APPENDIX C

Noise Report

Sacramento Mixed-Use Apartments Project

Noise and Vibration Technical Report

August 2023

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1.0 INTRODUCTION

The purpose of this report is to evaluate the potential for noise and groundborne vibration impacts resulting from implementation of the proposed project at 3201 to 3231 Marysville Boulevard and 3206 to 3212 Ermina Drive (Project) in the City of Sacramento (City).This report includes an evaluation of potential impacts associated with the temporary increases in ambient noise levels in the vicinity of the Project Site; exposure of people in the vicinity of the Project Site to excessive noise or groundborne vibration levels; and whether exposure is in excess of standards established in the City's General Plan or Noise Ordinance. This report has been prepared by Impact Sciences, Inc., in support of the environmental documentation being prepared pursuant to the California Environmental Quality Act (CEQA).

1.1 PROJECT LOCATION

The Project Site located at 3201 to 3231 Marysville Boulevard and 3206 to 3212 Ermina Drive is approximately 1.51 acres and is comprised of 7 parcels (APNs: 251-0325-004, 251-0325-005, 251-0325-006, 251-0325-008, 251-0325-009, 251-0325-010, and 251-0325-011). The Project Site is within the North Sacramento Community Plan Area and is bound by Arcade Boulevard to the south, Marysville Boulevard to the east, and Ermina Drive to the west and north. The Project Site is approximately 215 feet south of Arcade Creek and 350 feet south of Hagginwood Park.

The Project Site currently contains two vacant buildings on the parcel located on the south end of the Project Site at 3201 Marysville Boulevard (APN: 251-0325-006). The remaining six parcels to the north are vacant. The Project Site is generally surrounded by commercial uses, including a laundromat, health center, tire shop, mechanics shop, market, and accountant office. There are three single-family residential uses north of the Project Site across Ermina Drive, and two single-family residential uses west of the Project Site across Ermina Drive. The Project Site is located within the North Sacramento Community Plan Area and is designated as a Suburban Corridor in the 2035 Land Use and Urban Form map. The Project Site and its surrounding parcels are currently zoned General Commercial (C-2). See **Figure 1, Aerial Photograph of the Project Site**.

1.2 PROJECT DESCRIPTION

The applicant proposes to demolish two existing one-story vacant buildings (approximately 1,548 square feet of demolition) and construct a new mixed-use building (approximately 125,501 square feet) with ground floor commercial, parking garage, and four floors of apartments located above ("Project"). See **Figure 2** through **Figure 6**, for the Project Site Plans**.** The mixed-use development would include ground floor retail, coffee, or restaurant uses with public plazas for outdoor dining, and amenities, utilities, and

parking spaces for the above apartments. The apartments would be located on floors two through five and include a mix of one- and two-bedroom units.

SOURCE: Esri, 2023

FIGURE 1

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Aerial Photograph of the Project Site

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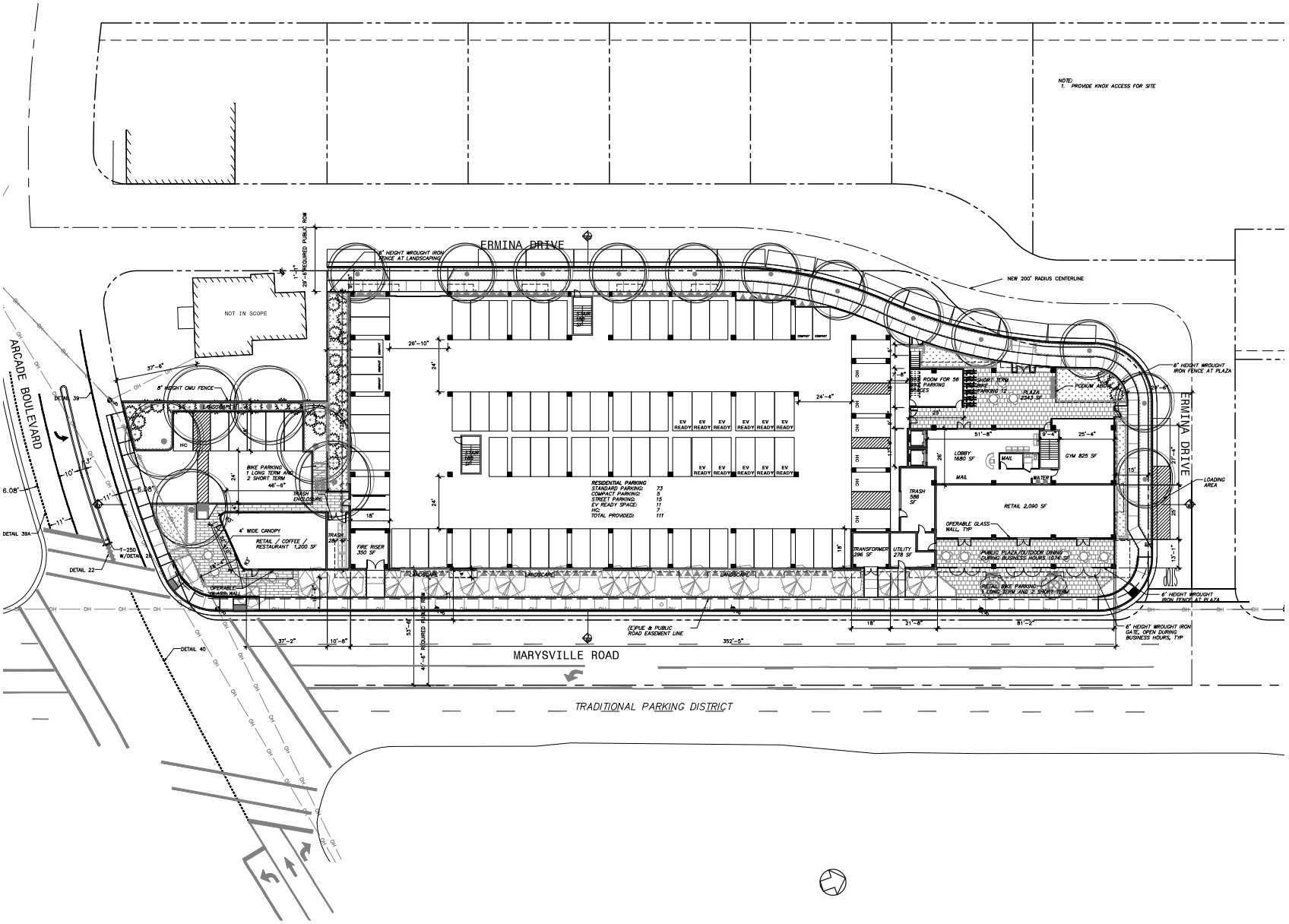

SOURCE: SCDC, 2023

FIGURE **2**

IMPACT SCIENCES

First Floor Plan

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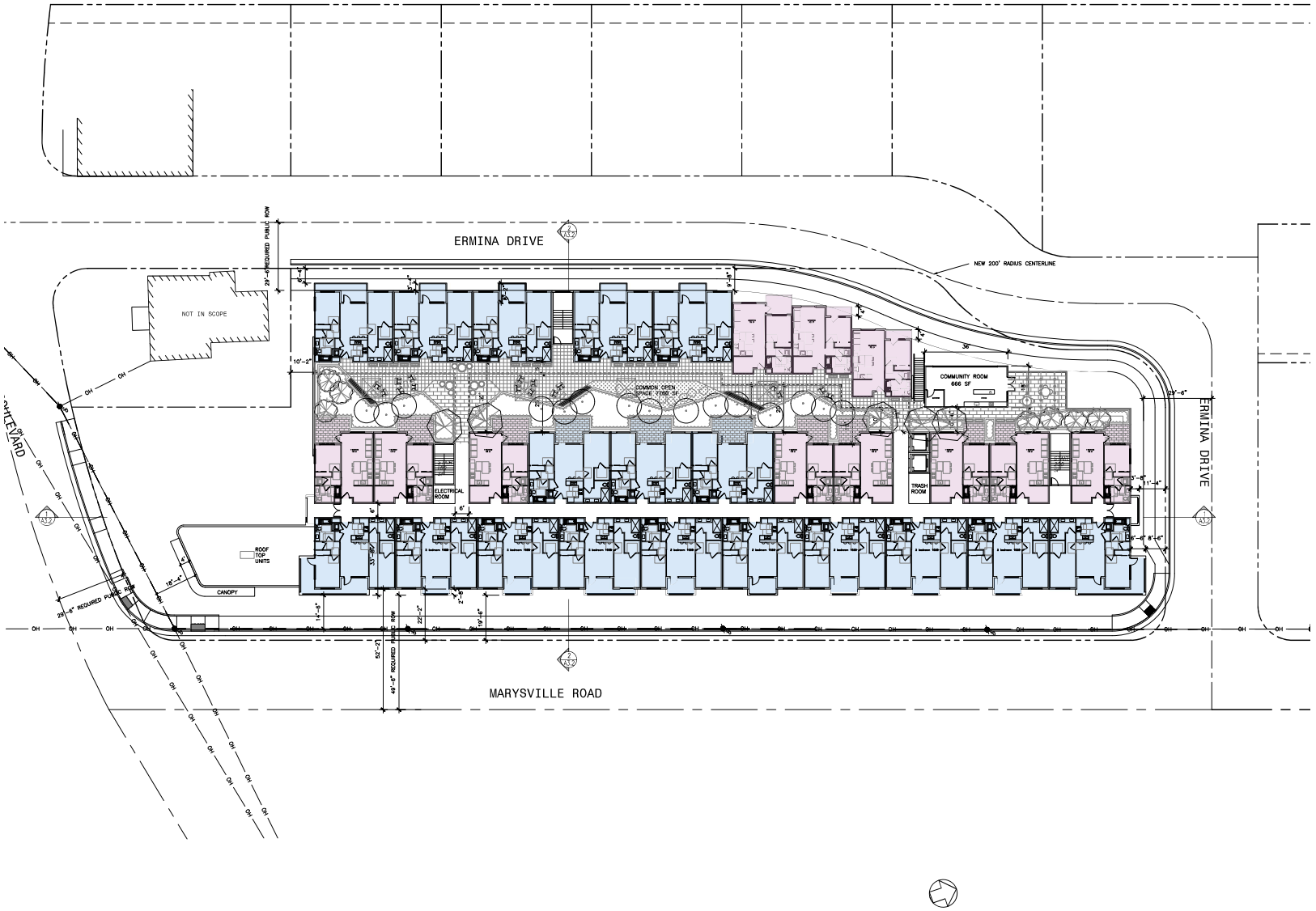

SOURCE: SCDC, 2023

FIGURE **3**

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Second Floor Plan

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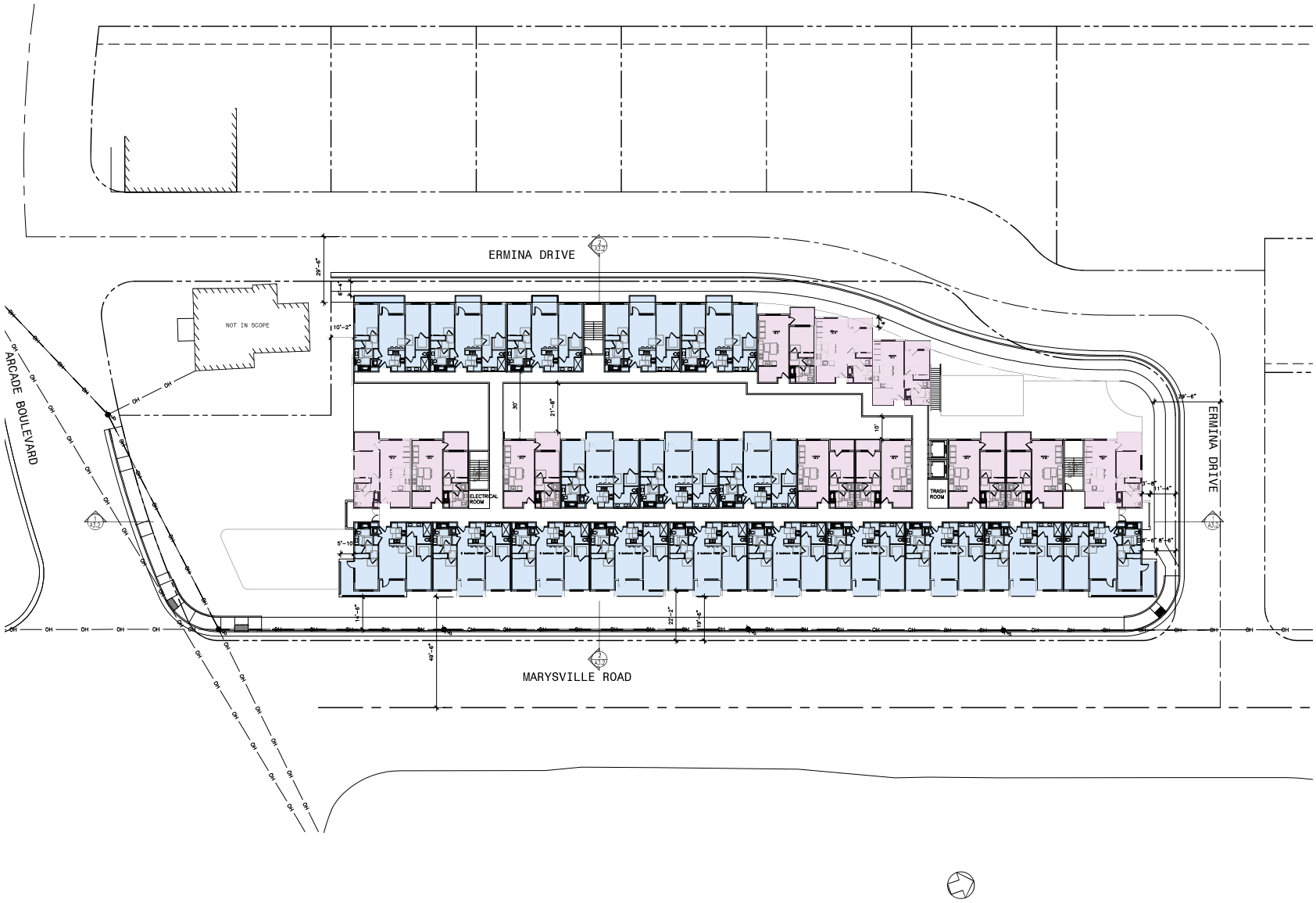

SOURCE: SCDC, 2023

FIGURE **4**

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Third and Fourth Floor Plan

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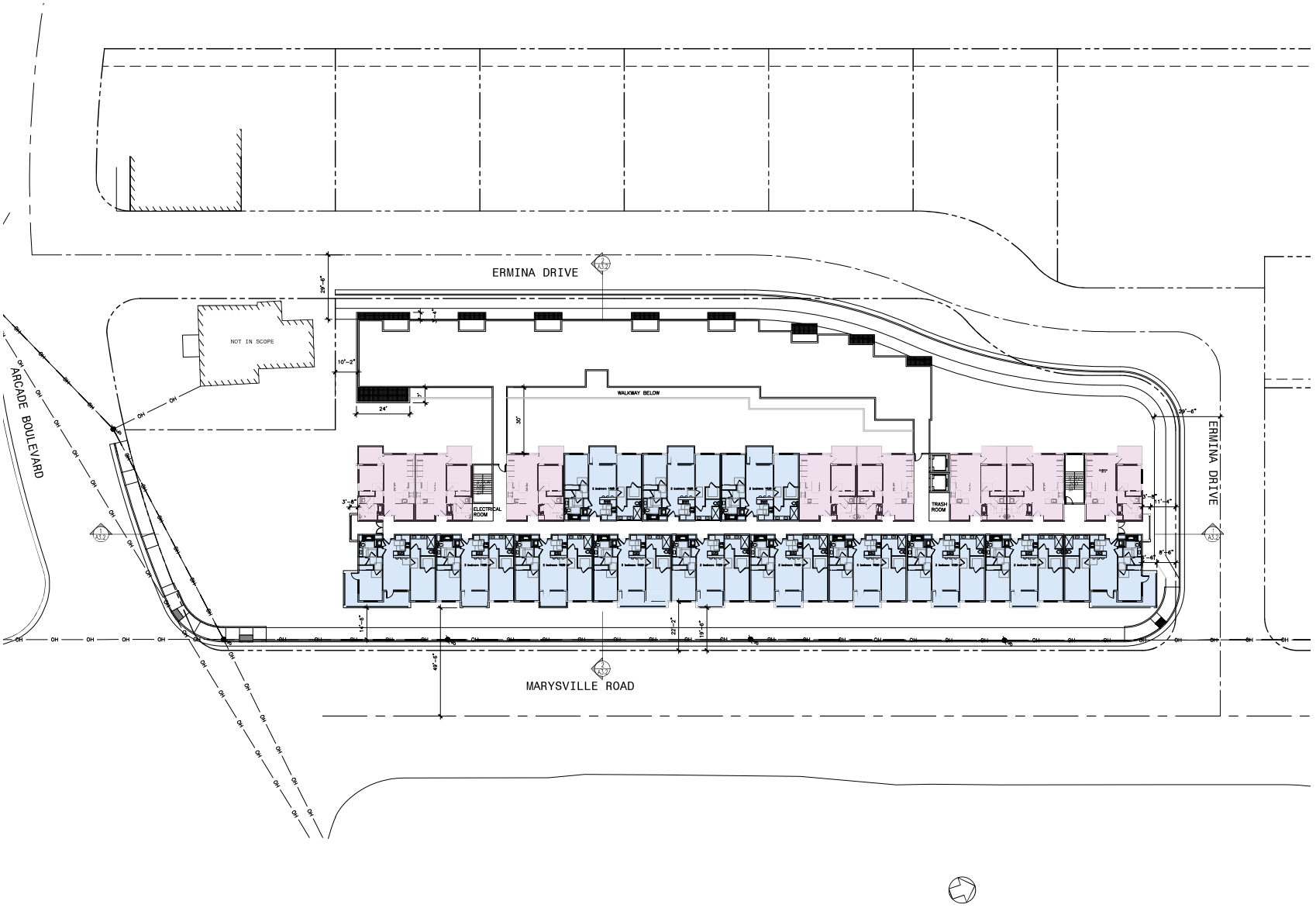

SOURCE: SCDC, 2023

FIGURE **5**

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Fifth Floor Plan

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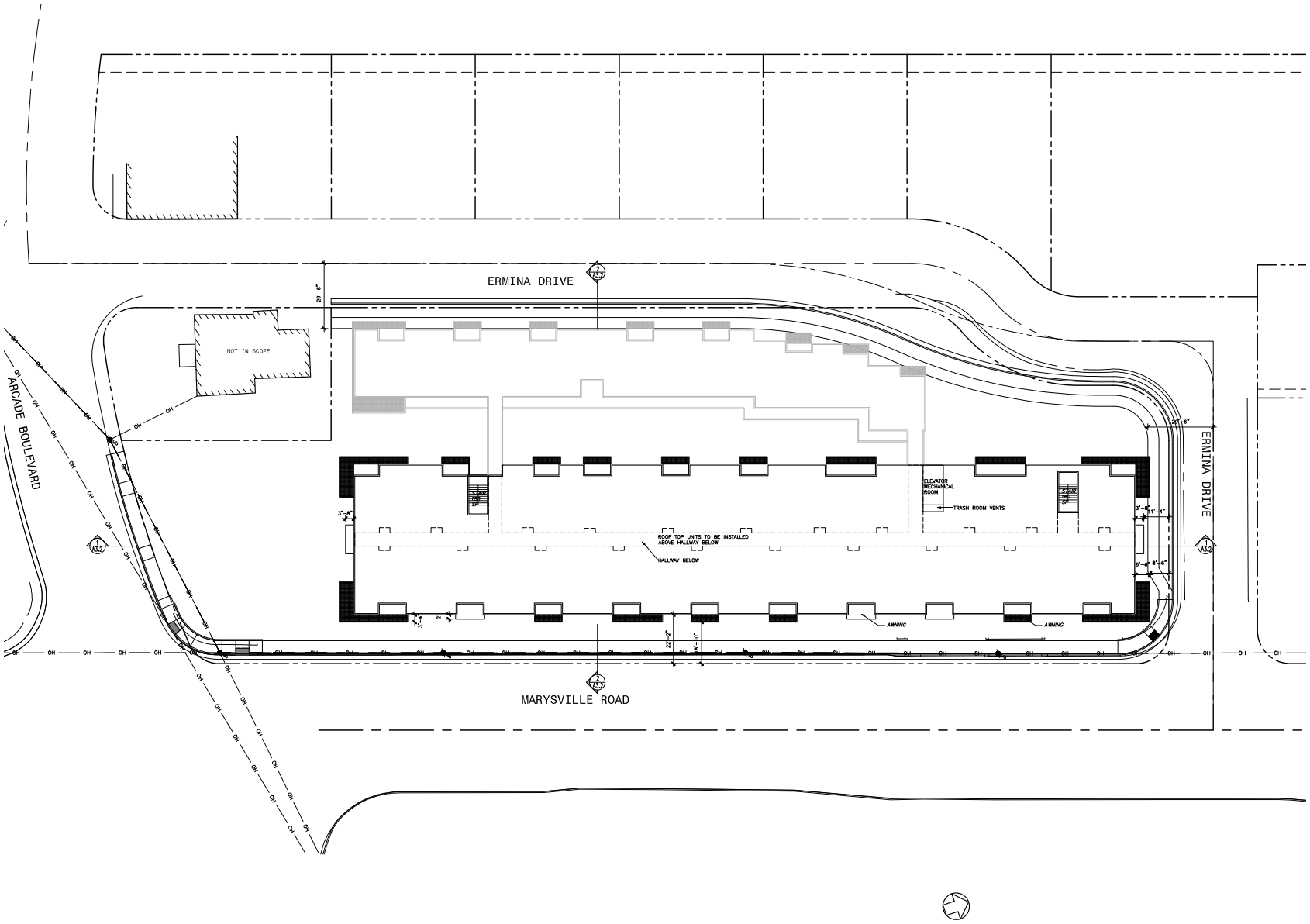

SOURCE: SCDC, 2023

FIGURE 6

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Roof Floor Plan

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2.0 ENVIRONMENTAL SETTING

2.1 FUNDAMENTALS OF NOISE & VIBRATION

Noise

Noise is usually defined as unwanted sound that is an undesirable byproduct of society's normal day-to-day activities. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm, and/or when it has adverse effects on health. Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). The human ear does not respond uniformly to sounds at all frequencies. For example, the human ear is less sensitive to low and high frequencies than medium frequencies, which more closely correspond with human speech. In response to the sensitivity of the human ear to different frequencies, the A-weighted noise level (or scale), which corresponds better with people's subjective judgment of sound levels, has been developed. This A-weighted sound level, referenced in units of dB(A), is measured on a logarithmic scale such that a doubling of sound energy results in a 3 dB(A) increase in noise level. Typically, changes in a community noise level of less than 3 dB(A) are not noticed by the human ear.[1] Changes from 3 to 5 dB(A) may be noticed by some individuals who are sensitive to changes in noise. A greater than 5 dB(A) increase is readily noticeable, while the human ear perceives a 10 dB(A) increase in sound level to be a doubling of sound.

On the A-weighted scale, the range of human hearing extends from approximately 3 to 140 dB(A). **Table 1, A-Weighted Decibel Scale**, provides examples of A-weighted noise levels from common sources. Noise sources occur in two forms: (1) point sources, such as stationary equipment or individual motor vehicles; and (2) line sources, such as a roadway with a large number of point sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6 dB(A) for each doubling of distance from the source to the receptor at acoustically "hard" sites and 7.5 dB(A) at acoustically "soft" sites.[2] For example, if a noise source produces a noise level of 89 dB(A) at a reference distance of 50 feet, the noise level would be 83 dB(A) at a distance of 100 feet from the noise source, 77 dB(A) at a distance of 200 feet, and so on. Noise generated by a mobile source will decrease by approximately 3 dB(A) over hard surfaces and 4.5 dB(A) over soft surfaces for each doubling of distance.

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1 California Department of Transportation (Caltrans), *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013. Available online at: https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf, accessed August 16, 2023.

2 Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 97. Examples of "hard" or reflective sites include asphalt, concrete, and hard and sparsely vegetated soils. Examples of acoustically "soft" or absorptive sites include soft, sand, plowed farmland, grass, crops, heavy ground cover, etc.

Table 1
A-Weighted Decibel Scale

Typical A-Weighted Sound Levels	Sound Level (dB(A), Leq)
Threshold of Pain	140
Jet Takeoff at 100 Meters	125
Jackhammer at 15 Meters	95
Heavy Diesel Truck at 15 Meters	85
Conversation at 1 Meter	60
Soft Whisper at 2 Meters	35

Source: United States Occupational Safety & Health Administration, Noise and Hearing Conservation Technical Manual, 1999.

Sound levels also can be attenuated by man-made or natural barriers (e.g., sound walls, berms, and ridges), as well as elevational differences. Noise is most audible when traveling by direct line-of-sight, an interrupted visual path between the noise source and noise receptor. Barriers, such as walls or buildings that break the line-of-sight between the source and the receiver, can greatly reduce noise levels from the source since sound can only reach the receiver by diffraction. However, if a barrier is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

Solid walls and berms may reduce noise levels by 5 to 10 dB(A) depending on their height and distance relative to the noise source and the noise receptor.[3] Sound levels may also be attenuated 3 dB(A) by a first row of houses and 1.5 dB(A) for each additional row of houses.[4] The minimum noise attenuation provided by typical structures in California is provided in **Table 2, Building Noise Reduction Factors**.

[3] Federal Highway Administration, *Highway Noise Mitigation*, (1980) 18.

[4] California Department of Transportation (Caltrans), *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013. Available online at: https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf, accessed August 16, 2023.

Table 2
Building Noise Reduction Factors

Building Type	Window Condition	Noise Reduction Due to Exterior of the Structure (dB(A))
All	Open	10
Light Frame	Ordinary Sash (closed)	20
	Storm Windows	25
Masonry	Single Glazed	25
	Double Glazed	35

Source: Federal Highway Administration, Highway Traffic Noise: Analysis and Abatement Guidance. December 2011.

Sound Rating Scales

Various rating scales approximate the human subjective assessment to the "loudness" or "noisiness" of a sound. Noise metrics have been developed to account for additional parameters, such as duration and cumulative effect of multiple events. Noise metrics are categorized as single event metrics and cumulative metrics, as summarized below.

In order to simplify the measurement and computation of sound loudness levels, frequency weighted networks have obtained wide acceptance. The A-weighted scale, discussed above, has become the most prominent of these scales and is widely used in community noise analysis. Its advantages are that it has shown good correlation with community response and is easily measured. The metrics used in this analysis are all based upon the dB(A) scale.

Equivalent Noise Level

Equivalent Noise Level (Leq) is the sound level corresponding to a steady-state A-weighted sound level containing the same total energy as several single event noise exposure level events during a given sample period. Leq is the "acoustic energy" average noise level during the period of the sample. It is based on the observation that the potential for noise annoyance is dependent on the total acoustical energy content of the noise. The equivalent noise level is expressed in units of dB(A). Leq can be measured for any period, but is typically measured for 15 minutes, 1 hour, or 24 hours. Leq for a 1-hour period is used by the Federal Highway Administration (FHWA) for assessing highway noise impacts. Leq for 1 hour is referred to as the Hourly Noise Level (HNL) in the California Airport Noise Regulations and is used to develop Community

Noise Equivalent Level values for aircraft operations. Construction noise levels and ambient noise measurements in this section use the Leq scale.

Community Noise Equivalent Level

Community Noise Equivalent Level (CNEL) is a 24-hour, time-weighted energy average noise level based on the A-weighted decibel. It is a measure of the overall noise experienced during an entire day. The term "time-weighted" refers to the penalties attached to noise events occurring during certain sensitive periods. In the CNEL scale, 5 decibels (dB) are added to measured noise levels occurring between the hours of 7 P.M. and 10 P.M. For measured noise levels occurring between the hours of 10 P.M. and 7 A.M., 10 dB are added. These decibel adjustments are an attempt to account for the higher sensitivity to noise in the evening and nighttime hours and the expected lower ambient noise levels during these periods. Existing and projected future traffic noise levels in this section use the CNEL scale.

Day-Night Average Noise Level

The day-night average sound level (Ldn) is another average noise level over a 24-hour period. Noise levels occurring between the hours of 10 P.M. and 7 A.M. are increased by 10 dB. This noise is weighted to take into account the decrease in community background noise of 10 dB(A) during this period. Noise levels measured using the Ldn scale are typically similar to CNEL measurements.

Adverse Effects of Noise Exposure

Noise is known to have several adverse effects on humans, which has led to laws and standards being set to protect public health and safety, and to ensure compatibility between land uses and activities. Adverse effects of noise on people include hearing loss, communication interference, sleep interference, physiological responses, and annoyance. Each of these potential noise impacts on people is briefly discussed in the following narrative.

Hearing Loss

Hearing loss is generally not a community noise concern, even near a major airport or a major freeway. The potential for noise-induced hearing loss is more commonly associated with occupational noise exposures in heavy industry, very noisy work environments with long-term exposure, or certain very loud recreational activities (e.g., target shooting and motorcycle or car racing). The Occupational Safety and Health Administration (OSHA) identifies a noise exposure limit of 90 dB(A) for 8 hours per day to protect from hearing loss (higher limits are allowed for shorter duration exposures). Noise levels in neighborhoods, even in very noisy neighborhoods, are not sufficiently loud enough to cause hearing loss.

Communication Interference

Communication interference is one of the primary concerns in environmental noise. Communication interference includes speech disturbance and intrusion with activities such as watching television. Noise can also interfere with communications such as within school classrooms. Normal conversational speech is in the range of 60 to 65 dB(A) and any noise in this range or louder may interfere with speech.

Sleep Interference

Noise can make it difficult to fall asleep, create momentary disturbances of natural sleep patterns by causing shifts from deep to lighter stages, and cause awakening. Noise may even cause awakening that a person may or may not be able to recall.

Physiological Responses

Physiological responses are those measurable effects of noise on people that are realized as changes in pulse rate, blood pressure, and other physical changes. Studies to determine whether exposure to high noise levels can adversely affect human health have concluded that, while a relationship between noise and health effects seems plausible, there is no empirical evidence of the relationship.

Annoyance

Annoyance is an individual characteristic and can vary widely from person to person. Noise that one person considers tolerable can be unbearable to another of equal hearing capability. The level of annoyance depends both on the characteristics of the noise (including loudness, frequency, time, and duration), and how much activity interference (such as speech interference and sleep interference) results from the noise. However, the level of annoyance is also a function of the attitude of the receiver. Attitudes may also be affected by the relationship between the person affected and the source of noise, and whether attempts have been made to abate the noise.

Vibration

Vibration consists of waves transmitted through solid material. Groundborne vibration propagates from a source through the ground to adjacent buildings by surface waves. Vibration may comprise a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating and is measured in hertz (Hz). Most environmental vibrations consist of a composite, or "spectrum" of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most groundborne vibration that can be felt generally starts from a low frequency of less than one Hz to a high of about 200 Hz. Vibration is often measured in terms of the peak

particle velocity (PPV) in inches per second (in/sec) when considering impacts on buildings or other structures, as PPV represents the maximum instantaneous peak of vibration that can stress buildings. Because it is a representation of acute vibration, PPV is often used to measure the temporary impacts of short-term construction activities that could instantaneously damage-built structures. Vibration is often also measured by the root mean squared (RMS) because it best correlates with human perception and response. Specifically, RMS represents "smoothed" vibration levels over an extended period of time and is often used to gauge the long-term chronic impact of a Project's operation on the adjacent environment. RMS amplitude is the average of a signal's squared amplitude. It is most commonly measured in decibel notation (VdB).

Vibration energy attenuates as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source. High frequency vibrations reduce much more rapidly than low frequencies, so that in the far-field from a source, the low frequencies tend to dominate. Soil properties also affect the propagation of vibration. When groundborne vibration interacts with a building, there is usually a ground-to-foundation coupling loss (i.e., the foundation of the structure does not move in sync with the ground vibration), but the vibration can also be amplified by the structural resonances of the walls and floors. Vibration in buildings is typically perceived as rattling of windows or items on shelves, or the motion of building surfaces. At high levels, vibration can result in damage to structures.

Manmade groundborne vibration is generally limited to areas within a few hundred feet of certain types of construction activities, especially pile driving. Road vehicles 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 induces perceptible vibration in buildings, such as window rattling or shaking of small loose items (typically caused by heavy trucks in passing), then it is most likely an effect of low-frequency airborne noise or ground characteristics. Human annoyance by vibration is related to the number and duration of events. The more events or the greater the duration, the more annoying it will be to humans.

Construction vibration damage criteria are assessed based on structural category (e.g., reinforced-concrete, steel, or timber). The Federal Transit Administration (FTA) guidelines consider 0.2 inch/sec PPV to be the significant impact level for non-engineered timber and masonry buildings. Structures or buildings constructed of reinforced concrete, steel, or timber have a vibration damage criterion of 0.5 inch/sec PPV pursuant to FTA Guidelines.[5] The FTA Guidelines include a table showing the vibration damage criteria based on structural category and is presented below in **Table 3, Construction Vibration Damage Criteria.**

[5] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018. Available online at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf, accessed August 16, 2023.

Table 3
Construction Vibration Damage Criteria

Building/Structural Category	PPV, in/sec
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual. September 2018.

2.2 NOISE SENSITIVE RECEPTORS

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses. The closest noise sensitive receptors are single-family residences located 35 feet to the west and to the north of the Project Site, the Good Samaritan Church of God/the Hagginwood Academy for Children located 50 feet to the east of the Project Site, single-family residences located 135 feet from the southeast corner of the Project Site, and a single-family residence 125 feet from the southwest corner of the Project Site. See **Figure 7, Sensitive Receptor Map.**

2.3 EXISTING CONDITIONS

According to the Draft Master Environmental Impact Report for the City of Sacramento 2035 General Plan Update Noise and Vibration section, the roadway segment of Marysville Boulevard from Arcade Boulevard to Del Paso Boulevard has an existing noise level of 60.0 CNEL dB(A) at 50 feet.[6] The main sources of groundborne vibration near the Project Site are heavy-duty vehicular travel (e.g., private vehicles, delivery trucks and transit buses) on local roadways. Trucks and buses typically generate groundborne vibration

6 City of Sacramento, *Draft Master Environmental Impact Report for the City of Sacramento 2035 General Plan Update – Noise and Vibration*, 2014. Available at: https://www.cityofsacramento.org/-/media/Corporate/Files/CDD/Planning/Environmental-Impact-Reports/2035-GP-Update/Public-Draft-MEIR081114.pdf?la=en, accessed August 16, 2023.

velocity levels of around 63 VdB at 50 feet, and these levels could reach 72 VdB where trucks and buses pass over bumps in the road.[7] In terms of PPV levels, a heavy-duty vehicle traveling at a distance of 50 feet can result in a vibration level of approximately 0.001 inch per second.

7 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018. Available online at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf, accessed April 24, 2023

SOURCE: Esri, 2023

FIGURE 7

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Sensitive Receptor Map

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3.0 REGULATORY FRAMEWORK

3.1 FEDERAL REGULATIONS

Occupational Health and Safety Act of 1970

Under the Occupational Safety and Health Act of 1970 (29 U.S.C. §1919 et seq.), the Occupational Safety and Health Administration (OSHA) has adopted regulations designed to protect workers against the effects of occupational noise exposure. These regulations list permissible noise level exposure as a function of the amount of time during which the worker is exposed. The regulations further specify a hearing conservation program that involves monitoring noise to which workers are exposed, ensuring that workers are made aware of overexposure to noise, and periodically testing the workers' hearing to detect any degradation.[8]

Noise Control Act of 1972

Under the authority of the Noise Control Act of 1972, the United States Environmental Protection Agency (U.S. EPA) established noise emission criteria and testing methods published in Parts 201 through 205 of Title 40 of the Code of Federal Regulations (CFR) that apply to some transportation equipment (e.g., interstate rail carriers, medium trucks, and heavy trucks) and construction equipment. In 1974, U.S. EPA issued guidance levels for the protection of public health and welfare in residential areas of an outdoor L_{dn} of 55 dB(A) and an indoor L_{dn} of 45 dB(A). These guidance levels are not standards or regulations and were developed without consideration of technical or economic feasibility. There are no federal noise standards that directly regulate environmental noise related to the construction or operation of the Project. Moreover, the federal noise standards are not reflective of urban environments that range by land use, density, proximity to commercial or industrial centers, etc. As such, for purposes of determining acceptable sound levels to determine and evaluate intrusive noise sources and increases, this document utilizes the County of San Bernardino Noise Regulations, discussed below.

Federal Transit Administration Vibration Standards

There are no federal vibration standards or regulations adopted by any agency that are applicable to evaluating vibration impacts from activities associated with the Project. However, the Federal Transit Administration (FTA) has adopted vibration criteria for use in evaluating vibration impacts from construction activities. The vibration damage criteria adopted by the FTA are shown in **Table 4, Construction Vibration Damage Criteria.**

8 United States Department of Labor, *Occupational Safety and Health Act of 1970*. Available online at: https://www.osha.gov/laws-regs/oshact/completeoshact, accessed August 16, 2023.

Table 4
Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: FTA, Transit Noise and Vibration Impact Assessment Manual, 2018.

3.2 STATE REGULATIONS

Office of Planning and Research Guidelines for Noise Compatible Land Use

The State of California has not adopted statewide standards for environmental noise, but the Governor's Office of Planning and Research (OPR) has established guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. The City has developed its own compatibility guidelines in the Noise Element of the General Plan based in part on OPR Guidelines, see **Table 6,** later in this report. California Government Code Section 65302 requires each county and city in the State to prepare and adopt a comprehensive long-range general plan for its physical development, with Section 65302(f) requiring a noise element to be included in the general plan. The noise element must: (1) identify and appraise noise problems in the community; (2) recognize Office of Noise Control guidelines; and (3) analyze and quantify current and projected noise levels.

Caltrans Vibration/Groundborne Noise Standards

The State of California has not adopted Statewide standards or regulations for evaluating vibration or groundborne noise impacts from land use development projects. Although the State has not adopted any vibration standard, Caltrans recommends the following vibration thresholds that are more practical than those provided by the FTA.[9] See **Table 5, Guideline Vibration Damage Potential Threshold Criteria.**

The state noise and vibration guidelines are to be used as guidance with respect to planning for noise, not standards and/or regulations to which the City must adhere.

9 Caltrans, *Transportation and Construction Vibration Guidance Manual*, 2020.

Table 5
Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (inch/sec)	
	Transient Sources[1]	Continuous/Frequent Intermittent Sources[2]
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50

Source: Table 19, Transportation and Construction Vibration Guidance Manual (Caltrans 2020).
1 Transient sources create a single, isolated vibration event, such as blasting or drop balls.
2 Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Title 24, California Code of Regulations

The California Noise Insulation Standards of 1988 (California Code of Regulations Title 24, Section 3501 et seq.) require that interior noise levels from the exterior sources not exceed 45 dB(A) Ldn/community noise equivalent level (CNEL)[10] in any habitable room of a multi-residential use facility (e.g., hotels, motels, dormitories, long-term care facilities, and apartment houses and other dwellings, except detached single-family dwellings) with doors and windows closed. Where exterior noise levels exceed 60 dB(A) CNEL/Ldn, an acoustical analysis is required to show that the building construction achieves an interior noise level of 45 dB(A) CNEL/Ldn or less.

10 Measurements are based on Ldn or CNEL.

3.2 LOCAL PLANS AND POLICIES

City of Sacramento 2035 General Plan

The City of Sacramento 2035 General Plan was adopted in March 2015, and guides the City in the implementation of creating a sustainable city through goals, policies, and implementation programs.[11] The General Plan's Citywide Goals and Polices tab contains a Citywide Goals and Polices section, which contains an Environmental Restraints chapter that establishes policies to protect residents, businesses, and visitors from noise hazards by establishing exterior and interior noise standard. The following goals and policies are relevant to the Proposed Project:

Goal EC 3.1. **Noise Reduction.** Minimize noise impacts on human activity to ensure the health and safety of the community.

Policy EC 3.1.1 **Exterior Noise Standards.** The City shall require noise mitigation for all development where the projected exterior noise levels exceed those shown in **Table 6**, to the extent feasible.

Table 6
Exterior Noise Compatibility Standards for Various Land Uses

Land Use Type	Highest Level of Noise Exposure that is Regarded as "Normally Acceptable"[a] (Ldn[b], or CNEL[c])
Residential – Low Density Single Family, Duplex, Mobile Homes	60 dB(A)
Residential – Multi-family	65 dB(A)
Urban Residential Infill and Mixed-Use Projects	70 dB(A)
Transient Lodging – Motels, Hotels	65 dB(A)
Schools, Libraries, Churches, Hospitals, Nursing Homes	70 dB(A)
Auditoriums, Concert Halls, Amphitheaters	Mitigation based on site-specific study
Sports Arena, Outdoor Spectator Sports	Mitigation based on site-specific study
Playgrounds, Neighborhood Parks	70 dB(A)
Golf Courses, Riding Stables, Water Recreation, Cemeteries	75 dB(A)
Office Buildings – Business, Commercial, and Professional	70 dB(A)
Industrial, Manufacturing, Utilities, Agriculture	75 dB(A)

Source: City of Sacramento. 2015. Environmental Restraints Section of the City of Sacramento 2035 General Plan – Table EC 1. Available at: Environmental-Constraints.pdf (cityofsacramento.org)

11 City of Sacramento, *Environmental Restraints Section of the City of Sacramento 2035 General Plan*, 2015. Available online at: https://www.cityofsacramento.org/-/media/Corporate/Files/CDD/Planning/General-Plan/2035-GP/Environmental-Resources.pdf?la=en, accessed August 16, 2023.

Policy EC 3.1.2 Exterior Incremental Noise Standards. The City shall require noise mitigation for all development that increase existing ambient noise levels by more than the allowable increment shown in **Table 7**, to the extent feasible.

Table 7
Exterior Incremental Noise Impact Standards for Noise-Sensitive Uses (dB(A))

Residences and Buildings Where People Normally Sleep		Institutional Land Uses With Primarily Daytime and Evening Uses	
Existing L_{dn}	Allowable Noise Increment	Existing Peak Hour L_{dn}	Allowable Noise Increment
45	8	45	12
50	5	50	9
55	3	55	6
60	2	60	5
65	1	65	3
70	1	70	3
75	0	75	1
80	0	80	0

Source: City of Sacramento. 2015. Environmental Restraints Section of the City of Sacramento 2035 General Plan – Table EC 2. Available at: Environmental-Constraints.pdf (cityofsacramento.org)

Policy EC 3.1.3 **Interior Noise Standards.** The City shall require new development to include noise mitigation to assure acceptable interior noise levels appropriate to the land use type: 45 dB(A) Ldn (with windows closed) for residential, transient lodgings, hospitals, nursing homes and other uses where people normally sleep; and 45 dB(A) Leq (peak hour with windows closed) for office buildings and similar uses.

Policy EC 3.1.5 **Interior Vibration Standards.** The City shall require construction projects anticipated to generate a significant amount of vibration to ensure acceptable interior vibration levels at nearby residential and commercial uses based on the current City or Federal Transit Administration (FTA) criteria.

Policy EC 3.1.8 **Operational Noise.** The City shall require mixed-use, commercial, and industrial projects to mitigate operational noise impacts to adjoining sensitive uses when operational noise thresholds are exceeded.

Policy EC 3.1.10 **Construction Noise.** The City shall require development projects subject to discretionary approval to assess potential construction noise impacts on nearby sensitive uses and to minimize impacts on these uses, to the extent feasible.

Policy EC 3.1.11 **Alternatives to Sound Walls.** The City shall encourage the use of design strategies and other noise reduction methods along transportation corridors in lieu of sound walls to mitigate noise impacts and enhance aesthetics.

North Sacramento Community Plan

The Project Site is within the North Sacramento Community Plan. The Community Plan, adopted alongside the Sacramento 2035 General Plan Update, establishes the community's vision, acknowledges community issues, and establishes policies to improve the community. Policies that are relevant to the Project are listed below:[12]

NS.LU 1.1 **Development North of Business 80.** The City shall encourage development north of Business 80 in a manner which emphasizes neighborhood cohesiveness and variety of housing types.

NS.LU 1.5 **Noise Sensitive Land.** The City shall avoid the placement of noise-sensitive land uses adjacent to the Western Pacific and Union Pacific railroad lines that form the western and eastern borders of the North Sacramento Community.

City of Sacramento Municipal Code

The Sacramento Municipal Code (Municipal Code) contains several references to noise control.[13] Sections of the Municipal Code relevant to the Project are listed below:

Article II. Noise Standards

8.68.060 Exterior noise standards

A. The following noise standards unless otherwise specifically indicated in this article shall apply to all agricultural and residential properties.

   1. From seven a.m. to ten p.m. the exterior noise shall be fifty-five (55) dB(A).

   2. From ten p.m. to seven a.m. the exterior noise standard shall be fifty (50) dB(A).

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12 City of Sacramento, *North Sacramento Community Plan*, 2015. Available at: https://www.cityofsacramento.org/-/media/Corporate/Files/CDD/Planning/Community-Plans/North-Sacramento.pdf?la=en, accessed August 16, 2023.

13 City of Sacramento, *Sacramento, California City Code*, Title 8, Health and Safety. Available online at: https://library.qcode.us/lib/sacramento_ca/pub/city_code/item/title_8-chapter_8_68, accessed August 16, 2023.

B. It is unlawful for any person at any location to create any noise which causes the noise levels when measured on agricultural or residential property to exceed for the duration of time set forth following, the specified exterior noise standards in any one hour by:

Cumulative Duration of the Intrusive Sound:	**Allowance Decibels:**
1. Cumulative period of 30 minutes per hour	0
2. Cumulative period of 15 minutes per hour	+5
3. Cumulative period of 5 minutes per hour	+10
4. Cumulative period of 1 minute per hour	+15
5. Level not to be exceeded for any time per hour	+20

C. Each of the noise limits specified in subsection B of this section shall be reduced by five dB(A) for impulsive or simple tone noises, or for noises consisting of speech or music.

D. If the ambient noise level exceeds that permitted by any of the first four noise limit categories specified in subsection B of this section, the allowable noise limit shall be increased in five dB(A) increments in each category to encompass the ambient noise level. If the ambient noise level exceeds the fifth noise level category, the maximum ambient noise level shall be the noise limit for that category.

8.68.070 Interior noise standards

A. In any apartment, condominium, townhouse, duplex or multiple dwelling unit it is unlawful for any person to create any noise from inside his or her unit that causes the noise level when measured in a neighboring unit during the periods ten p.m. to seven a.m. to exceed:

1. Forty-five (45) dB(A) for a cumulative period of more than five minutes in any hour;

2. Fifty (50) dB(A) for a cumulative period of more than one minute in any hour;

3. Fifty-five (55) dB(A) for any period of time.

B. If the ambient noise level exceeds that permitted by any of the noise level categories specified in subsection A of this section, the allowable noise limit shall be increased in five dB(A) increments in each category to encompass the ambient noise level.

8.68.080 Exemptions

D. Noise sources due to the erection (including excavation), demolition, alteration or repair of any building or structure between the hours of seven a.m. and six p.m., on Monday, Tuesday, Wednesday, Thursday, Friday and Saturday, and between nine a.m. and six p.m. on Sunday; provided, however, that the operation of an internal combustion engine shall not be exempt pursuant to this subsection if such engine is not equipped with suitable exhaust and intake silencers which are in good working order. The director of building inspections may permit work to be done during the hours not exempt by this subsection in the case of urgent necessity and in the interest of public health and welfare for a period not to exceed three days. Application for this exemption may be made in conjunction with the application for the work permit or during progress of the work.

4.0 NOISE ANALYSIS

4.1 THRESHOLDS OF SIGNIFICANCE

In accordance with Appendix G of the *State CEQA Guidelines*, Project related noise and vibration impacts would be considered significant if it would cause:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the Project Site in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generation of excessive ground-borne vibration or ground-borne noise levels; and
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the Project area to excessive noise levels.

The *State CEQA Guidelines* do not define the levels at which groundborne vibration or groundborne noises are considered "excessive." Thus, in terms of construction-related vibration impacts on buildings, the adopted guidelines and recommendations by the FTA to limit groundborne vibration based on the age and/or condition of the structures that are located in close proximity to construction activity are used in this analysis to evaluate potential groundborne vibration impacts. Based on the FTA criteria, construction impacts relative to groundborne vibration would be considered significant if the following were to occur:

- Project construction activities would cause a PPV groundborne vibration level to exceed 0.5 inches per second at any building that is constructed with reinforced-concrete, steel, or timber;
- Project construction activities would cause a PPV groundborne vibration level to exceed 0.3 inches per second at any engineered concrete and masonry buildings;
- Project construction activities would cause a PPV groundborne vibration level to exceed 0.2 inches per second at any non-engineered timber and masonry buildings; or
- Project construction activities would cause a PPV ground-borne vibration level to exceed 0.12 inches per second at any historical building or building that is extremely susceptible to vibration damage.

In terms of groundborne vibration impacts associated with human annoyance, this analysis uses the FTA's vibration impact thresholds for sensitive buildings, residences, and institutional land uses under conditions where there are a frequent number of events per day, which would provide for the most conservative

vibration analysis. These thresholds are 65 VdB at buildings where vibration would interfere with interior operations, 72 VdB at residences and buildings where people normally sleep, and 75 VdB at other institutional buildings.[14] The 65 VdB threshold applies to typical land uses where vibration would interfere with interior operations, including vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and university research operations. Vibration-sensitive equipment includes, but is not limited to, electron microscopes, high-resolution lithographic equipment, and normal optical microscopes. The 72 VdB threshold applies to all residential land uses and any buildings where people sleep, such as hotels and hospitals. The 75 VdB threshold applies to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

The *State CEQA Guidelines* do not define the levels at which noise would be considered substantial increases. Thus, for purposes of this analysis, the Project would normally have a significant impact on noise levels from project operations if the project causes the ambient noise level measured at the property line of affected uses to increase beyond the exterior noise compatibility standards and incremental noise impact standards established earlier in **Table 6** and **Table 7.**

4.2 METHODOLOGY

Noise levels associated with project-related construction activities were calculated using the FHWA Roadway Construction Noise Model (RCNM). Noise levels were also compared to the City's noise ordinance, which includes provisions regarding construction noise levels. Specifically, the Municipal Code Section 8.68.080 exempts noise sources (including excavation), demolition, alteration or repair of any building or structure between the hours of seven a.m. and six p.m., on Monday, Tuesday, Wednesday, Thursday, Friday and Saturday, and between nine a.m. and six p.m. on Sunday; provided, however, that the operation of an internal combustion engine shall not be exempt pursuant to this subsection if such engine is not equipped with suitable exhaust and intake silencers which are in good working order. As the Project would comply with the daytime construction hours established in the Municipal Code, this analysis also uses the FTA's general construction noise criteria of 90 dB(A) Leq (1-hour)[15] to provide additional context for the Project's potential to generate daytime construction noise impacts.

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14 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018. Available online at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf, accessed August 16, 2023.

15 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, Table 7-2 (General Assessment Construction Noise Criteria), September 2018.

4.3 IMPACT ANALYSIS

Impact NOI-1 **Would the Proposed Project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the Project Site in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? *(Less than Significant).***

Construction Impacts

Construction of the Project would require the use of heavy equipment for demolition, grading/site preparation/landscaping, and building construction. Construction activities would also involve the use of smaller power tools, generators, and other sources of noise. During each stage of construction, several types of equipment potentially could be operating concurrently and noise levels would vary based on the amount of equipment in operation and the location of the activity. The Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM) has compiled data regarding the noise-generating characteristics of specific types of construction equipment and typical construction activities.

With the use of the RCNM, as detailed in **Appendix A** to this report,[16] the construction noise levels forecasted for the sensitive receptors are presented in **Table 8, Estimated Exterior Construction Noise at Sensitive Receptors.** Noise levels would diminish notably with distance from the construction site at a rate of 6 dB(A) per doubling of distance (noise from stationary or point sources is reduced by about 6 dB(A) for every doubling of distance at acoustically hard locations). For example, a noise level of 86 dB(A) Leq measured at 50 feet from the noise source to the receptor would decline to 80 dB(A) Leq at 100 feet from the source to the receptor and fall by another 6 dB(A) Leq to 74 dB(A) Leq at 200 feet from the source to the receptor. These noise attenuation rates assume a flat and unobstructed distance between the noise generator and the receptor. Intervening structures and vegetation would further attenuate (reduce) the noise. Furthermore, it should be noted that increases in noise levels at sensitive receptors during construction would be intermittent and temporary and would not generate continuously high noise levels.

16 Project construction noise levels were calculated based on the Project's anticipated mix of construction equipment with the FHWA RCNM Version 1.1.

Table 8
Estimated Exterior Construction Noise at Sensitive Receptors

Sensitive Land Uses[a]	Distance to Project Site (feet)[a]	Estimated Peak Construction Noise Levels [dB(A) 1-Hour Leq)]	Exceed FTA 90 dB(A) 1-Hour Leq Criteria?
1. Single family residence to the west	35	77.8	No
2. Single family residences to the north	35	77.8	No
3. The Good Samaritan Church of God/Hagginwood Academy for Children	50	74.6	No
4. Single family residences to the southeast	135	72.5	No
5. Single family residences to the southwest	125	75.1	No

Note: Per FTA guidance, calculations based off of two loudest pieces of equipment measured from center of site to receptor
*Source: Impact Sciences, Inc., August 2023. See **Appendix A** to this report for details related to equipment and distance assumptions.*

While construction activity would increase noise levels in the vicinity of the Project Site (see **Table 8**), the Project's construction activities would not exceed the FTA's general construction noise criteria of 90 dB(A) Leq (1-hour) at any sensitive receptors. Furthermore, Project construction would occur during the permitted periods between seven a.m. and six p.m., on Monday, Tuesday, Wednesday, Thursday, Friday and Saturday, and between nine a.m. and six p.m. on Sunday, and all operation of an internal combustion engines shall be equipped with suitable exhaust and intake silencers. Thus, the Project would be consistent with the criteria set forth in the City's Municipal Code. As such, construction noise impacts would be less than significant and no mitigation is required. While no mitigation measures are required, the Project would implement the following best management practices to reduce temporary construction impacts as feasible:

- Prior to issuance of any grading or building permit, the Project Applicant shall demonstrate to the satisfaction of the City's Building Official that construction noise reduction methods shall be used where feasible. These methods include shutting off idling equipment, installing temporary acoustic barriers around stationary construction noise sources, maximizing the distance between construction equipment staging areas and occupied residential areas, and utilizing electric power tools.

- During construction, stationary construction equipment shall be placed such that emitted noise is directed away from sensitive noise receptors.

- Per the Municipal Code, construction shall be limited to the hours of 7:00 a.m. and 6:00 p.m. Monday through Saturday and from 9:00 a.m. to 6:00 p.m. on Sunday.

Operational Impacts

Permanent Operational Traffic Noise

Traffic volumes for the Project were estimated from the defaults generated from CalEEMod. The Project is anticipated to generate a maximum of approximately 1,503 daily vehicle trips.[17] The closest roadway to the Project Site with a recorded average daily traffic volume is Marysville Boulevard, to the east of the Project Site. According to City data, this roadway segment carries approximately 13,037 average daily trips where Marysville Boulevard intersects with Arcade Boulevard.[18] Based on this data, it is clear the Project's 1,503 daily trips would not have the potential double traffic volumes on existing roadways in the vicinity of the Project Site. Since it would take a doubling (i.e., a 100% increase) of roadway traffic volume to increase noise levels by 3 dB(A), the addition of traffic volume from operation of the Project would not increase traffic to levels capable of producing a 3 dB(A) ambient noise increase. Additionally, the Project is consistent with the surrounding land uses, which currently generate mobile noise sources typical of a residential neighborhood. As such, any noise increase would be imperceptible, and impacts would be ***less than significant***.

Stationary Noise Sources

New mechanical equipment, HVAC units, and exhaust fans are included as a part of the Project design. Although the operation of this equipment would generate noise, the design of these on-site HVAC units and exhaust fans would be required to comply with the regulations of the City Code. Specifically, Section 8.68.060 of the City Code establishes exterior noise standards that apply to residential properties. Noises from stationary sources such as heating, air conditioning, and ventilation systems should not result in exceedance of the 55 dB(A) threshold during daytime hours and 50 dB(A) during nighttime hours. As such, compliance with Section 8.68.060 of the City Code would ensure noise from stationary sources would be ***less than significant***.

Impact NOI-2 **Would the Proposed Project result in the generation of excessive groundborne vibration or groundborne noise levels? *(Less than Significant).***

The FTA provides ground-borne vibration impact criteria with respect to building damage during construction activities. PPV, expressed in inches per second, is used to measure building vibration damage.

17 Impact Sciences. *CalEEMod Output for the Sacramento Mixed-Use Apartments Project*. 2023.

18 City of Sacramento, "Traffic Counts," 1990. Available online at: https://www.cityofsacramento.org/Public-Works/Transportation/Traffic-Data-Maps/Traffic-Counts, accessed August 16, 2023.

Construction vibration damage criteria are assessed based on structural category (e.g., reinforced-concrete, steel, or timber). FTA guidelines consider 0.2 inch/sec PPV to be the significant impact level for non-engineered timber and masonry buildings. Structures or buildings constructed of reinforced concrete, steel, or timber have a vibration damage criterion of 0.5 inch/sec PPV pursuant to FTA guidelines.[19] Although the nearby structures appear to be constructed of reinforced concrete, steel, or timber, this analysis conservatively applies the 0.2 inch/sec PPV threshold typically applied to non-engineered timber and masonry buildings.

The vibration levels at nearby buildings are shown below in **Table 9, Vibration Levels at Off-Site Buildings from Project Construction.**

Table 9
Vibration Levels at Off-Site Buildings from Project Construction

Sensitive Uses Off-Site[a]	Distance to Project Site (ft.)	Receptor Significance Threshold PPV (in./sec)	Estimated PPV (in/sec)/
1. Single family residence to the west	35	0.2	0.054
2. Single family residence to the north	35	0.2	0.054
3. The Good Samaritan Church of God/Hagginwood Academy for Children	50	0.2	0.031
4. Single family residences to the southeast	135	0.2	0.007
5. Single family residences to the southwest	125	0.2	0.008

*Source: Impact Sciences, Inc., August 2023. See **Appendix A** to this report.*

The vibration velocities predicted to occur at the nearest buildings would be 0.054 in/sec PPV. These nearby structures are considered to be constructed of reinforced concrete, steel, or timber which have a vibration damage criterion of 0.5 inch/sec PPV pursuant to FTA guidelines. However, as stated earlier, the Project was conservatively assessed against the more conservative threshold typically applied to non-engineered timber and masonry buildings. As shown in **Table 9**, Project construction vibration levels would not have the potential to exceed this standard and this impact would be less than significant.

19 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018. Available online at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf, accessed August 16, 2023.

Impact NOI-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, would the project expose people residing or working in the project area to excessive noise levels? *(Less than Significant).***

The Project Site is located within the McClellan Air Force Base Comprehensive Land Use Plan and is located approximately 2.5 miles southwest of Sacramento McClellan Airport. The McClellan Air Force Base officially closed on July 13, 2001, and has been converted to McClellan Park, a private industrial park with corporate aviation, freight, technology, and other industrial sectors.[20] While the Project is within an airport land use plan, the land use plan for the McClellan Air Force Base was adopted in 1987 and was later amended in December of 1992, and the McClellan Air Force Base officially closed on July 13, 2001.[21] According to the more recent North Sacramento Community Plan, the Project Site is located outside of the 65 CNEL noise contour and is not located within 2 miles of the Sacramento McClellan Airport. Therefore, no impacts with respect to airstrip or airport related noise would occur and no further analysis is required.

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20 City of Sacramento, *North Sacramento Community Pla*n, 2015. Available online at: https://www.cityofsacramento.org/-/media/Corporate/Files/CDD/Planning/Community-Plans/North-Sacramento.pdf?la=en, accessed August 16, 2023.

21 Airport Land Use Commission, *McClellan Air Force Base Comprehensive Land Use Plan*, 1987. Available online at: https://www.sacog.org/sites/main/files/file-attachments/mcclellan_afb_clup_amend_dec_1992_-_93-014.pdf?1456339912, accessed August 16, 2023.

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Federal Highway Administration, *Highway Noise Mitigation*, (1980) 18.

Federal Transit Administration. *Transit Noise and Vibration Impact Assessment Manual*. 2018. Available online at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf, accessed August 16, 2023.

Impact Sciences. *CalEEMod Output for the Sacramento Mixed-Use Apartments Project*. 2023.

United States Occupational Safety & Health Administration. *Noise and Hearing Conservation Technical Manual*. 1999.

United States Department of Labor. *Occupational Safety and Health Act of 1970*. Available online at: https://www.osha.gov/laws-regs/oshact/completeoshact, accessed August 16, 2023.

APPENDIX A

Noise and Vibration Technical Data

Report date: 8/14/2023
Case Description: Sacramento Mixed Use Apartments

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Single family residence to the west	Residential	60	60	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	195	0
Pavement Scarafier	No	20		89.5	195	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Concrete Saw	77.8	70.8
Pavement Scarafier	77.7	70.7
Total	77.8	73.7

*Calculated Lmax is the Loudest value.

Per FTA guidance, calculations based off of two loudest pieces of equipment measurent from center of site to receptor.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Single family residences to the north	Residential	60	60	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	195	0
Pavement Scarafier	No	20		89.5	195	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Concrete Saw	77.8	70.8
Pavement Scarafier	77.7	70.7
Total	77.8	73.7

*Calculated Lmax is the Loudest value.

Per FTA guidance, calculations based off of two loudest pieces of equipment measurent from center of site to receptor.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Good Samaritan Church of God/Hagginwood	Commercial	60	60	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	279	0
Pavement Scarafier	No	20		89.5	279	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Concrete Saw	74.6	67.7
Pavement Scarafier	74.6	67.6
Total	74.6	70.6

*Calculated Lmax is the Loudest value.

Per FTA guidance, calculations based off of two loudest pieces of equipment measurent from center of site to receptor.

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Single family residences to the southeast	Residential	60	60	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	358	0
Pavement Scarafier	No	20		89.5	358	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Concrete Saw	72.5	65.5
Pavement Scarafier	72.4	65.4
Total	72.5	68.5

*Calculated Lmax is the Loudest value.

Per FTA guidance, calculations based off of two loudest pieces of equipment measurent from center of site to receptor.

---- Receptor #5 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Single family residences to the southwest	Residential	60	60	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	264	0
Pavement Scarafier	No	20		89.5	264	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Concrete Saw	75.1	68.1
Pavement Scarafier	75	68.1
Total	75.1	71.1

*Calculated Lmax is the Loudest value.

Per FTA guidance, calculations based off of two loudest pieces of equipment measurent from center of site to receptor.

Sacramento Mixed Use Apartments Project — Single family residences to the southwest

Ref= Reference vibration level (PPV)

RefD= Reference distance for Reference vibration level (Feet)

Vibration PPV		
Ref=	0.089	Based on type of equipment
RefD=	25	
D=	125	Distance from equipment to sensitive receptor
Equip=	0.008	

Peak demolition vibration based on utilizing a large bulldozer.

Source: FTA Tranist Noise and Vibration Impact Assessment, 2006.

Sacramento Mixed Use Apartments Project — Single family residence to the north

Ref= Reference vibration level (PPV)

RefD= Reference distance for Reference vibration level (Feet)

Vibration PPV		
Ref=	0.089	Based on type of equipment
RefD=	25	
D=	35	Distance from equipment to sensitive receptor
Equip=	0.054	

Peak demolition vibration based on utilizing a large bulldozer.

Source: FTA Tranist Noise and Vibration Impact Assessment, 2006.

Sacramento Mixed Use Apartments Project — Single family residence to the west

Ref= Reference vibration level (PPV)

RefD= Reference distance for Reference vibration level (Feet)

Vibration PPV		
Ref=	0.089	Based on type of equipment
RefD=	25	
D=	35	Distance from equipment to sensitive receptor
Equip=	0.054	

Peak demolition vibration based on utilizing a large bulldozer.

Source: FTA Tranist Noise and Vibration Impact Assessment, 2006.

Sacramento Mixed Use Apartments Project — Good Samaritan Church/Hagginwood Academy

Ref= Reference vibration level (PPV)

RefD= Reference distance for Reference vibration level (Feet)

Vibration PPV		
Ref=	0.089	Based on type of equipment
RefD=	25	
D=	50	Distance from equipment to sensitive receptor
Equip=	0.031	

Peak demolition vibration based on utilizing a large bulldozer.

Source: FTA Tranist Noise and Vibration Impact Assessment, 2006.

Sacramento Mixed Use Apartments Project — Single family residences to the southeast

Ref= Reference vibration level (PPV)

RefD= Reference distance for Reference vibration level (Feet)

Vibration PPV		
Ref=	0.089	Based on type of equipment
RefD=	25	
D=	135	Distance from equipment to sensitive receptor
Equip=	0.007	

Peak demolition vibration based on utilizing a large bulldozer.

Source: FTA Tranist Noise and Vibration Impact Assessment, 2006.