4.10 NOISE

This section identifies noise conditions at the project site and in the surrounding area and evaluates the potential impacts pertaining to noise conditions due to project implementation. Information in this section is based on the following references: the *City of Fairfield General Plan* Health and Safety Element, the *City of Fairfield Municipal Code,* and the Federal Transit Administration's *Noise and Vibration Impact Assessment Manual* (FTA Manual).[1,2,3]

In *California Building Industry Association v. Bay Area Air Quality Management District*, the Supreme Court of California ruled that "CEQA generally does not require an analysis of how existing environmental conditions will affect a project's future users or residents."[4] With this ruling, CEQA no longer considers the impact of the environment on a project to be an environmental impact, unless the project could exacerbate an existing environmental hazard. Therefore, an EIR is not required to include an evaluation of whether the project would have the potential to expose project site residential receptors to excessive noise from existing noise sources near the project site, and such an analysis is not included the impact analysis below. However, the *City of Fairfield General Plan* requires that a noise analysis be completed for a residential project to ensure that the residents are not exposed to noise levels in excess of General Plan standards. To address this requirement, an analysis of noise levels that would be experienced in the exterior recreational areas, such as the swimming pool area, as well as inside the proposed apartments was conducted. That analysis is presented in **Appendix IA**.

4.10.1 Environmental Setting

4.10.1.1 Noise and Vibration Fundamentals

Characteristics of Sound. Noise is usually 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 generally causes annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; 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 is the average rate of sound energy transmitted through a unit area perpendicular to the direction in which the sound waves are traveling. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

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1 City of Fairfield. 2004. *City of Fairfield General Plan* Health and Safety Element. October.

2 City of Fairfield. 2022. *City of Fairfield Municipal Code*.

3 Federal Transit Administration (FTA). 2018. Office of Planning and Environment. *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual). FTA Report 0123. September.

4 *Cal. Building Industry Assn. v. Bay Area Air Quality Mgmt. Dist.* (2015) 62 Cal.4th 369, 386.

Measurement of Sound. Sound intensity is measured with the A-weighted decibel (dBA) scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound, similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represent 1,000 times as much acoustic energy as 0 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the sound's loudness. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound levels dissipate exponentially with distance from their noise sources. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment. Line source sound levels decrease 4.5 dB for each doubling of distance in a relatively flat environment with absorptive vegetation.

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. The 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 human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels. CNEL is the time-weighted average noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noises 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 relaxation hours. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City uses the L_{dn} noise scale for long-term traffic noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts, which are increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this increase in noise levels 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 dB and 3 dB. This range of noise level increase has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels have the potential to result in noise impacts.

Physiological Effects of Noise. Physical damage to human hearing begins at prolonged exposure to sound levels higher than 85 dBA. Exposure to high sound levels affects the entire system, with prolonged sound exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. Extended periods of sound exposure above 90 dBA have the potential to result in permanent cell damage. When the sound level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of sound is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by a feeling of pain in the ear (i.e., the threshold of pain). A sound level of 160–165 dBA will result in dizziness or a loss of equilibrium.

Table 4.10.A: Definitions of Acoustical Terms, lists definitions of acoustical terms, and **Table 4.10.B: Common Sound Levels and Their Noise Sources**, shows common sound levels and their sources.

Fundamentals of Vibration. Vibration refers to ground-borne noise and perceptible motion. Ground-borne noise is generally not a problem because noise arriving via the normal airborne path is usually greater than ground-borne noise. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) of the vibration source, although there are examples of ground-borne vibration causing interference at distances greater than 200 ft. When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible.

Table 4.10.A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of sound measurement that denotes the ratio between two quantities that are 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 1 second (i.e., the 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 that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period, respectively.
Equivalent Continuous Noise 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 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA 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 dBA 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 from many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content, as well as the prevailing ambient noise level.

Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991)[5].

5 Harris, Cyril M., editor. 1991. *Handbook of Acoustical Measurements and Noise Control, Third Edition*.

Table 4.10.B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	Reference level
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2022).

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings. Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize the potential for damage to structures. Vibration velocity level in decibels is defined as

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where “L_v” is the vibration velocity in decibels (VdB), “V” is the RMS velocity amplitude, and “V_{ref}” is the reference velocity amplitude, or 1×10^{-6} inches/second (in/sec) used in the United States.

4.10.1.2 Existing Noise Environment

The noise environment in the project area is affected by a variety of noise sources, including vehicle traffic, aircraft, commercial, and industrial noise. The primary existing noise and vibration sources in the project area are transportation facilities, including Business Center Drive, Green Valley Road, and Interstate 80 (I-80) as well as parking lot noise associated with the neighboring office uses. At the time that this analysis was prepared, the neighboring parcel to the south is under construction. Noise generated at that site would also have an influence on the ambient noise environment at surrounding uses. The following section describes the existing noise environment and identifies the primary noise sources in the vicinity of the project site.

Existing Transportation Related Noise. Motor vehicles with their distinctive noise characteristics are a major source of noise in the project area. 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. Traffic noise depends primarily on traffic speed (high-frequency tire noise increases with speed) and the proportion of truck traffic, which generates engine, exhaust and wind noise. The proximity of major streets makes the project site susceptible to traffic noise.

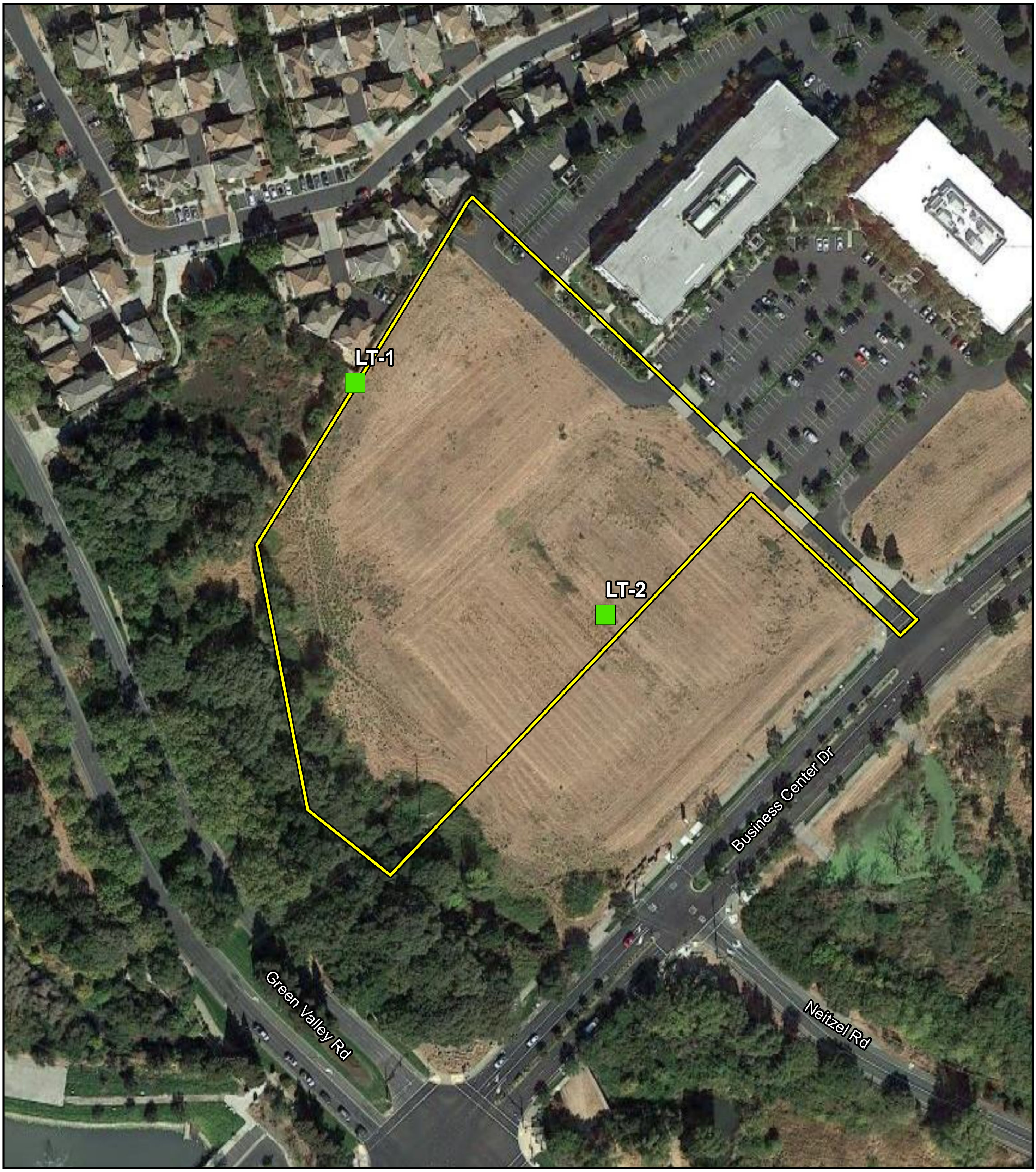
Existing Commercial/Industrial/Office Noise. Commercial and office use activity is a minor noise source at the project site. Automobile and truck access, vehicles parking, and loading/unloading activities are all associated with the parking lots and buildings located to the east of the proposed project.

Existing Aircraft Noise. The closest airport to the project site is Napa County Airport, located approximately 7.5 miles west of the project site. According to the *Napa County General Plan* (2008), the project site is located well outside the 55 dBA CNEL noise contour associated with the airport.[6] Travis Air Force Base is located about 10 miles east of the project site, and the project site is also located outside the 60 dBA CNEL noise contour associated with that airport.

Existing Sensitive Land Uses. Certain land uses are considered more sensitive to noise than others. Examples of these include residential areas, transient lodging, educational facilities, hospitals, childcare facilities, and senior housing. The current nearest sensitive uses to the project site are single-family homes adjacent to the northern property line. A hotel is currently under construction on the parcel between the project site and Business Center Drive. Once completed and occupied (anticipated in May 2023), the hotel would be considered a sensitive receptor that would be exposed to noise from the project site. Other sensitive uses, such as an assisted living facility and a medical center, are located more than 0.25 mile northeast from the project site.

Noise Level Monitoring. To assess the existing noise conditions in the project vicinity, noise measurements were conducted at the project site. Due to existing construction activities to the south of the project site, two long-term (24-hour) measurements were taken from February 27, 2022, to February 28, 2022, to assess typical ambient noise levels on the project site. Based on noise measurement results, the land uses in the vicinity of the project site are exposed to noise levels between 58.5 dBA L_{dn} and 62.0 dBA L_{dn} primarily associated with vehicle traffic noise and railroad events. Noise measurement locations are shown in **Figure 4.10-1: Noise Monitoring Locations** and the results are summarized in **Table 4.10.C: Existing Noise Level Measurements.** Noise measurement data information is provided in **Appendix IB** of this EIR.

6 Napa County. 2008. *Napa County General Plan*. June 3.



LEGEND

Project Location

Long-term Noise Monitoring Location

0 80 160
FEET

SOURCE: Google (2021)

FIGURE 4.10-1

Green Valley 3 Apartments Project

Noise Monitoring Locations

I:\BTI2101\GIS\MXD\Noise_Locations.mxd (5/13/2022)

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Table 4.10.C: Existing Noise Level Measurements

Location Number	Location Description	Daytime Noise Levels[1] (dBA L_{eq})	Nighttime Noise Levels[2] (dBA L_{eq})	Average Daily Noise Levels (dBA L_{dn})	Primary Noise Sources
LT-1	Northern property line, near the southwest corner of the rear yard at 515 Malvasia Court.	50.5 – 60.0	49.7 – 59.3	61.8	Traffic on Green Valley Road, Business Center Drive, I-80, Community Park, and Business Park activities
LT-2	Southern boundary of the project site, approximately 260 ft north of Business Center Drive.	48.7 – 55.9	47.1 – 54.6	58.2	Traffic on I-80, Green Valley Road, Business Center Drive, Business Park activities

Source: Compiled by LSA (February 2022).
[1] Daytime Noise Levels = noise levels during the hours of 7:00 a.m. to 7:00 p.m.
[2] Nighttime Noise Levels = noise levels during the hours of 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
ft = foot/feet
I-80 = Interstate 80
L_{eq} = equivalent continuous sound level
L_{dn} = Day/Night Noise Level

4.10.2 Regulatory Setting

The following discusses applicable standards and policies related to noise, including those from federal, state, regional, and local agencies.

4.10.2.1 Federal Laws and Regulations

No federal laws or regulations are applicable to private residential development projects such as the proposed project. However, construction noise and vibration impact criteria developed by the Federal Transit Administration (FTA) are used in this analysis to analyze construction noise and ground-borne vibration impacts of the proposed project. Therefore, FTA guidance for construction noise and ground-borne vibration impact assessment is summarized below.

Federal Transit Administration. Criteria that may be used to evaluate the significance of construction noise are set forth in the FTA Manual. FTA's Detailed Analysis Construction Noise Criteria presents a daytime noise level standard of 80 dBA L_{eq} and a nighttime noise level standard of 70 dBA L_{eq}. The FTA Manual also gives guidance that construction noise levels should be based on the composite noise levels of the two noisiest pieces of equipment per construction phase.

The vibration impact criteria included in the FTA Manual are shown in **Table 4.10.D: Ground-Borne Vibration Impact Criteria for Assessing Human Annoyance**. The criteria account for variation in project types as well as the frequency of events, which differ widely among projects. When there are fewer events per day, it takes higher vibration levels to evoke the same community response. This is accounted for in the criteria by distinguishing between projects with frequent and infrequent events, in which the term "frequent events" is defined as more than 70 events per day.

Table 4.10.D: Ground-Borne Vibration Impact Criteria For Assessing Human Annoyance

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 µin/sec)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB

Source: *Noise and Vibration Impact Assessment Manual,* Table 6-3 (FTA 2018).
[1] Frequent events are defined as more than 70 vibration events of the same source per day.
[2] Occasional events are defined as between 30 and 70 vibration events of the same source per day.
[3] Infrequent events are defined as fewer than 30 vibration events of the same source per day.
[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
µin/sec = microinches per second
dB = decibels
FTA = Federal Transit Administration
HVAC = heating, ventilation, and air-conditioning
VdB = vibration velocity decibels

The criteria for potential building damage from ground-borne vibration and noise are based on the maximum levels for a single event. **Table 4.10.E: Construction Vibration Structure Damage Criteria** lists the potential vibration structure damage criteria associated with construction activities, as suggested in the FTA Manual. FTA guidelines show that a vibration level of up to 102 VdB (equivalent to 0.5 in/sec in PPV) is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster), and would not result in any construction vibration damage. For a non-engineered (those not designed by an engineer or architect) timber and masonry building, the construction vibration structure damage criterion is 94 VdB (0.2 in/sec in PPV).

Table 4.10.E: Construction Vibration Structure Damage Criteria

Building Category	PPV (in/sec)	Approximate L_V (VdB)[1]
Reinforced concrete, steel, or timber (no plaster)	0.50	102
Engineered concrete and masonry (no plaster)	0.30	98
Non-engineered timber and masonry	0.20	94
Buildings extremely susceptible to vibration damage	0.12	90

Source: *Noise and Vibration Impact Assessment Manual,* Table 7-5 (FTA 2018).
[1] RMS VdB re 1 µin/sec.
µin/sec = microinches per second
FTA = Federal Transit Administration
in/sec = inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity in decibels

4.10.2.2 State Laws and Regulations

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

4.10.2.3 Local Plans and Regulations

City of Fairfield General Plan. The following policies of the *City of Fairfield General Plan* pertaining to noise would be applicable to the proposed project:

> **Policy HS 9.1:** Ground transportation noise: The compatibility of proposed projects with existing and future noise levels due to ground transportation noise sources shall be evaluated by comparison to Table HS-1 where the existing or future noise level from ground transportation noise sources is determined to exceed the standards of Table HS-1. Noise levels in outdoor activity areas and interior spaces shall be mitigated to the levels shown in Table HS-1.

Consistent with this policy, noise levels in outdoor activity areas and interior spaces shall be mitigated to the levels shown in **Table 4.10.F: Maximum Allowable Noise Exposure to Ground Transportation Noise Sources**, included below.

> **Policy HS 9.2:** Aircraft noise: All new land use proposals shall comply with the basic and supporting land use compatibility criteria of the Travis AFB Land Use Compatibility Plan (LUCP) and the Land Use Compatibility Plan for Travis Aero Club for aircraft generated community noise.

> **Policy HS 9.3:** Non-transportation noise: Noise created by new non-transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards of Table HS-2. Where proposed non-transportation noise sources are likely to produce noise levels exceeding the performance standards of Table HS-2, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.

Table 4.10.F: Maximum Allowable Noise Exposure to Ground Transportation Noise Sources

Land Use	Outdoor Activity Areas[1]	Interior Spaces	
	L_{dn}/CNEL, dB	L_{dn}/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	--
Transient lodging	60[3]	45	--
Hospitals, nursing homes	60[3]	45	--
Theaters, auditoriums, music halls	--	--	35
Churches, meeting halls	60[3]	--	40
Office buildings	--	--	45
Schools, libraries, museums	--	--	45
Playgrounds, neighborhood parks	70	--	--

Source: *City of Fairfield, Fairfield General Plan* Health and Safety Element, Table HS-1, October 2004.

1 Where the location of outdoor activity areas is unknown, the exterior noise-level standard shall be applied to the property line of the receiving land use.

2 As determined for a typical worst-case hour during periods of use.

3 Where it is not possible to reduce noise in outdoor activity areas to 60 dB L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB L_{dn}/CNEL may be allowed provided that available exterior noise-level reduction measures have been implemented and interior noise levels are in compliance with this table.

-- = not applicable
CNEL = Community Noise Equivalent Level
dB = decibel(s)
L_{dn} = day/night average noise level
L_{eq} = equivalent continuous sound level

Consistent with this policy, noise created by new non-transportation noise sources shall be mitigated so as not to exceed the interior and exterior noise level standards as shown in **Table 4.10.F: Maximum Allowable Noise Exposure to Ground Transportation Noise Sources**, included below.

> **Policy HS 9.4:** Non-transportation noise: New development of noise sensitive land uses shall not be allowed where the noise level due to non-transportation noise sources will exceed the standards shown in **Table 4.10.G** above. Where noise sensitive land uses are proposed in areas exposed to existing or projected exterior non-transportation noise levels exceeding the performance standards shown in **Table 4.10.G** above, an acoustical analysis shall be required so that noise mitigation may be included in the project design.

Table 4.10.G: Noise-Level Performance Standards for New Projects Affected by or Including Non-Transportation Sources

Land Use	Noise-Level Descriptor	Exterior Noise-Level Standard (Applicable at Property Line)		Interior Noise-Level Standard	
		Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Residential	L_{eq}	50	45	40	35
	L_{max}	70	65	60	55
Transient lodging, hospitals, nursing homes	L_{eq}	--	--	40	35
	L_{max}	--	--	60	55
Theaters, auditoriums, music halls	L_{eq}	--	--	35	35
Churches, meeting halls	L_{eq}	--	--	40	40
Office Buildings	L_{eq}	--	--	45	--
Schools, libraries, museums	L_{eq}	--	--	45	--
Playgrounds, parks	L_{eq}	65	--	--	--

Source: *City of Fairfield General Plan*, Health and Safety Element, Table HS-2, page HS-15, October 2004.
Notes: Each of the noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or recurring impulsive noises. These noise-level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwelling).
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level

Policy HS 9.5: All acoustical analyses required by the Noise Component of the Health and Safety Element shall:

- Be the responsibility of the applicant.
- Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.
- Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions.
- Estimate existing and projected (20 years) noise levels in terms of L_{dn} and/or the standards shown in **Table 4.10.G** above, and compare those levels to the policies of this Element.

- Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of this Element. Where the noise source in question consists of intermittent single events, the report must address the effects of maximum noise levels in sleeping rooms in terms of possible sleep disturbance.

- Estimate noise exposure after the prescribed mitigation measures have been implemented.

- Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation measures.

Policy HS 9.6: The City shall utilize procedures for project review and issuance of building permits to ensure that noise mitigation measures identified in an acoustical analysis are implemented in the project design.

Policy HS 9.7: The City shall require monitoring of compliance with the standards of the Noise Element after completion of projects where noise mitigation measures have been required.

City of Fairfield Municipal Code. Chapter 25, Article X – Noise Regulations, Section 25.1404 Specific Prohibitions, of the City's Municipal Code states the following:

> "No person shall do, cause or suffer or permit to be done on any premises owned, occupied or controlled by such person, any of the following acts:
>
> Construction activities – Operating or permitting the operation of any tools or equipment used in construction, grading or demolition works between the hours of 10:00 p.m. and 7:00 a.m. except by written permission of the Director of Public Works."

Chapter 25, Article X – Noise Regulations, Section 25.1405 Exemptions, of the City's Municipal Code states the following:

> "Sound or noise emanating from the following sources and activities are exempt from the provisions of this ordinance:
>
> A. Sound sources typically associated with residential uses (e.g., children at play, air conditioning and similar equipment, but not including barking dogs)."

4.10.3 Significance Criteria

The significance criteria for noise and vibration impacts used in this analysis are consistent with Appendix G of the *State CEQA Guidelines*. The proposed project may be deemed to have a significant impact with respect to noise and vibration if it would result in:

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

- **Generation of excessive groundborne vibration or groundborne noise levels.**

- **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.**

4.10.3.1 Non-Transportation-related Noise Thresholds

Based on the City's non-transportation noise exposure limits for sensitive uses identified in **Table 4.10.G**, a significant non-transportation-related operational noise impact would occur if exterior locations at nearby residential uses were to experience non-transportation noise levels above 50 dBA L_{eq} and 70 dBA L_{max} between 7:00 a.m. and 10:00 p.m. and 45 dBA L_{eq} and 65 dBA L_{max} between 10:00 p.m. and 7:00 a.m. due to the proposed project.

4.10.3.2 Transportation-related Noise Thresholds

Changes in noise levels of less than 3 dBA are typically not noticed by the human ear. Changes from 3 to 5 dBA would be noticed by some individuals who are sensitive to changes in noise. A 5 dBA increase is readily noticeable. Based on this information, the following thresholds were used in this EIR to evaluate the significance of the project-related transportation noise increases:

- An increase of 5 dBA or greater in noise level that occurs from project-related traffic would be considered significant where existing or projected future traffic noise levels are less than 60 dBA L_{dn}.

- An audible increase of 3 dBA or greater in noise level that occurs from project-related traffic would be considered significant where existing or projected future traffic noise levels are 60 dBA L_{dn} or greater.

4.10.3.3 Construction Noise Thresholds

The *City of Fairfield Municipal Code* exempts construction-generated noise that occurs between the hours of 7:00 a.m. to 10:00 p.m. from noise standards set forth in **Table 4.10-G**. The City directs construction activities to avoid the more noise sensitive hours (e.g., evening, nighttime, early morning) and to ensure construction equipment is equipped with noise control devices. This helps reduce the level of disturbance attributable to construction noise. Because the *Fairfield Municipal Code* exempts construction-generated noise between the hours of 7:00 a.m. and 10:00 p.m. in order to assess the potential for a construction noise impact in this EIR, the FTA criterion of 80 dBA L_{eq} is considered appropriate and is used in the analysis below to determine whether the project construction activities could result in a significant noise impact.

4.10.3.4 Vibration Thresholds

A significant vibration impact would occur if estimated vibration levels exceed the standards listed in **Table 4.10.D** or **Table 4.10.E** during either construction or operation of the proposed project.

4.10.4 Methodology

Noise levels associated with project-related construction activities were calculated using the FHWA Roadway Construction Noise Model (RCNM) and combined with existing ambient noise level readings to determine new ambient noise levels with construction activities. Construction vibration levels were calculated and compared to the applicable FTA vibration criteria.

Noise from stationary sources includes noise generated by residential activity, such as heating, ventilation, and air conditioning (HVAC), and on-site parking noise. Average noise levels for such activities were compared to the existing ambient sound level readings.

Traffic noise in the project area was modeled using average daily traffic (ADT) which was provided by the project's transportation impact assessment.[7] The noise levels from future traffic conditions were compared to existing traffic noise levels to determine whether traffic increased enough to result in an audible noise level increase.

4.10.5 Project Impacts

The following describes the potential impacts pertaining to noise conditions that could result from implementation of the proposed project. As applicable, conditions of approval (COAs) and mitigation measures are presented to reduce significant impacts.

4.10.5.1 Temporary or Permanent Noise Increase

Impact NOI-1: Project construction activities would generate a substantial temporary 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.

Two types of short-term/temporary noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise-exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to 84 dBA L_{max}), the effect on longer-term ambient noise levels would be small when compared to existing daily traffic volumes on Business Center Drive. Because construction-related vehicle trips would not approach existing daily traffic volumes, traffic noise would not increase by 3 dBA CNEL. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Furthermore, there are no noise-sensitive receptors located along the routes that construction traffic would use to travel between the project site and the nearby freeways.

[7] Fehr & Peers. 2022. Green Valley 3 Apartment Complex Traffic Volumes. April.

Therefore, short-term, construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated on the project site during construction, which includes site preparation, grading, foundation and utility work, building construction, paving, and architectural coating on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the project site and, therefore, the noise levels surrounding the site as construction progresses. Further, construction activities and their durations would vary from one part of the project site to the other. 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. **Table 4.10.H: Typical Construction Equipment Noise Levels** lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor, taken from the FHWA *Roadway Construction Noise Model*.[8]

In addition to the reference maximum noise level, the usage factor provided in **Table 4.10.H** is used to calculate the hourly noise level impact for each piece of equipment based on the following equation:

$$L_{eq}(equip) = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right)$$

where: $L_{eq}(equip)$ = L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. = noise emission level of the particular piece of equipment at a reference distance of 50 ft.

U.F. = usage factor that accounts for the fraction of time that the equipment is in use over the specified period of time.

D = distance from the receiver to the piece of equipment.

Each piece of construction equipment operates as an individual point source. Using the following equation, a composite noise level can be calculated when multiple sources of noise operate simultaneously:

$$Leq\ (composite) = 10 * \log_{10}\left(\sum_{1}^{n} 10^{\frac{Ln}{10}}\right)$$

8 Federal Highway Administration (FHWA). 2006. Highway Construction Noise Handbook. Roadway Construction Noise Model, FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. NTIS No. PB2006-109012. August.

Table 4.10.H: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 Ft[2]
Auger Drill Rig	20	84
Backhoes	40	80
Compactor (ground)	20	80
Compressor	40	80
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklift	20	85
Front-end Loaders	40	80
Graders	40	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Trencher	50	80
Welder	40	73

Source: FHWA Roadway Construction Noise Model User's Guide, Table 1 (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.
1 Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.
2 Maximum noise levels were developed based on Specification 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
FHWA = Federal Highway Administration
ft = foot/feet
L_{max} = maximum instantaneous sound level

Using the equations from the methodology above, the reference information in **Table 4.10.H,** and the construction equipment list provided, the composite noise level of the two loudest pieces of equipment during each construction phase was calculated. It should be noted that project construction would not include equipment such as pile drivers, rock drills, or jackhammers. The project construction composite noise levels at a distance of 50 ft would range from 74 dBA L_{eq} to 82 dBA L_{eq} with the highest noise levels occurring during the rough grading phase.

Once composite noise levels are calculated, reference noise levels can then be adjusted for distance using the following equation:

$$Leq\ (at\ distance\ X) = Leq\ (at\ 50\ feet) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

In general, this equation shows that doubling the distance would decrease noise levels by 6 dBA while halving the distance would increase noise levels by 6 dBA. Using this equation, noise levels that would be received at the nearest sensitive receptors were calculated. **Table 4.10.I: Potential Construction Noise Impacts at Nearest Receptors** shows the nearest sensitive uses to the project site, their distance from the center of construction activities, and composite noise levels expected during construction. These noise level projections do not consider intervening topography or the existing property line wall to the north. Construction equipment calculations are provided in **Appendix IB.**

Table 4.10.I: Potential Construction Noise Impacts at Nearest Receptors

Receptor (Location)	Composite Noise Level (dBA L_{eq}) at 50 ft[1]	Distance (ft)	Composite Noise Level (dBA L_{eq})
Residential (North)	82	210	70
Hotel (South)	82	280	67

Source: Compiled by LSA (2022).
[1] The composite construction noise level represents the rough grading phase which is expected to result in the greatest noise level as compared to other phases.
dBA L_{eq} = average A-weighted hourly noise level

While construction noise will vary, it is expected that composite noise levels during construction would average 70 dBA L_{eq} at the nearest sensitive residential receptor to the north during daytime hours. However, when grading activities are closer to the property line, based on a distance of 20 feet from source to receptor, noise levels would approach 90 dBA L_{eq}. It is also expected that composite noise levels during construction would average 67 dBA L_{eq} at the hotel receptor to the south during daytime hours, and when grading activities are closer to the property line, based on a distance of 70 feet from source to receptor, noise levels would approach 79 dBA L_{eq}.

As stated above, noise impacts associated with construction activities are regulated by the City's noise ordinance. The proposed project would comply with the construction hours specified in the City's Noise Ordinance, which states that construction activities are allowed between the hours of 7:00 a.m. and 10:00 p.m. on weekdays. Adherence to the hours specified in the Noise Ordinance and avoidance of construction activities during nighttime hours would help avoid adverse effects such as annoyance and sleep interference. However, during the daytime, construction activities would have the potential to reach 90 dBA L_{eq} and exceed the FTA 80 dBA L_{eq} construction noise standard at one or more of the adjacent sensitive receptors, and the impact from construction noise would be significant. **Mitigation Measures NOI-1 through NOI-5,** which are set forth below, would reduce construction noise by at least 10 dBA. With the implementation of the mitigation measures, noise levels would be reduced by approximately 13 dBA to 77 dBA L_{eq} and would be below the 80 dBA L_{eq} construction noise standard, as supported by the calculation in **Appendix IB**.

Though construction noise activities may, at times, result in noise levels that are elevated above ambient levels at the nearby receptors, there would be no permanent health effects. The Occupational Safety and Health Administration requires hearing conservation plans when noise levels continuously exceed 85 dBA over an 8-hour period. With mitigation, the predicted noise levels at the nearest receptors would not exceed this 85 dBA level over an 8-hour period. Therefore, construction noise would not result in adverse health effects related to pain, the onset of hearing loss or other significant health effects.

Level of Significance prior to Mitigation: Potentially Significant

Mitigation Measures: The following mitigation measures are required to reduce ambient noise levels during construction.

MM NOI-1 The construction contractor shall ensure that construction activities and equipment use, whose specific location on the site may be flexible (e.g., operation of compressors and generators, cement mixing, general truck idling), shall be conducted as far as possible from the nearest noise- and vibration-sensitive land uses, and natural and/or manmade barriers (e.g., intervening construction trailers) shall be used to screen propagation of noise from such activities towards these land uses. These activities shall be located in the southeast quadrant of the project site, as feasible.

MM NOI-2 The construction contractor shall ensure that a minimum 12-foot-high barrier, such as plywood structures or flexible sound control curtains, shall be erected on the project site boundary adjacent to the sensitive receptors to minimize the amount of noise during construction. A 12-foot-high construction noise barrier would provide approximately 13 dBA reduction to the closest residential receptors to the north.

MM NOI-3 The construction contractor shall ensure the use of power construction equipment with state-of-the-art noise shielding and muffling devices. This specification shall be included on all project plans.

MM NOI-4 The construction staging area shall be as far as possible from sensitive receptors. Staging shall occur in the southeast quadrant of the project site, as feasible.

MM NOI-5 The construction contractor shall ensure that no less than two weeks prior to commencement of construction, notification shall be provided to the off-site residential, hotel, school, and church uses within 500 feet of the project site that discloses the construction schedule, including the types of activities and equipment that would be used throughout the duration of the construction period. Contact information shall also be posted where readily visible to the public.

Level of Significance after Mitigation: Less than Significant

Impact NOI-2: Project occupancy and operations would not generate a substantial temporary 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.

Project occupancy and operations would add new noise sources to the project site and would have the potential to increase noise levels on and in the vicinity of the project site. The potential increase in noise levels on site and along roadways that would experience traffic increases due to the proposed project are analyzed below.

Operational Project Traffic Noise Impacts on Off-Site Receptors. The guidelines included in the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108) were used to evaluate traffic-related noise conditions along roadway segments in the project vicinity. This model requires various parameters, including traffic volumes provided by the proposed project traffic study, vehicle mix, vehicle speed, and roadway geometry, to compute typical equivalent noise levels during daytime, evening, and nighttime hours.[9] The resultant noise levels are weighted and summed over 24-hour periods to estimate the L_{dn} values. **Table 4.10.J: Existing Traffic Noise Levels Without and With the Project** and **Table 4.10.K: Opening Year Traffic Noise Levels Without and With the Project** provide the existing traffic noise levels with and without project and opening year with and without project scenarios, respectively. These noise levels represent the worst-case scenario, which assumes no shielding is provided between the traffic and the location where the noise contours are drawn. The standard vehicle mix for California roadways was used for traffic on these roadway segments. **Appendix IB** provides the specific assumptions used in developing these noise levels and model printouts.

Tables 4.10.J and **4.10.K** show that the increase in project-related traffic noise would be no greater than 0.2 dBA in the existing and opening year. Noise level increases below 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, traffic noise impacts from project-related traffic on off-site sensitive receptors would be less than significant, and no noise reduction measures are required.

Operational Stationary-Source Noise Impacts on Off-Site Receptors. The proposed project would include heating, ventilation, and air conditioning (HVAC) equipment as well as a parking garage that would have the potential to increase noise levels on the project site and affect nearby off-site receptors.

HVAC Equipment. Primary HVAC equipment would be located on the rooftop of the apartment building and would be shielded by a mechanical screen. The equipment would be located approximately 120 ft to the southwest of the nearest sensitive receptor, located to the north of the project site. Based on a 6 dBA reduction per doubling of distance, the noise level from the equipment would be reduced by 27 dBA L_{eq} at the nearest receptor. Additionally, the proposed mechanical screen wall around rooftop equipment would provide a minimum of 7 dBA of noise reduction.

In order to avoid a significant impact, noise levels generated by HVAC equipment should be 45 dBA or less at the sensitive receptor. Taking into account the distance and noise barrier reduction, the baseline noise level of the HVAC equipment should be 79 dBA or less at 5 ft (45 dBA + 7 dBA +27 dBA = 79 dBA). Research of several manufacturers' (e.g., Trane) technical data revealed that that there are residential air conditioners with noise levels with an approximate range from 42.3 to 60.3 dBA L_{eq} when measured at a distance of 5 ft. Should the project install

9 Fehr & Peers. 2022. op. cit.

Table 4.10.J: Existing Traffic Noise Levels Without and With Project

Roadway Segment	Without Project Traffic Conditions					With Project Traffic Conditions					
	ADT	Centerline to 70 dBA L_{dn} (ft)	Centerline to 65 dBA L_{dn} (ft)	Centerline to 60 dBA L_{dn} (ft)	L_{dn} (dBA) 50 ft from Centerline of Outermost Lane	ADT	Centerline to 70 dBA L_{dn} (ft)	Centerline to 65 dBA L_{dn} (ft)	Centerline to 60 dBA L_{dn} (ft)	L_{dn} (dBA) 50 ft from Centerline of Outermost Lane	Increase from Baseline Conditions
Green Valley Road, south of Business Center Drive	23,100	< 50	164	497	67.6	23,600	70	167	508	67.7	0.1
Lopes Road, south of I-80 ramps	12,200	< 50	89	264	65.4	12,300	< 50	90	266	65.4	0.0
Business Center Drive, east of Green Valley Road	12,100	< 50	89	262	65.3	12,600	< 50	92	273	65.4	0.1
Business Center Drive, west of Westamerica Drive	7,400	< 50	61	163	63.1	7,700	< 50	63	169	63.3	0.2
Suisun Valley Road, south of Business Center Drive	11,700	< 50	92	255	64.7	11,700	< 50	92	255	64.7	0.0
Pittman Road, south of I-80 ramps	14,300	< 50	102	309	66.1	14,300	< 50	102	309	66.1	0.0

Source: Compiled by LSA (2022).

ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
I-80 = Interstate 80
L_{dn} = day/night average noise level

Table 4.10.K: Opening Year Traffic Noise Levels Without and With Project

Roadway Segment	Without Project Traffic Conditions					With Project Traffic Conditions					
	ADT	Centerline to 70 dBA L_{dn} (ft)	Centerline to 65 dBA L_{dn} (ft)	Centerline to 60 dBA L_{dn} (ft)	L_{dn} (dBA) 50 ft from Centerline of Outermost Lane	ADT	Centerline to 70 dBA L_{dn} (ft)	Centerline to 65 dBA L_{dn} (ft)	Centerline to 60 dBA L_{dn} (ft)	L_{dn} (dBA) 50 ft from Centerline of Outermost Lane	Increase from Baseline Conditions
Green Valley Road, south of Business Center Drive	29,200	79	204	628	68.6	29,700	80	207	638	68.7	0.1
Lopes Road, south of I-80 ramps	14,200	< 50	102	307	66.0	14,300	< 50	103	309	66.1	0.1
Business Center Drive, east of Green Valley Road	16,500	< 50	117	356	66.6	17,000	< 50	121	367	66.7	0.1
Business Center Drive, west of Westamerica Drive	9,900	< 50	76	215	64.4	10,200	< 50	78	222	64.5	0.1
Suisun Valley Road, south of Business Center Drive	13,600	< 50	103	295	65.4	13,600	< 50	103	295	65.4	0.0
Pittman Road, south of I-80 ramps	16,000	< 50	113	345	66.6	16,000	< 50	113	345	66.6	0.0

Source: Compiled by LSA (2022).
ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
I-80 = Interstate 80
L_{dn} = day/night average noise level

HVAC equipment with noise levels of 60.3 dBA L_{eq} to serve the nine apartments closest to the single-family residential uses to the north and accounting for distance and barrier reduction, noise levels at the nearest single-family homes would approach 36 dBA L_{eq}. A noise level of 36 dBA L_{eq} would be less than 50 L_{eq} during the daytime and 45 L_{eq} during the night-time which are the thresholds for the evaluation of non-transportation noise impacts (see **Table 4.10.G**) and much lower than the existing quietest nighttime ambient noise level which is 49.7 dBA L_{eq}.

Due to the low noise level generated, noise generated by HVAC systems would not exceed the ambient noise levels and would be exempt from complying with the specific noise standards presented in the *City of Fairfield Municipal Code* per Section 25.1405. Therefore, any impact from HVAC equipment noise would be less than significant.

Parking Garage. The operation of the proposed project would include a two (2) level parking structure. Based on reference noise level measurements gathered by LSA, noise levels from parking activities, such as persons conversing and slamming doors, would generate hourly noise levels of up to 64.0 dBA L_{eq} at 15 ft. The closest sensitive uses to the proposed parking garage are located at a distance of approximately 50 ft. to the north. Assuming a reduction of 6 dBA per doubling of distance and a minimum reduction of 5 dBA provided by the existing 7.0 ft high property line wall, noise levels from the proposed parking garage are expected to approach 48.0 dBA L_{eq}. This level is below the hourly noise levels measured at LT-1 (see **Figure 4.10-1**) which range between 49.7 and 60 dB L_{eq} and are representative of the residences to the north. The parking structure noise would not affect the hotel receptors to the south of the project due to the shielding provided by the intervening residential building. Therefore, the proposed project would not exceed existing noise levels or cause an increase of more than 3.0 dBA during any given hour and supports the determination of a less-than-significant impact requiring no mitigation.

In summary, noise increases due to project occupancy and operations would not exceed any of the thresholds, and the impacts would be less than significant.

Level of Significance prior to Mitigation: Less than Significant

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not Applicable

4.10.5.2 Vibration

Impact NOI-3: The project would not generate excessive groundborne vibration or groundborne noise levels.

The construction vibration impact analysis below analyzes the potential for project construction activities to result in human annoyance using vibration levels in VdB and assesses the potential for building damage using vibration levels in PPV (in/sec). This is because vibration levels calculated in VdB are best for characterizing human response to vibration, while vibration levels in PPV are best for characterizing potential for damage to structures.

Table 4.10.L: Vibration Source Amplitudes for Construction Equipment shows the PPV and VdB values at 25 ft from the construction vibration source. As shown in **Table 4.10.L**, bulldozers and other heavy-tracked construction equipment (expected to be used for this project) generate approximately 0.089 PPV in/sec or 87 VdB of ground-borne vibration when measured at 25 ft, based on the FTA Manual. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings (single-family homes to the north) and the project construction boundary (assuming the construction equipment would be used at or near the project setback line).

Table 4.10.L: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	L_V (VdB)[1]
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large Bulldozer[2]	**0.089**	**87**
Caisson Drilling	0.089	87
Loaded Trucks[2]	**0.076**	**86**
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: *Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] RMS vibration velocity in decibels (VdB) is 1 µin/sec.
[2] Equipment shown in **bold** is expected to be used on site.
µin/sec = microinches per second
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inch/inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

The formulae for vibration transmission are provided below and **Table 4.10.M: Estimated Construction Vibration Levels** below provides a summary of off-site construction vibration levels.

$$L_v dB\ (D) = L_v dB\ (25\ ft) - 30\ Log\ (D/25)$$

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

As shown in **Table 4.10.E**, the FTA guidelines indicate that for a non-engineered timber and masonry building, the construction vibration building damage criterion is a PPV of 0.2 in/sec or more. Based on the information provided in **Table 4.10.M: Estimated Construction Vibration Levels,** vibration levels from project construction are expected to approach 0.124 in/sec PPV at the surrounding structures and would be below the 0.2 in/sec PPV threshold.

Table 4.10.M: Estimated Construction Vibration Levels

Land Use	Direction	Equipment	Reference Vibration Level (VdB) at 25 ft	Reference Vibration Level (PPV) at 25 ft	Distance (ft)	Average Vibration Level (VdB)	Maximum Vibration Level (PPV)
Residential	North	Large Bulldozers	87	0.089	20[1]	--	0.124
					225[2]	58	--
Hotel	South	Large Bulldozers	87	0.089	70[1]	--	0.019
					280[2]	56	--

Source: Compiled by LSA (2022).

[1] Distance between the closest single-family residence or hotel, appropriate for damage potential, and project site construction limit. All other homes would experience lower vibration levels.

[2] Distance between the closest single-family residence or hotel, appropriate for annoyance potential, and the center of the project site. All other homes would experience lower vibration levels.

ft = foot/feet
PPV = peak particle velocity
in/sec = inch/inches per second
VdB = vibration velocity decibels

As shown in **Table 4.10.D** above, the threshold at which vibration levels would result in annoyance would be 72 VdB for residential or hotel uses. Based on the information provided in **Table 4.10.M**, vibration levels are expected to approach 58 VdB at the closest residential uses to the north and 56 VdB at the hotel to the south and would not exceed the annoyance thresholds.

Other building structures surrounding the project site are farther away and would experience further reduced vibration. Therefore, construction vibration impacts would be less than significant. No vibration reduction measures are required.

Level of Significance prior to Mitigation: Less than Significant

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not Applicable

4.10.5.3 Airport Noise

Impact NOI-4: The project would not be located in the vicinity of a private airstrip or an airport land use plan, or within two miles of a public airport or public use airport, and would not expose people residing or working in the project area to excessive noise levels.

The closest airport to the project site is Napa County Airport, located approximately 7.5 miles west of the project site. According to the *Napa County General Plan*, the project site is located well outside the 55 dBA CNEL noise contour associated with the airport. Additionally, Travis Air Force Base is located approximately 10 miles east of the project site. According to the *Air Installation Compatible Use Zone Study – Travis Air Force Base, California* (2009), the project site is located outside the 60 dBA CNEL noise contour. Therefore, aircraft noise generated from the Travis Air Force Base and Napa County Airport would not expose people residing or working on the project site to excessive noise levels due to the proximity of a public airport. There would be no impact related to exposure to excessive noise due to a nearby airport.

Level of Significance prior to Mitigation: No Impact

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not Applicable

4.10.5.4 Cumulative Impacts

Cumulative Impact C-NOI-1: Cumulative development in the project vicinity, including the proposed project, would not result in significant cumulative construction and operational noise impacts.

As defined in Section 15130 of the *State CEQA Guidelines*, cumulative impacts are the incremental effects of an individual project when viewed in connection with the effects of past, present, and reasonably foreseeable future projects within the cumulative impact area for noise and vibration. The cumulative impact area for noise and vibration is based on projects occurring within a 1.5-mile radius of the project site (see **Table 4.A: Cumulative Projects in the Vicinity of the Project Site** in **Chapter 4.0: Environmental Setting, Impacts, and Mitigation Measures** of this EIR). Cumulative development in the vicinity of the project site includes nine pending and ongoing projects. The following analysis discusses the potential cumulative impacts associated with the proposed project in conjunction with these other projects within the cumulative impact area.

Traffic Noise. As discussed under **Impact NOI-2**, above, operation of the proposed project would result in a traffic noise increase of 0.2 dBA under the opening year plus project scenario as compared to existing conditions. An audible increase in traffic noise (3 dBA) requires an approximate doubling of traffic volumes. Because traffic volumes are not anticipated to double under any scenario, it is not anticipated that there would be an audible increase in traffic noise. Therefore, the cumulative traffic noise impact is considered less than significant.

HVAC Noise. Cumulative noise from on-site stationary HVAC equipment, when combined with HVAC equipment from nearby related project sites, may increase ambient noise to distinctly audible levels at nearby sensitive receptors. However, as described above and in Section 25.1405 of the *City of Fairfield Municipal Code*, sound sources associated with residential uses, such as air conditioning and similar equipment, are exempt from provisions presented in the Municipal Code. Because noise generated by HVAC systems is exempt from the standards presented in the *City of Fairfield Municipal Code*, this impact would be less than significant.

On-Site Construction Noise. There is a Residence Inn hotel project located directly south of the proposed project that is currently under construction. Both the Residence Inn Mitigated Negative Declaration and this analysis for the proposed project identify the same worst-case sensitive receptor located just to the north of the project site.[10] This receptor is located approximately 210 ft from the center of the proposed project site and 550 ft from the Residence Inn hotel project to the south. The Initial Study for the hotel project does not quantify the noise levels, however if it is assumed that the noise reduction due to distance and mitigation measures would be similar to that of the proposed project, the ambient noise level during construction of the Residence Inn project

[10] City of Fairfield. 2019. *Mitigated Negative Declaration for the Residence Inn*. February 13.

could reach levels of up to approximately 74 dBA L_{eq} at the nearest receptor. This noise increase would not exceed the applicable 80 dBA L_{eq} construction noise standard. Given the fact that the hotel construction has been commenced and the proposed apartment project would not commence construction until Summer 2023, the construction of the two projects will not overlap based on the anticipated May 2023 completion date for the hotel. Nonetheless, if the proposed project construction occurs at the same time as the Residence Inn project for a limited duration (i.e., as a result of unanticipated construction delays for the hotel), the combined noise level would be slightly elevated as compared to if the construction of each project occurred individually. However, both projects would implement construction phase mitigation measures, and **Mitigation Measures NOI-1 through NOI-5**, set forth above for the proposed project, represent the best available control measures to mitigate construction noise level impacts of the proposed project. As a result, with the implementation of the proposed mitigation measures, the project's contribution would be rendered cumulatively not considerable. The impact would be less than significant.

Construction Vibration. As noted above, the nearest sensitive receptors to the project site are located to the north approximately 210 ft from the center of the project site. At this distance, no construction equipment, including pile driving if it were to be used, would generate vibrations that would exceed the vibration limit of 0.2 in/sec PPV which is the threshold for structure damage or the human annoyance threshold of 72 VdB at the nearest sensitive receptors. Even if there was an unanticipated delay in the completion of the hotel, resulting in a limited overlap in the construction of both projects, the use of heavy equipment and/or pile drivers would not be anticipated at the hotel site at such a late stage of completion. Therefore, construction vibrations of the proposed project would not combine with the construction vibrations of another project to result in a significant cumulative impact on nearby receptors.

Operational Vibration. During operation of the proposed project and the nearest related project, Residence Inn hotel, there would not be any significant stationary sources of groundborne vibration, such as heavy equipment operations, that could combine and affect nearby sensitive receptors. Operational groundborne vibrations in the project vicinity would be generated by vehicular travel on the local roadways. Vehicles traveling on paved roads rarely create enough groundborne vibration to be perceptible to humans unless the road surface is poorly maintained and there are potholes or bumps. If traffic, typically heavy trucks, induces perceptible vibration in buildings, such as window rattling or shaking of small loose items, then it is most likely an effect of low-frequency airborne noise or ground characteristics. Although some of the related projects (such as the three industrial warehouses off of Business Center Drive) would generate heavy truck traffic, the proposed project would not generate truck traffic, other than occasional trucks that would make routine household deliveries. Furthermore, the roads that the trucks would use are well maintained. Lastly, trucks traveling to and from the project vicinity to the nearest freeway interchanges would not travel past residential areas or other land uses that could be vibration sensitive. Therefore, the cumulative traffic would not result in significant cumulative vibration effects that could result in annoyance or building damage.

Therefore, the cumulative construction and operational noise and vibration impacts would be less than significant, and no additional mitigation is required for cumulative noise and vibration impacts.

Level of Significance prior to Mitigation: Less than Significant

Mitigation Measures: No mitigation measures are required.

Level of Significance after Mitigation: Not applicable

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