Environmental Noise Assessment

Oat Hill Apartments

City of American Canyon, California

September 10, 2020

Project #200705

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APPENDIX F

ENVIRONMENTAL NOISE ASSESSMENT

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INTRODUCTION

The Oat Hill Apartments residential project is located along the south of Napa Junction Road and west of Highway 29 in the City of American Canyon, California. The project consists of the construction of 17 separate buildings on two combined parcels containing 291 residential units.

Figure 1 shows the project site plan. **Figure 2** shows an aerial photo of the project site.

ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE

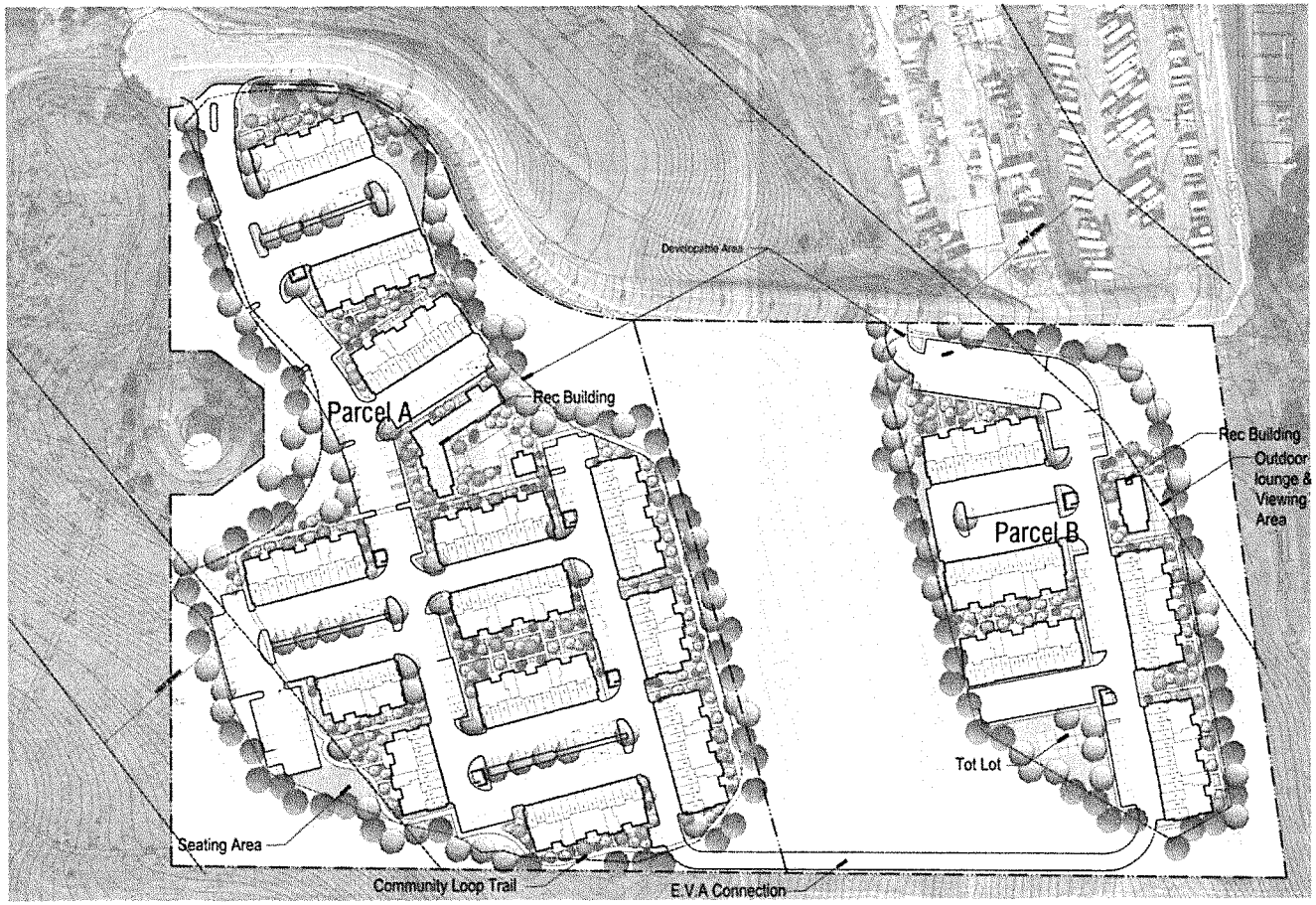
Fundamentals of Acoustics

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

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

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

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment.



Project Summary

Parcel A

Gross Site Area: ± 11.3 Acres
Developable Area: ± 8.1 Acres
Total Units: 206 Homes
- (52) 1 Bdrm Units
- (108) 2 Bdrm Units
- (46) 3 Bdrm Units

Density: 18.2 DU per Gross Acre
25.4 DU per Developable Area

Parking:

Required: 438 Spaces
- (52) 1 Bedroom x 1.5 Spaces =78 Spaces
- (154) 2 or more Bedroom x 2 Spaces =308 Spaces
- (206) Guest x 0.25 Spaces =52 Spaces

Provided: 451 On-site & Off-site Spaces
428 On-site Spaces
- Garage: 157 Spaces
- Carports: 49 Spaces
- Head In: 222 Spaces

23 Off-site Spaces

Open Space
- Common Open Space: 53,571 SF
- Hillside Slope Area: 139,392 SF

Parcel B

Gross Site Area: ± 9.5 Acres
Developable Area: ± 3.6 Acres
Total Units: 85 Units
- (20) 1 Bdrm Units
- (45) 2 Bdrm Units
- (20) 3 Bdrm Units

Density: 8.9 DU per Gross Area
23.6 DU per Developable Area

Parking:

Required: 182 Spaces
- (20) 1 Bedroom x 1.5 Spaces =30 Spaces
- (45) 2 or more Bedroom x 2 Spaces =130 Spaces
- (85) Guest x 0.25 Spaces =22 Spaces

Provided: 183 Spaces
- Garage: 65 Spaces
- Carports: 20 Spaces
- Head In: 98 Spaces (9' x 18')

Open Space
- Common Open Space: 27,647 SF
- Hillside Slope Area: 257,004 SF

Notes:

1. Site plan is for conceptual purposes only.
2. Site plan may be reviewed by Planning, Building, and Fire departments for code compliance.
3. Seek information per civil engineer.
4. Civil engineer to verify all setbacks and grading information.
5. Building footprints might change due to the final design/ construction style.
6. Open space area is subject to change due to the footing design of the elevation.
7. Building setbacks are measured from property lines to

Oat Hill Apartments
City of American Canyon, California

Figure 1
Project Site Plan

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Oat Hill Apartments

City of American Canyon, California

Figure 2

Noise Measurement Sites

Legend

Project Site

Noise Measurement - Long Term

0 ft 250 ft 500 ft

Projection: State Plane (California Zone 2) / NAD83 / meters
Rev. Date: 08/05/2020

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The decibel scale is logarithmic, not linear. In other words, two sound levels 10-dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10-dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (DNL or L_{dn}) is based upon the average noise level over a 24-hour day, with a +10-decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Table 1 lists several examples of the noise levels associated with common situations. **Appendix A** provides a summary of acoustical terms used in this report.

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft.)	--100--	
Gas Lawn Mower at 1 m (3 ft.)	--90--	
Diesel Truck at 15 m (50 ft.), at 80 km/hr. (50 mph)	--80--	Food Blender at 1 m (3 ft.) Garbage Disposal at 1 m (3 ft.)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft.)	--70--	Vacuum Cleaner at 3 m (10 ft.)
Commercial Area Heavy Traffic at 90 m (300 ft.)	--60--	Normal Speech at 1 m (3 ft.)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. September, 2013.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1-dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6-dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

EXISTING NOISE AND VIBRATION ENVIRONMENTS

EXISTING NOISE RECEPTORS

Some land uses are considered more sensitive to noise than others. Land uses often associated with sensitive receptors generally include residences, schools, libraries, hospitals, and passive recreational areas. Sensitive noise receptors may also include threatened or endangered noise sensitive biological species, although many jurisdictions have not adopted noise standards for wildlife areas. Noise sensitive land uses are typically given special attention in order to achieve protection from excessive noise.

Sensitivity is a function of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities involved. In the vicinity of the project site, sensitive land uses include existing single-family residential uses and Calvary Baptist Church located east of the project site and Napa Junction Magnet Elementary School located northeast of the project site.

EXISTING GENERAL AMBIENT NOISE LEVELS

The existing noise environment in the project area is primarily defined by traffic on the Napa Vallejo Highway (Highway 29). Other noise sources include airplane flyovers to and from the Napa County Airport, transportation noise from the Union Pacific Rail Road line to the north of the project, and operational noise originating from a lumber processing facility to the southwest.

To quantify the existing ambient noise environment in the project vicinity, Saxelby Acoustics conducted continuous (24-hr.) noise level measurements at two locations on the project site. Noise measurement locations are shown on **Figure 2**. A summary of the noise level measurement survey results is provided in **Table 2**. **Appendix B** contains the complete results of the noise monitoring.

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

Larson Davis Laboratories (LDL) model 812 and 820 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with a B&K Model 4230 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

TABLE 2: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

Site	Location	Date	L_{dn}	Daytime L_{eq}	Daytime L_{50}	Daytime L_{max}	Nighttime L_{eq}	Nighttime L_{50}	Nighttime L_{max}
LT-1	Northeastern Corner of Project Site	8/5/20 to 8/6/20	55	51	49	64	48	46	60
LT-2	Western Corner of Project Site	8/5/20 to 8/6/20	55	49	47	66	48	46	61

Notes:
- All values shown in dBA
- Daytime hours: 7:00 a.m. to 10:00 p.m.
- Nighttime Hours: 10:00 p.m. to 7:00 a.m.
- Source: Saxelby Acoustics 2020

FUTURE TRAFFIC NOISE ENVIRONMENT AT OFF-SITE RECEPTORS

Off-Site Traffic Noise Impact Assessment Methodology

To assess noise impacts due to project-related traffic increases on the local roadway network, traffic noise levels are predicted at sensitive receptors for existing and future, project and no-project conditions.

Existing and Future noise levels due to traffic are calculated using the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108). The model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict traffic noise levels in terms of L_{dn}, it is necessary to adjust the input volume to account for the day/night distribution of traffic.

Project trip generation volumes were provided by the project traffic engineer (W-Trans), truck usage and vehicle speeds on the local area roadways were estimated from field observations. The predicted increases in traffic noise levels on the local roadway network for Existing and Future conditions which would result from the project are provided in terms of L_{dn}.

Traffic noise levels are predicted at the sensitive receptors located at the closest typical setback distance along each project-area roadway segment. In some locations sensitive receptors may not receive full shielding from noise barriers, or may be located at distances which vary from the assumed calculation distance.

Table 3 summarizes the modeled traffic noise levels at the nearest sensitive receptors along each roadway segment in the Project area. **Appendix C** provides the complete inputs and results of the FHWA traffic modeling.

TABLE 3: PREDICTED TRAFFIC NOISE LEVEL AND PROJECT-RELATED TRAFFIC NOISE LEVEL INCREASES

Roadway	Segment	Existing No Project	Existing + Project	Change	Future No Project	Future + Project	Change
Napa Junction Rd.	West of Theresa Ave.	47.3	52.2	4.9	47.8	52.4	4.6
Theresa Ave.	South of Napa Junction Rd.	60.2	60.5	0.3	60.7	61.0	0.3
Napa Junction Rd.	East of Theresa Ave.	60.6	61.1	0.5	61.1	61.6	0.4
Theresa Ave.	North of Eucalyptus Dr.	62.5	62.8	0.3	63.1	63.4	0.3

Note: All noise levels are predicted at closest sensitive receptors in terms of dBA, L_{dn}.

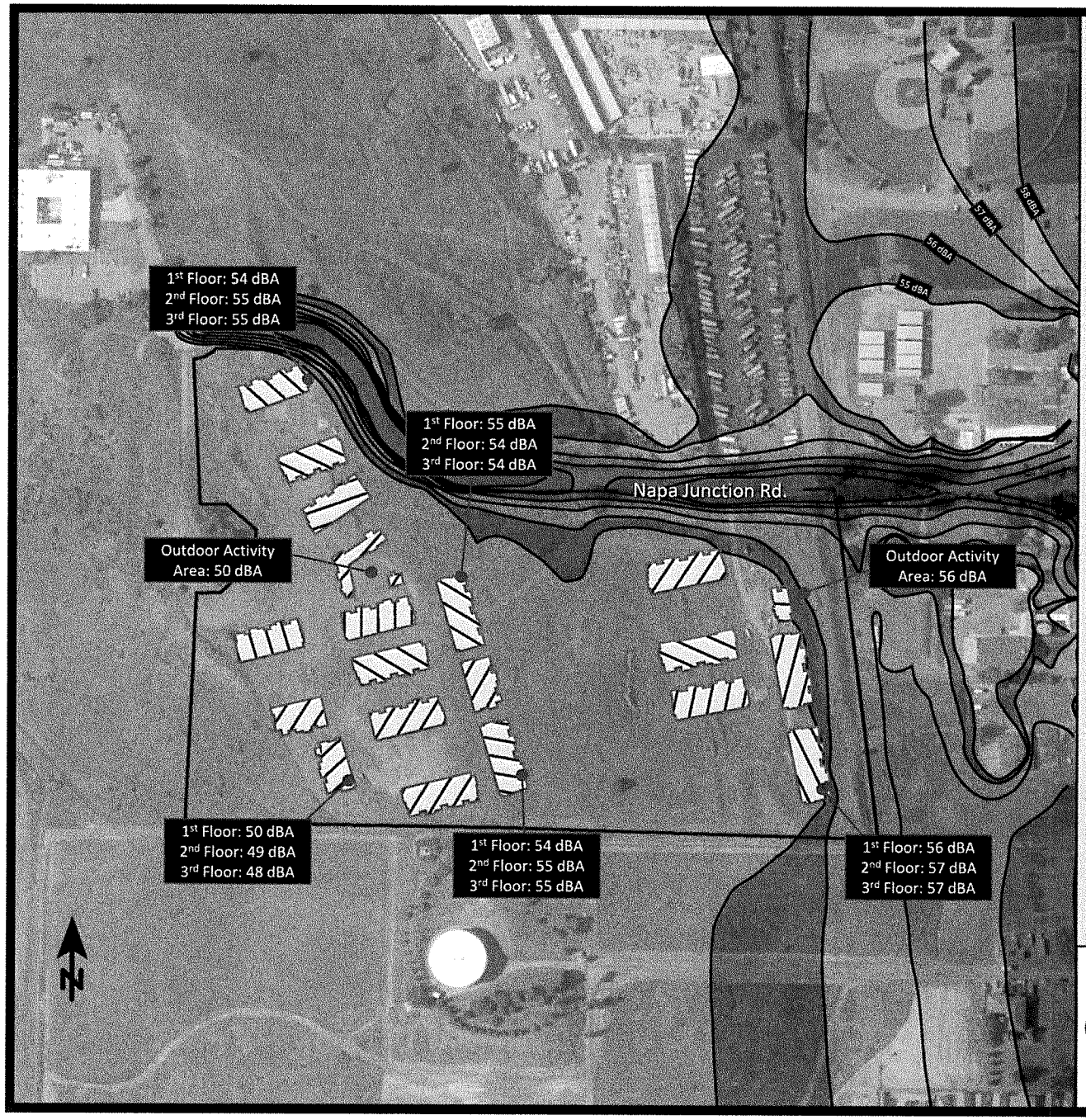
EVALUATION OF TRANSPORTATION NOISE SOURCES ON THE PROJECT SITE

On-Site Transportation Noise Prediction Methodology

Saxelby Acoustics used the SoundPLAN noise model to calculate traffic noise levels at the proposed residential uses due to traffic on Highway 29 and Napa Junction Road. The proposed project buildings and surrounding structures were input into the SoundPLAN model to determine the traffic noise exposure on the project site. Future (2041) traffic noise levels for Highway 29 were calculated by assuming a 1% per year increase in traffic volumes. Future traffic noise levels for Napa Junction Road were calculated using the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108). The results of this analysis are shown graphically on **Figure 3**.

NAPA COUNTY AIRPORT NOISE

The Napa County Airport is located approximately 1.8 miles west of the project site and aircraft overflights were observed during visits to the project site. **Figure 4** shows the noise contours for the airport as published in the City of American Canyon General Plan.



Oat Hill Apartments

City of American Canyon, California

Figure 3

Future (2041) Transportation Noise Contours (dBA L_{dn})

Signs and symbols

Proposed Building

Levels in dB(A)

<= 55
55 - 56
56 - 57
57 - 58
58 - 59
59 - 60
> 60

1 : 3215

0 15 30 60 90 120 m

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Figure 4

Airport Noise Contours

Legend

- Project Site
- 55 dBA Contour
- 60 dBA Contour
- 65 dBA Contour

1000 ft 3000 ft 5000 ft

Projection: State Plane (California Zone 2) / NAD83 / meters
Rev. Date: 08/28/2020

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CONSTRUCTION NOISE ENVIRONMENT

During the construction of the proposed project noise from construction activities would temporarily add to the noise environment in the project vicinity. As shown in **Table 4**, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dB at a distance of 50 feet.

TABLE 4: CONSTRUCTION EQUIPMENT NOISE

Type of Equipment	Maximum Level, dBA at 50 feet
Auger Drill Rig	84
Backhoe	78
Compactor	83
Compressor (air)	78
Concrete Saw	90
Dozer	82
Dump Truck	76
Excavator	81
Generator	81
Jackhammer	89
Pneumatic Tools	85

Source: *Roadway Construction Noise Model User's Guide*. Federal Highway Administration. FHWA-HEP-05-054. January 2006.

CONSTRUCTION VIBRATION ENVIRONMENT

The primary vibration-generating activities associated with the proposed project would occur during construction when activities such as grading, utilities placement, and parking lot construction occur. TABLE 5 shows the typical vibration levels produced by construction equipment.

TABLE 5: VIBRATION LEVELS FOR VARIOUS CONSTRUCTION EQUIPMENT

Type of Equipment	Peak Particle Velocity at 25 feet (inches/second)	Peak Particle Velocity at 50 feet (inches/second)	Peak Particle Velocity at 100 feet (inches/second)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210 (Less than 0.20 at 26 feet)	0.074	0.026

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

REGULATORY CONTEXT

FEDERAL

There are no federal regulations related to noise that apply to the Proposed Project.

STATE

The State Building Code, Title 24, Part 2 of the State of California Code of Regulations, establishes uniform minimum noise insulation performance standards to protect persons within new buildings which house people, including hotels, motels, dormitories, apartment houses, and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room. Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

LOCAL

City of American Canyon General Plan

The City of American Canyon General Plan sets forth the following goals, objectives, and policies relevant to noise that are applicable to the proposed project:

- **Goal 11:** Ensure that American Canyon's existing and future residents, employees and employers, as well as visitors to the City, are protected from the adverse human health and environmental impacts of excessive noise levels created by stationary and ambient (intrusive) noise sources and conditions. Take all necessary and appropriate action to avoid or mitigate the detrimental effects of such excessive noise on the community.
- **Objective 11.1:** Control both ambient and stationary (intrusive) noise conditions and impacts that may occur in American Canyon. Maintain base line information regarding ambient and stationary noise sources within the community.
- **Policy 11.1.1:** Promote noise-compatible land use relationships by implementing the noise standards identified in Figure 11-2 [of the General Plan], to be utilized for design purposes in new development and for establishing a program to attenuate existing noise problems.
- **Policy 11.1.2:** Monitor and update available data regarding the community's ambient and stationary noise levels.
- **Objective 11.2:** Protect residents, employees, and visitors to the community from

excessive noise exposure. If possible, mitigate the adverse impacts of existing or unavoidable excessive noise on these same groups.

- **Policy 11.2.1:** Require that new development for locations in which the exterior or interior noise levels indicated in Figure 11-2 [of the General Plan] are likely to be exceeded, submit a noise attenuation study prepared by a qualified acoustical engineer in order to determine appropriate mitigation measures.
- **Policy 11.2.4:** Require that new industrial, commercial and related land uses, or the expansion of these existing land uses, demonstrate that they would not directly cause ambient noise levels to exceed an exterior Ldn of 65 dB(A) in areas containing housing, schools, health care facilities, or other "noise-sensitive" land uses. Additionally, require that potentially significant noise generators, including uses such as night clubs that cause sporadic noise intensities, submit noise analyses prepared by an acoustical expert that include specific recommendations for mitigation when: a) the project is located in close proximity to noise-sensitive land uses or land that is planned for noise-sensitive land uses, or b) the proposed noise source could violate the noise provisions of the General Plan or City Noise ordinance.
- **Objective 11.3:** Minimize the adverse impacts of traffic-generated noise on residential and other "noise-sensitive" uses as depicted on Figure 11-5 [of the General Plan].
- **Policy 11.3.1:** Minimize motor vehicle noise impacts from streets and highways through proper route location and sensitive roadway design by employing the following strategies:
  a. Consider the impacts of truck routes, the effects of a variety of truck traffic, and future motor vehicle volumes on noise levels adjacent to master planned roadways when improvements to the circulation system are planned.
  b. Mitigate traffic volumes and vehicle speed through residential neighborhoods.
  c. Work closely with the State of California Department of Transportation (Caltrans) in the early stages of highway improvements and design modifications to ensure that proper consideration is given to potential noise impacts on the City.
- **Policy 11.3.2:** Require that all new nonresidential development design and configure on-site ingress and egress points to divert traffic (and its resultant noise) away from "noise-sensitive" land uses to the greatest degree practicable.
- **Policy 11.4.1:** Restrict the development of uses located within the 65 CNEL contour of Napa Airport to industrial, agricultural, or other open space uses (see Figure 11-5 [of the General Plan]).
- **Policy 11.4.1:** Require that development in the vicinity of Napa Airport comply with the noise standards contained in the Airport Land Use Compatibility Plan (ALUP).

- **Objective 11.5:** Minimize noise spillover or encroachment from commercial and industrial land uses into adjoining residential neighborhoods or "noise-sensitive" uses.
- **Objective 11.7:** Minimize the impacts of construction noise on adjacent uses.

The City of American Canyon General Plan establishes an exterior noise level criterion of 65 dB L_{dn} (or CNEL) or less within outdoor activity areas of residential land uses. Additionally, the City requires that cumulative noise exposure from exterior noise sources within noise-sensitive dwellings not exceed 45 dB L_{dn} (or CNEL).

City of American Canyon Municipal Code

Municipal Code Chapter 8.12.080 establishes maximum noise limits for construction activities. Where economically and technically feasible, construction noise at residential receptors is limited to no more than 75 dBA between the hours of 7:00 a.m. and 7:00 p.m. and 60 dBA between 7:00 p.m. and 7:00 a.m.

County of Napa

The Airport Land Use Compatibility Plan governs land use around the Napa County Airport and sets forth noise compatibility standards for new development land use activities. Table 2-1 of the Airport Land Use Compatibility Plan identifies acceptable aviation noise levels by land use. For multifamily residential uses, aviation noise levels of 50-55 dBA Community Noise Equivalent Level (CNEL) are listed as "clearly acceptable."

Figure 5 shows the Napa County Airport Land Use Compatibility Plan Noise Compatibility Guidelines.

FIGURE 5: NAPA COUNTY AIRPORT NOISE COMPATIBILITY GUIDELINES

Table 2-1

Noise Compatibility Guidelines

LAND USE CATEGORY	CNEL, dBA 50-55	55-60	60-65	65-70	70-75
Residential					
Single family, nursing homes, mobile homes	+	o	–	—	
multi-family, apartments, condominiums	++	+	o	–	
Public					
schools, libraries, hospitals	+	o	–	—	—
churches, auditoriums, concert halls	+	o	o	–	—
transportation, parking, cemeteries	++	++	++	+	o
Commercial and Industrial					
offices, retail trade	++	+	o	o	–
service commercial, wholesale trade, warehousing, light industrial	++	++	+	o	o
general manufacturing, utilities, extractive industry	++	++	++	+	+
Agricultural and Recreational					
cropland	++	++	++	++	+
livestock breeding	++	+	o	o	–
parks, playgrounds, zoos	++	+	+	o	–
golf courses, riding stables, water recreation	++	++	+	o	o
outdoor spectator sports	++	+	+	o	–
amphitheaters	+	o	–	–	—

LAND USE AVAILABILITY		INTERPRETATION/COMMENTS
++	Clearly Acceptable	The activities associated with the specified land use can be carried out with essentially no interference from the noise exposure.
+	Normally Acceptable	Noise is a factor to be considered in that slight interference with outdoor activities may occur. Conventional construction methods will eliminate most noise intrusions upon indoor activities.
o	Marginally Acceptable	The indicated noise exposure will cause moderate interference with outdoor activities and with indoor activities when windows are open. The land use is acceptable on the conditions that outdoor activities are minimal and construction features which provide sufficient noise attenuation are used (e.g., installation of air conditioning so that windows can be kept closed). Under other circumstances, the land use should be discouraged.
–	Normally Unacceptable	Noise will create substantial interference with both outdoor and indoor activities. Noise intrusion upon indoor activities can be mitigated by requiring special noise insulation construction. Land uses which have conventionally constructed structures and/or involve outdoor activities which would be disrupted by noise should generally be avoided.
—	Clearly Unacceptable	Unacceptable noise intrusion upon land use activities will occur. Adequate structural noise insulation is not practical under most circumstances. The indicated land use should be avoided unless strong overriding factors prevail and it should be prohibited if outdoor activities are involved.

Criteria for Acceptable Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. **Table 6** which was developed by Caltrans, shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of peak particle velocity in inches per second.

Table 6 indicates that the threshold for architectural damage to structures is 0.20 in/sec p.p.v. A threshold of 0.20 in/sec p.p.v. is considered to be a reasonable threshold for short-term construction projects.

TABLE 6: EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS

Peak Particle Velocity		Human Reaction	Effect on Buildings
mm/second	in/second		
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of "architectural" damage to normal dwelling - houses with plastered walls and ceilings. Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize "architectural" damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: *Transportation Related Earthborne Vibrations.* Caltrans. TAV-02-01-R9601. February 20, 2002.

IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Appendix G of the CEQA Guidelines states that a project would normally be considered to result in significant noise impacts if noise levels conflict with adopted environmental standards or plans or if noise generated by the project would substantially increase existing noise levels at sensitive receivers on a permanent or temporary basis. Significance criteria for noise impacts are drawn from CEQA Guidelines Appendix G (Items XI [a-c]).

Would the project:

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

b. Generate excessive groundborne vibration or groundborne noise levels?

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

Noise Level Increase Criteria for Long-Term Project-Related Noise Level Increases

The California Environmental Quality Act (CEQA) guidelines define a significant impact of a project if it "increases substantially the ambient noise levels for adjoining areas." Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local project criteria or ordinances, or substantially increase noise levels at noise sensitive land uses. The potential increase in traffic noise from the project is a factor in determining significance. Research into the human perception of changes in sound level indicates the following:

- A 3-dB change is barely perceptible,
- A 5-dB change is clearly perceptible, and
- A 10-dB change is perceived as being twice or half as loud.

A limitation of using a single noise level increase value to evaluate noise impacts is that it fails to account for pre-project-noise conditions. **Table 7** is based upon recommendations made by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes

in ambient noise levels resulting from aircraft operations. The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been accepted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the L_{dn}.

TABLE 7: SIGNIFICANCE OF CHANGES IN NOISE EXPOSURE

Ambient Noise Level Without Project, Ldn	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the **Table 7** data, an increase in the traffic noise level of 5 dB or more would be significant where the pre-project noise levels are less than 60 dB Ldn, or 3 dB or more where existing noise levels are between 60 to 65 dB Ldn. Extending this concept to higher noise levels, an increase in the traffic noise level of 1.5 dB or more may be significant where the pre-project traffic noise level exceeds 65 dB Ldn. The rationale for the **Table 7** criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

PROJECT-SPECIFIC IMPACTS AND MITIGATION MEASURES

IMPACT 1: WOULD THE PROJECT GENERATE A SUBSTANTIAL TEMPORARY OR PERMANENT INCREASE IN AMBIENT NOISE LEVELS IN THE VICINITY OF THE PROJECT IN EXCESS OF STANDARDS ESTABLISHED IN THE LOCAL GENERAL PLAN OR NOISE ORDINANCE, OR APPLICABLE STANDARDS OF OTHER AGENCIES?

Exterior noise at New Sensitive Receptors

As shown in **Figure 3**, the proposed project is predicted to be exposed to transportation noise levels of up to 56 dBA at the eastern outdoor activity area and 50 dBA at the western outdoor activity area. This complies with the City of American Canyon existing General Plan standard of 65 dBA L_{dn} for outdoor activity areas.

The City of American Canyon General Plan requires that interior noise levels of new residential uses must be 45 dBA L_{dn} or less. Standard construction methods typically yield a 25 dBA noise reduction. The proposed project buildings are predicted to be exposed to noise levels of up to 57 dBA L_{dn}. Based upon a 25 dB reduction, the interior noise level would be 22 dBA L_{dn}. This complies with City of

American Canyon allowable transportation noise exposure limits.

This is a **less-than-significant** impact and no mitigation is required.

Traffic Noise Increases

The CEQA guidelines specify criteria to determine the significance of traffic noise impacts. Where existing traffic noise levels are less than 60 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +5.0 dB L_{dn} increase in roadway noise levels will be considered significant. As shown in **Table 3**, the maximum increase due to traffic noise is +4.9 dBA along Napa Junction Rd. on the segment west of Theresa Ave. The existing noise level due to traffic noise on this segment is 47.3 dBA and the future no-project noise level is predicted to be 47.8 dBA. All other increases are below +1.5 dBA.

Therefore, impacts resulting from increased traffic noise would be considered ***less-than-significant.***

Construction Noise

During the construction phases of the project, noise from construction activities would add to the noise environment in the immediate project vicinity. As indicated in **Table 4**, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dBA L_{max} at a distance of 50 feet. Construction activities would also be temporary in nature and are anticipated to occur during normal daytime working hours.

The City of American Canyon Municipal Code establishes maximum noise limits for construction activities of 75 dBA between the hours of 7:00 a.m. and 7:00 p.m. and 60 dBA between 7:00 p.m. and 7:00 a.m. The nearest residential uses are located approximately 320 feet to the east, as measured from the center of the eastern housing site. At this distance, maximum construction noise levels would be in the range of 60-74 dBA L_{max} in the backyards of the nearest residential uses.

Noise would also be generated during the construction phase by increased truck traffic on area roadways. A project-generated noise source would be truck traffic associated with transport of heavy materials and equipment to and from the construction site. This noise increase would be of short duration and would occur during daytime hours.

Although construction activities are temporary in nature and would occur during normal daytime working hours, construction-related noise could result in sleep interference at existing noise-sensitive land uses in the vicinity of the construction if construction activities were to occur outside the normal daytime hours. Therefore, impacts resulting from noise levels temporarily exceeding the threshold of significance due to construction would be considered ***potentially significant***.

Mitigation Measure

1(a) The City shall establish the following as conditions of approval for any permit that results in the use of construction equipment:

- Construction activities (excluding activities that would result in a safety concern to the public or construction workers) shall be limited to between the daytime hours of 7 AM and 7 PM daily.
- Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.
- When not in use, motorized construction equipment shall not be left idling for more than 5 minutes.
- Stationary equipment (power generators, compressors, etc.) shall be located at the furthest practical distance from nearby noise-sensitive land uses or sufficiently shielded to reduce noise-related impacts.

Timing/Implementation: Implemented prior to approval of grading and/or building permits
Enforcement/Monitoring: City of American Canyon Community Development Services Department

Implementation of mitigation measure 1(a) would help to reduce construction-generated noise levels. With mitigation, this impact would be considered ***less-than-significant***.

IMPACT 2: WOULD THE PROJECT GENERATE EXCESSIVE GROUNDBORNE VIBRATION OR GROUNDBORNE NOISE LEVELS?

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural.

The **Table 5** data indicate that construction vibration levels anticipated for the project are less than the 0.2 in/sec threshold at distances of 26 feet. Sensitive receptors which could be impacted by construction related vibrations, especially vibratory compactors/rollers, are located approximately 26 feet, or further, from typical construction activities. At these distances construction vibrations are not predicted to exceed acceptable levels. Additionally, construction activities would be temporary in nature and would likely occur during normal daytime working hours.

This is a **less-than-significant** impact and no mitigation is required.

IMPACT 3: **FOR A PROJECT LOCATED WITHIN THE VICINITY OF A PRIVATE AIRSTRIP OR AN AIRPORT LAND USE PLAN OR, WHERE SUCH A PLAN HAS NOT BEEN ADOPTED, WITHIN TWO MILES OF A PUBLIC AIRPORT OR PUBLIC USE AIRPORT, WOULD THE PROJECT EXPOSE PEOPLE RESIDING OR WORKING IN THE PROJECT AREA TO EXCESSIVE NOISE LEVELS?**

Based upon **Figure 4**, the proposed project is located approximately 1.4 miles outside of the predicted 55 dBA CNEL noise contour. According to Table 2-1 (**Figure 5**) of the Napa County Airport Land Use Compatibility Plan, multi-family residential land uses exposed to noise levels less than 55 dBA CNEL are "Clearly Acceptable." Land use may be carried out with essentially no interference from the noise exposure.

This is a **less-than-significant** impact and no mitigation is required.

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