shall comply with the City's Municipal Code exterior noise limit standards as defined in Municipal Code 9.54.040 Exterior Noise

> Limits. In addition, the City shall require all proposed development of noise sensitive land uses within the Plan area, that would be exposed to average daily ambient noise levels in excess of the City's established normally acceptable standards for that land use, to submit an acoustical analysis prior to issuance of building permits. This analysis must be prepared by a qualified acoustical analyst and must specify noise insulation features to be incorporated into the project design that would reduce stationary noise impacts to meet the City's interior noise standard for such proposed land uses. Noise insulation features may include shielding to protect noise-sensitive outdoor activity areas or may include building sound insulation treatments such as sound-rated windows to protect interior spaces. (LTS)

Implementation of Mitigation Measure NOISE-1 would ensure that the exposure of sensitive receptors to excessive noise levels from stationary noise sources is sufficiently mitigated to be less-than-significant.

Railroad Noise Sources. As was noted in the setting discussion above, future build-out of the approved SMART rail line would include construction of the Larkspur SMART Station and operation of the associated rail line service. This rail line is expected to be located along the east side of U.S. 101 within the Plan area, ending at the proposed Larkspur SMART Ferry Terminal. Potential noise impacts from this rail line were analyzed in the *Sonoma-Marin Area Rail Transit (SMART) Final Environmental Impact Report*.[8] According to this report, cumulative daily noise exposure from passenger and freight rail operations at distances greater than 50 feet from the tracks would be less than 60 dBA L_{dn}. At a distance of 100 feet from the centerline of the railroad tracks, these noise levels would attenuate to below 55 dBA L_{dn}, which would meet the City's normally acceptable land use compatibility standard for residential development (see Table IV.E-5). Therefore, implementation of the Station Area Plan would not result in the exposure of sensitive receptors to excessive noise levels from railroad noise sources, and this impact would be considered less than significant and no additional mitigation measures are required.

Traffic Noise Sources. The FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate traffic-related noise conditions in the vicinity of the Plan area. The resultant noise levels were weighed and summed over a 24-hour period in order to determine the L_{dn} values. Table IV.E-9 summarizes traffic noise levels along modeled roadway segments under Existing and Existing Plus Project traffic conditions. Table IV.E-10 summarizes traffic noise levels under Cumulative and Cumulative Plus Project traffic conditions. The traffic noise model printouts for all calculations are included in Appendix D of this EIR.

[8] Parsons Brinckerhoff, 2006, op. cit.

Table IV.E-9: Existing and Existing Plus Project Traffic Noise Levels

Roadway Segment	Existing Plus Project ADT	L_{dn} (dBA) 50 Feet From Centerline of Outermost Lane		Increase from Existing Conditions	Significant increase over conditions without the project?
		Existing	Existing Plus Project		
Sir Francis Drake Boulevard – La Cuesta Drive to Eliseo Drive	42,000	69.8	69.9	0.1	No
Sir Francis Drake Boulevard – Eliseo Drive to U.S. 101 SB Ramps	49,200	70.5	70.6	0.1	No
Sir Francis Drake Boulevard – U.S. 101 NB Ramps to Larkspur Landing Circle	41,100	69.0	69.4	0.4	No
Sir Francis Drake Boulevard – Larkspur Landing Circle to Larkspur Landing Circle	25,900	67.4	67.8	0.4	No
Sir Francis Drake Boulevard – Larkspur Landing Circle to Drakes Cove Road	26,500	68.2	68.3	0.1	No
Eliseo Drive – Sir Francis Drake Boulevard to Bretano Way	4,200	55.9	56.0	0.1	No
Larkspur Landing Circle – Sir Francis Drake Boulevard to Old Quarry Road S.	9,900	58.7	59.2	0.5	No
Larkspur Landing Circle – Drakes Way to Sir Francis Drake Boulevard	9,500	57.8	59.0	1.2	No

Source: LSA Associates, Inc., 2013.

Table IV.E-10: Cumulative and Cumulative Plus Project Traffic Noise Levels

Roadway Segment	Cumulative Plus Project ADT	L_{dn} (dBA) 50 Feet From Centerline of Outermost Lane		Increase from Cumulative No Project Conditions	Significant increase over conditions without the project?
		Cumulative No Project	Cumulative Plus Project		
Sir Francis Drake Boulevard – La Cuesta Drive to Eliseo Drive	50,200	70.6	70.7	0.1	No
Sir Francis Drake Boulevard – Eliseo Drive to U.S. 101 SB Ramps	58,500	71.2	71.3	0.1	No
Sir Francis Drake Boulevard – U.S. 101 NB Ramps to Larkspur Landing Circle	52,800	70.2	70.5	0.3	No
Sir Francis Drake Boulevard – Larkspur Landing Circle to Larkspur Landing Circle	35,600	68.9	69.2	0.3	No
Sir Francis Drake Boulevard – Larkspur Landing Circle to Drakes Cove Road	37,500	69.7	69.8	0.1	No
Eliseo Drive – Sir Francis Drake Boulevard to Bretano Way	4,600	56.4	56.4	0.0	No
Larkspur Landing Circle – Sir Francis Drake Boulevard to Old Quarry Road S.	11,100	59.3	59.7	0.4	No
Larkspur Landing Circle - Drakes Way to Sir Francis Drake Boulevard	11,300	58.7	59.8	1.1	No

Source: LSA Associates, Inc., 2013.

A significant impact would occur if project-related traffic noise levels, as measured at proposed on-site noise sensitive land uses, would exceed the City's normally acceptable standard for that land use type. The City's Land Use Compatibility Standards (shown in Table IV.E-5) require project-by-project environmental review to ensure that noise impacts on new proposed development are considered and mitigated for specific projects. Environments with ambient noise levels of up to 55 dBA L_{dn} are considered normally acceptable for new residential development and no mitigation would be required. However, new construction or development of residential land uses in environments with ambient noise levels above 55 dBA and up to 70 dBA L_{dn} would require detailed analysis of noise reduction requirements and noise insulation features to be included in the design to ensure that interior noise levels are maintained.

According to the modeling results, traffic noise levels along Sir Francis Drake Boulevard would range from 68.3 dBA to 70.6 dBA L_{dn} under Existing Plus Project conditions as measured at 50 feet from the roadway centerline. Under Cumulative Plus Project conditions, traffic noise levels along Sir Francis Drake Boulevard would range from 69.2 dBA to 71.3 dBA L_{dn} as measured at 50 feet from the roadway centerline.

Based on the latest traffic counts available from Caltrans,[9] existing traffic noise levels along U.S. 101 range up to 79.1 dBA L_{dn} as measured at 50 feet from the centerline of the outermost travel lane. These noise levels attenuate to below 70 dBA L_{dn} at a distance of approximately 350 feet from the roadway centerline, and to below 55 dBA L_{dn} at a distance of approximately 3,500 feet from the roadway centerline.

It should be noted that these projected traffic noise levels along these modeled roadway segments do not take into account any existing sound walls or terrain features that could reduce traffic noise levels at adjacent land uses, but rather assume a worst-case direct line-of-sight over hard surface to the modeled traffic noise sources. This assumption and level of analysis is appropriate for a program-level noise analysis.

Thus, any new residential development within the Plan area along roadway segments that would experience traffic noise levels in excess of 55 dBA L_{dn} would be required to incorporate noise reduction features into the design of the project to reduce traffic noise impacts to a less-than-significant level. In addition, any new office, business, commercial or professional development that would experience traffic noise levels in excess of 70 dBA L_{dn} would require a similar noise impact analysis and appropriate mitigation.

Impact NOISE-2: Local traffic would generate long-term exterior noise exceeding normally acceptable levels (under the City's land use compatibility standards) within and in the vicinity of the Plan area and could expose sensitive land uses to unacceptable noise levels. (S)

[9] Caltrans, 2011. *Traffic and Vehicle Data Systems Unit*. Website: www.dot.ca.gov/hq/traffops/saferesr/trafdata/2011all/index.html.

Mitigation Measure NOISE-2: The following language shall be included as a Condition of Approval for new projects associated with implementation of the Station Area Plan:

- All proposed new development of noise sensitive land uses within the Plan area, that would be exposed to average daily ambient noise levels in excess of the City's established normally acceptable standards for that land use, is required to submit an acoustical analysis prior to issuance of building permits. This analysis must be prepared by a qualified acoustical analyst and must specify noise insulation features to be incorporated into the project design that would reduce traffic noise impacts to meet the City's interior noise standard for such proposed land uses. Noise insulation features may include shielding to protect noise-sensitive outdoor activity areas or may include building sound insulation treatments such as sound-rated windows to protect interior spaces. (LTS)

Implementation of Mitigation Measure NOISE-2 would ensure that the exposure of sensitive receptors to excessive noise levels from traffic noise sources is sufficiently mitigated to be less-than-significant.

(2) Generate Excessive Groundborne Vibration. Common sources of groundborne vibration and noise include trains and construction activities such as blasting, pile driving and operating heavy earthmoving equipment. No permanent noise sources that would expose persons to excessive groundborne vibration or noise levels are proposed as part of the Station Area Plan. There are no existing permanent sources of groundborne vibration or noise in the Station Area Plan area vicinity that could impact proposed sensitive land uses. However, construction activities associated with projects that could occur under the Station Area Plan could result in exposure of sensitive land uses to excessive groundborne vibration and noise levels. Problems, such as disturbance, due to groundborne vibration and noise from these sources are usually contained to areas within about 100 feet of the vibration source.[10] Typical groundborne vibration levels measured at a distance of 50 feet from heavy construction equipment in full operation, such as vibratory rollers, range up to approximately 94 VdB. These vibration levels would not be expected to cause damage to residential buildings of normal northern California construction. However, such vibration levels can cause annoyance for occupants of nearby buildings. In order to reduce exposing persons to excessive groundborne vibration and noise levels, the following mitigation measure, enforcing best management practices, shall be implemented.

Impact NOISE-3: Construction activities associated with implementation of the Station Area Plan could create significant short-term vibration impacts on nearby sensitive land uses. (S)

The following mitigation measure would reduce construction-related vibration impacts resulting from development associated with implementation of the Station Area Plan to a less-than-significant level.

Mitigation Measure NOISE-3: The following language shall be included as a Condition of Approval for new projects associated with implementation of the Station Area Plan:

[10] U.S. Department of Transportation, 1995. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*. April.

- In the event that pile driving would be required for any proposed project within the Plan area, all residents within 600 feet of the project site shall be notified of the schedule for its use a minimum of one week prior to its commencement. The contractor shall implement "quiet" pile driving technology (such as pre-drilling of piles, the use of more than one pile driver to shorten the total pile driving duration, or the use of portable acoustical barriers) where feasible, in consideration of geotechnical and structural requirements and conditions.
- The project contractor shall phase demolition, earth-moving, and ground-impacting operations so as not to occur in the same time period. Unlike noise, the total vibration levels produced could be significantly less when each vibration source operates separately.
- The project contractor shall select demolition methods not involving impact, where possible (for example, milling generates lower vibration levels than excavation using clam shell or chisel drops).
- The project contractor shall avoid using vibratory rollers and packers near sensitive areas whenever possible. (LTS)

Implementation of Mitigation Measure NOISE-3 would ensure that the exposure of sensitive receptors to excessive groundborne vibration levels from demolition and construction activities is sufficiently mitigated to be less-than-significant.

(3) Substantial Permanent Increase in Ambient Noise Levels. Implementation of the Station Area Plan would result in increased ambient noise levels within the Plan area. Increases in ambient noise levels would result from projected increases in average daily vehicle trips, as well as from new stationary noise sources such as new mechanical equipment, new parking lot activity, and new loading and unloading activity within the Plan area. While stationary noise sources could result in temporary noise increases in their immediate vicinity, implementation of Mitigation Measure NOISE-1 would reduce this impact to less-than-significant.

Under Existing Plus Project conditions, modeled roadway segments throughout the Plan area would experience increases in traffic noise levels ranging from 0.1 dBA to 1.2 dBA compared to Existing Conditions without the project. These modeled roadway segments would experience traffic noise level increases ranging from 0.0 dBA to 1.1 dBA under Cumulative Plus Project conditions compared to levels that would exist under cumulative conditions without the project. Increases in noise levels of less than 3 dBA are essentially undetectable to the human ear in outdoor environments.

Due to the logarithmic nature of noise addition, a 20 percent increase in traffic volumes will result in only a 1 decibel increase in the average noise level. Total projected trips with implementation of the Station Area Plan would not result in even a 20 percent increase in the total average daily traffic volume on U.S. 101. Therefore, the project would not create a substantial permanent increase in traffic noise and this impact would be less-than-significant.

(4) Substantial Temporary or Periodic Increase in Ambient Noise Levels. Construction activities associated with implementation of the Station Area Plan could result in substantial temporary or periodic increases in ambient noise levels near construction sites throughout the Plan area.

Two types of short-term noise impacts would occur during demolition, site preparation, and construction of proposed projects. The first type would result from the increase in traffic flow on local streets, associated with the transport of workers, equipment, and materials to and from project sites. The transport of workers and construction equipment and materials to project sites within the Plan area would incrementally increase noise levels on access roads leading to the sites.

The second type would result from equipment use and activities associated with demolition, site preparation, and construction of proposed projects. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These phases would change the character of the noise generated on project sites and, therefore, the noise levels surrounding sites as construction progresses.

Table IV.E-11 lists typical maximum noise levels for various pieces of construction equipment, as measured at a distance of 50 feet from the operating equipment. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. The site preparation phase, which includes excavation and grading, tends to generate the highest noise levels, because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backhoes, bulldozers, draglines, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings. Typical maximum noise levels during the site preparation phase of construction can range up to 91 dBA L_{max} at 50 feet from multiple pieces of operating equipment.

Table IV.E-11: Typical Construction Equipment Maximum Noise Levels, L_{max}

Type of Equipment	Range of Maximum Sound Levels (dBA at 50 feet)	Suggested Maximum Sound Levels for Analysis (dBA at 50 feet)
Pile Drivers	81 to 96	93
Rock Drills	83 to 99	96
Jackhammers	75 to 85	82
Pneumatic Tools	78 to 88	85
Pumps	74 to 84	80
Scrapers	83 to 91	87
Haul Trucks	83 to 94	88
Cranes	79 to 86	82
Portable Generators	71 to 87	80
Rollers	75 to 82	80
Dozers	77 to 90	85
Tractors	77 to 82	80
Front-End Loaders	77 to 90	86
Hydraulic Backhoe	81 to 90	86
Hydraulic Excavators	81 to 90	86
Graders	79 to 89	86
Air Compressors	76 to 89	86
Trucks	81 to 87	86

Source: Bolt, Beranek & Newman, 1987. *Noise Control for Buildings and Manufacturing Plants.*

Construction of specific projects envisioned with implementation of the Station Area Plan would require the use of earthmovers such as bulldozers and scrapers, loaders and graders, water trucks, and pickup trucks. Pile driving could also be used as a construction technique for some projects based on geologic constraints. As shown in Table IV.E-11, the typical maximum noise level generated by backhoes on the proposed project site is assumed to be 86 dBA L_{max} at 50 feet from the operating equipment. The maximum noise level generated by bulldozers is approximately 85 dBA L_{max} at 50 feet. Noise level generated by pile driving can range up to 93 dBA L_{max} at 50 feet from the operating equipment. Each doubling of the sound sources with equal strength would increase the noise level by 3 dBA. Assuming each piece of construction equipment operates at some distance apart from the

other equipment, the worst-case combined noise level during the loudest phase of construction would be 94 dBA L_{max} at a distance of 50 feet.

Noise from construction, demolition, or paving activities are exempt from the City's exterior noise standards of the Noise Ordinance of the Municipal Code, provided such activities occur between the hours of 7:00 a.m. and 6:00 p.m. on weekdays (excluding holidays), and between 9:00 a.m. and 5:00 p.m. on Saturdays, Sundays, and legal holidays. This exemption is granted provided that all powered construction equipment is equipped with intake and exhaust mufflers recommended by the manufacturers. Pavement breakers and jackhammers shall also be equipped with acoustical attenuating shields or shrouds recommended by the manufacturers thereof.

Impact NOISE-4: Construction activities associated with implementation of the Station Area Plan could create significant short-term noise impacts on nearby sensitive land uses. (S)

The following mitigation measure would reduce construction-related noise impacts resulting from development associated with implementation of the Station Area Plan to a less-than-significant level.

> Mitigation Measure NOISE-4: The following language shall be included as a Condition of Approval for new projects associated with implementation of the Station Area Plan:
>
> - Construction contractors shall ensure that all powered construction equipment are equipped with intake and exhaust mufflers recommended by the manufacturers thereof. Pavement breakers and jackhammers shall also be equipped with acoustical attenuating shields or shrouds recommended by the manufacturers thereof.
> - Where feasible, construction contractors shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
> - Construction contractors shall, to the maximum extent practical, locate on-site equipment staging areas so as to maximize the distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
> - Construction contractors shall ensure that all noise producing construction activities, including warming-up or servicing equipment and any preparation for construction, shall be limited to the hours between 7:00 a.m. and 6:00 p.m. on weekdays (excluding holidays), and between 9:00 a.m. and 5:00 p.m. on Saturdays, Sundays, and legal holidays. (LTS)

Implementation of the multi-part Mitigation Measure NOISE-4 would sufficiently mitigate construction-related noise impacts to a less-than-significant level.

(5) Excessive Aircraft Noise. The San Francisco International Airport is located approximately 22 miles south of the Plan area and the Oakland International Airport is located approximately 21 miles southeast of the Plan area. The project site is located outside of the 65-CNEL noise contours for the both the San Francisco International Airport and the Oakland International Airport. The San Rafael Private Heliport is located approximately 1.2 miles east of the Plan area. While aircraft overflight noise is occasionally audible within the Plan area, due to the distance of the Plan area from surrounding airports, and due to the orientation of the runway approaches, the Plan area lies outside the 60 dBA CNEL contours of these airports. Therefore, development associated with implementation of the Station Area Plan would not expose people working or residing in the Plan area vicinity to excessive aircraft-related noise levels. This impact would be less than significant.

c. Cumulative Impacts of the Station Area Plan. A project would make a significant contribution to a cumulative noise impact if it results in a significant contribution to an environment with existing noise levels in excess of normally acceptable standards for the designated land uses. As described previously, traffic noise levels under Cumulative Plus Project conditions would result in increases along modeled roadway segments ranging up to 1.1 dBA compared to traffic noise levels under Cumulative conditions without the project. As noted in the traffic noise impact discussion in subsection (1) above, existing traffic noise levels along U.S. 101 are in excess of 55 dBA L_{dn} for the entire Plan area (up to 3,500 feet from the roadway centerline, assuming a direct line of sight). Therefore, noise level increases of up to 1.1 dBA along local roadway segments would not be perceptible compared to existing noise levels from traffic on U.S. 101. The project's contribution to the cumulative noise environment would be considered less-than-significant.