Appendix G:
Noise Impact Analysis Report

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Noise Impact Analysis Report
Midway Townhomes Project
City of Anaheim, Orange County, California

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Date: May 5, 2021

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ACRONYMS AND ABBREVIATIONS

ADT	Average Daily Traffic
AELUP	Airport Environs Land Use Plan
APN	Assessor's Parcel Number
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
EPA	United States Environmental Protection Agency
FCS	FirstCarbon Solutions
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HUD	United States Department of Housing and Urban Development
in/sec	inch per second
L_{dn}	Day-Night Average Sound Level
L_{eq}	equivalent noise/sound level
L_{max}	maximum noise/sound level
MM	Mitigation Measure
OSB	oriented strand board
PPV	peak particle velocity
rms	root mean square
STC	Standard Transmission Class
TTM	Tentative Tract Map
VdB	velocity in decibels

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SECTION 1: INTRODUCTION

1.1 - Purpose of Analysis and Study Objectives

This Noise Impact Analysis has been prepared by FirstCarbon Solutions (FCS) to determine the off-site and on-site noise impacts associated with the construction and implementation of the proposed Midway Townhomes Project (proposed project) in the City of Anaheim, California. The following is provided in this report:

- A description of the study area, project site, and proposed project.
- Information regarding the fundamentals of noise and vibration.
- A description of the local noise guidelines and standards.
- A description of the existing noise environment.
- An analysis of the potential short-term, construction-related noise and vibration impacts from the proposed project.
- An analysis of long-term, operations-related noise and vibration impacts from the proposed project.
- A comparative analysis to the findings of the Program Environmental Impact Report (Program EIR) No. 330 and Supplemental EIR No. 346.

Program EIR No. 330 concluded that buildout of the General Plan would have potentially significant and unavoidable traffic noise impacts, even with implementation of mitigation and applicable General Plan goals and policies. However, the analysis determined that buildout of the General Plan would result in less than significant impacts related to substantial temporary or permanent increases in ambient noise levels at sensitive receptors and in groundborne vibration impacts. Also, with implementation of Mitigation Measure (MM) 5.10-2, impacts from airport and airstrip activity would be reduced to less than significant.

Supplemental EIR No. 346 concluded that, similar to Program EIR No. 330, due to the scale of development activity associated with the Housing Opportunity Sites, many roadways within the City would still be expected to generate significant and unavoidable traffic noise impacts. However, also similar to Program EIR No. 330, the analysis determined that the proposed project would result in less than significant impacts related to substantial temporary or permanent increases in ambient noise levels at sensitive receptors and in groundborne vibration impacts. Finally, with implementation of MM 5.10-2 of Program EIR No. 330, impacts from airport and airstrip activity would be reduced to less than significant. No new significant impacts and no new mitigation were identified.

1.2 - Project Summary

1.2.1 - Site Location

The proposed project is located at 110 West Midway Drive, in the City of Anaheim, in Orange County, California (Exhibit 1). The 2.26-acre project site is located on Assessor's Parcel Numbers (APNs) 082-185-01, 082-185-47, 082-185-52, 082-185-53, and 082-185-59. The project site is located in the south-central portion of the City of Anaheim. It is located at the southwest corner of Anaheim Boulevard and West Midway Drive, and east of a proposed townhome development and Interstate 5 (I-5) (Exhibit 2.

Surrounding land uses include:

North:	West Midway Drive and Paul Revere Elementary School
East:	South Anaheim Boulevard and a parking lot for the Anaheim Marketplace
South:	A liquor store and Golden Skies Mobile Home Park
West:	Zeyn Street and a proposed townhome development

1.2.2 - Project Description

The proposed project would include the demolition of all existing structures on the project site and the development of 86 housing units in a 4-story building (Exhibit 3). The proposed project would include 29 one-bedroom units, 35 two-bedroom units, and 22 three-bedroom units. The proposed project would also provide amenities including a pool, a playground, a dog park, a public flex space used for community programs, and a leasing office. The proposed project would include 129 parking spaces.

The proposed project would provide 1,700 square feet of public flex space on the ground floor, providing for a variety of uses for the community. The ground floor would also contain a 3,300 square foot community center, which would include a clubroom for youth programs, as well as a leasing office.

The proposed project would include an outdoor recreational courtyard with a tot lot, community gardens, a swimming pool, an outdoor fireplace lounge area, restrooms, and a dog park. In total, the proposed project would include 22,220 square feet of common open spaces and 6,172 square feet of private open space.

Source: Census 2000 Data, The California Spatial Information Library (CaSIL).

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0 2.5 5 10 Miles

Exhibit 1
Regional Location Map

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CITY OF ANAHEIM
MIDWAY TOWNHOMES PROJECT
NOISE IMPACT ANALYSIS

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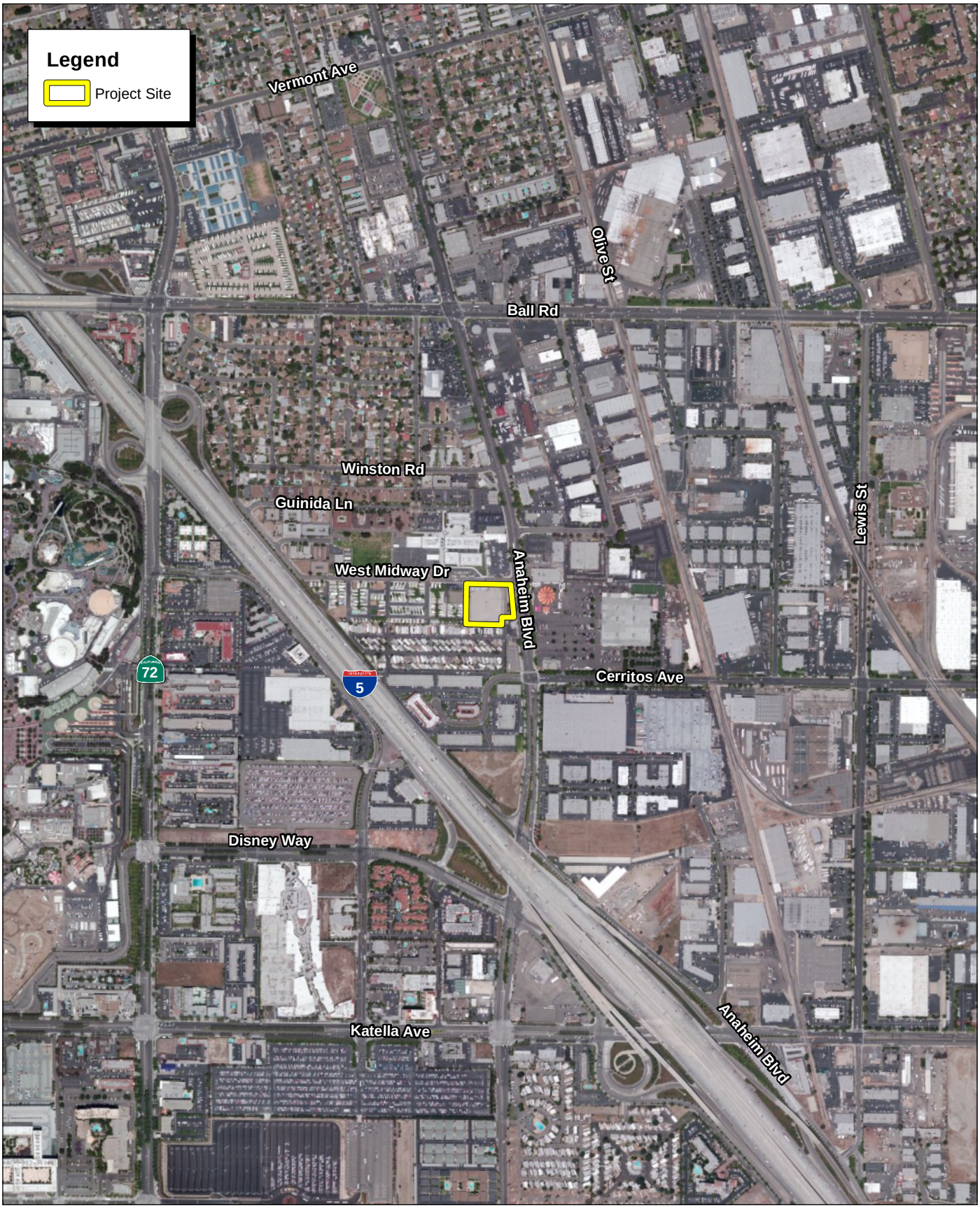

Source: ESRI Aerial Imagery.

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0 500 1,000 2,000 Feet

Exhibit 2
Local Vicinity Map
Aerial Base

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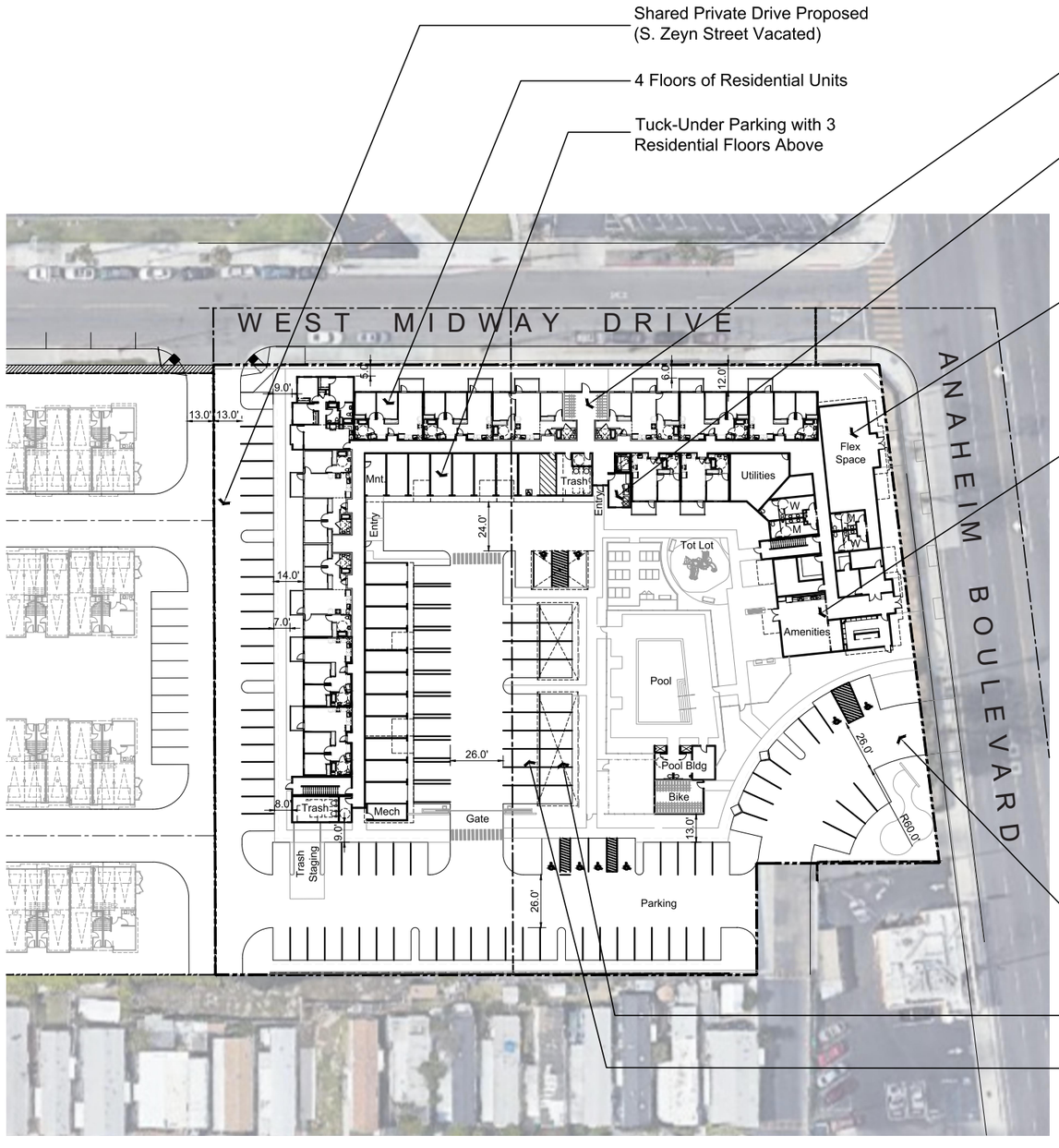


Project Data

W. Midway Drive & S. Anaheim Blvd, Anaheim, CA 92805

Gross Site Area	2.26 AC
Dwelling Units	86 DU
Density	38 DU / AC

Unit Summary:

Unit Plan	Unit Type	Total	Ratio
1 Bedroom	1bd/1ba	29	33.7%
2 Bedroom	2bd/1ba	35	40.7%
3 Bedroom	3bd/2ba	22	25.6%
Totals		**86**	

Parking Summary:

Parking Required	Req'd Ratio	
1 Bedroom	1 spaces /DU	029 spaces
2 Bedroom	1.5 spaces /DU	053 spaces
3 Bedroom	2 spaces /DU	044 spaces
Total Required		126 spaces
		1.46 sp/unit
Residential Parking Provided		
Garage Spaces		±018 spaces
Tandem Spaces		±021 spaces
Carport Spaces		±012 spaces
Open Spaces		±075 spaces
		±126 spaces
		1.46 spaces/unit
Public Use - On Site		±003 spaces
Total Provided		±129 spaces

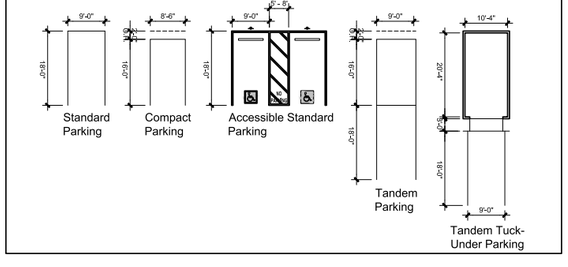
Bike Parking Summary:

Provided	±92 spaces

Open Space Summary:

Required		
Common Open Space	(200sf/du = 200*86)	±17,200 sf
Private Open Space	(70sf/du = 70*86)	±6,020 sf
Provided		
Common Open Space		±20,220 sf
Private Open Space		±6,172 sf

Typical Parking Spaces | Scale $\frac{1}{16}$"=1'-0"



Source: KTGY Architecture & Planning, March 26, 2020.

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Exhibit 3
Site Plan

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SECTION 2: NOISE AND VIBRATION FUNDAMENTALS

2.1 - Characteristics of Noise

Noise is generally defined as unwanted or objectionable sound. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm, or when it has adverse effects on health. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in the extreme, hearing impairment. Noise effects can be caused by pitch or loudness. *Pitch* is the number of complete vibrations or cycles per second of a wave that result in the range of tone from high to low; higher-pitched sounds are louder to humans than lower-pitched sounds. *Loudness* is the intensity or amplitude of sound.

Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit, which expresses the ratio of the sound pressure level being measured to a standard reference level. The 0 point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3 dB or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Only audible changes in existing ambient or background noise levels are considered potentially significant.

The human ear is not equally sensitive to all frequencies within the audible sound spectrum, so sound pressure level measurements can be weighted to better represent frequency-based sensitivity of average healthy human hearing. One such specific “filtering” of sound is called “A-weighting.” A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies that are audible to the human ear. Because decibels are logarithmic units, they cannot be added or subtracted by ordinary arithmetic means. For example, if one noise source produces a noise level of 70 dB, the addition of another noise source with the same noise level would not produce 140 dB; rather, they would combine to produce a noise level of 73 dB.

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

2.1.1 - Noise Descriptors

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on dBA. CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

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

2.1.2 - Noise Propagation

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source, as well as ground absorption, atmospheric conditions (wind, temperature gradients, and humidity) and refraction, and shielding by natural and manmade features. Sound from point sources, such as an air conditioning condenser, a piece of construction equipment, or an idling truck, radiates uniformly outward as it travels away from the source in a spherical pattern.

The attenuation or sound drop-off rate is dependent on the conditions of the land between the noise source and receiver. To account for this ground-effect attenuation (absorption), two types of site conditions are commonly used in noise models: soft-site and hard-site conditions. Soft-site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. For point sources, a drop-off rate of 7.5 dBA per each doubling of the distance (dBA/DD) is typically observed over soft ground with landscaping, as compared with a 6 dBA/DD drop-off rate over hard ground such as asphalt, concrete, stone and very hard packed earth. For line sources, such as traffic noise on a roadway, a 4.5 dBA/DD is typically observed for soft-site conditions compared to the 3 dBA/DD drop-off rate for hard-site conditions. Table 1 briefly defines these measurement descriptors and other sound terminology used in this section.

Table 1: Sound Terminology

Term	Definition
Sound	A vibratory disturbance created by a vibrating object which, when transmitted by pressure waves through a medium such as air, can be detected by a receiving mechanism such as the human ear or a microphone.
Noise	Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
Ambient Noise	The composite of noise from all sources near and far in a given environment.
Decibel (dB)	A unitless measure of sound on a logarithmic scale, which represents the squared ratio of sound-pressure amplitude to a reference sound pressure. The reference pressure is 20 micropascals, representing the threshold of human hearing (0 dB).
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level that approximates the frequency response of the human ear.
Equivalent Noise Level (L_{eq})	The average sound energy occurring over a specified time period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.
Maximum and Minimum Noise Levels (L_{max} and L_{min})	The maximum or minimum instantaneous sound level measured during a measurement period.
Day-Night Level (DNL or L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m. (nighttime).
Community Noise Equivalent Level (CNEL)	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the A-weighted sound levels occurring between 7:00 p.m. and 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring between 10:00 p.m. and 7:00 a.m.
Source: Data compiled by FCS 2018	

2.1.3 - Traffic Noise

The level of traffic noise depends on the three primary factors: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater number of trucks. Vehicle noise is a combination of the noise produced by the engine, exhaust, and tires. Because of the logarithmic nature of noise levels, a doubling of the traffic volume (assuming that the speed and truck mix do not change) results in a noise level increase of 3 dBA. Based on the Federal Highway

Administration (FHWA) community noise assessment criteria, this change is "barely perceptible." For reference, a doubling of perceived noise levels would require an increase of approximately 10 dBA. The truck mix on a given roadway also has an effect on community noise levels. As the number of heavy trucks increases and becomes a larger percentage of the vehicle mix, adjacent noise levels increase.

2.1.4 - Stationary Noise

A stationary noise producer is any entity in a fixed location that emits noise. Examples of stationary noise sources include machinery, engines, energy production, and other mechanical or powered equipment and activities such as loading and unloading or public assembly that may occur at commercial, industrial, manufacturing, or institutional facilities. Furthermore, while noise generated by the use of motor vehicles over public roads is preempted from local regulation, the use of these vehicles is considered a stationary noise source when operated on private property such as at a construction-site, a truck terminal, or warehousing facility.

The effects of stationary noise depend on factors such as characteristics of the equipment and operations, distance and pathway between the generator and receptor, and weather. Stationary noise sources may be regulated at the point of manufacture (e.g., equipment or engines), with limitations on the hours of operation, or with provision of intervening structures, barriers or topography.

Construction activities are a common source of stationary noise. Construction-period noise levels are higher than background ambient noise levels but eventually cease once construction is complete. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on each construction-site and, therefore, would change the noise levels as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction related noise ranges to be categorized by work phase. Table 2 shows typical noise levels of construction equipment as measured at a distance of 50 feet from the operating equipment.

Table 2: Typical Construction Equipment Maximum Noise Levels, L_{max}

Type of Equipment	Impact Device? (Yes/No)	Specification Maximum Sound Levels for Analysis (dBA at 50 feet)
Impact Pile Driver	Yes	95
Auger Drill Rig	No	85
Vibratory Pile Driver	No	95
Jackhammers	Yes	85
Pneumatic Tools	No	85
Pumps	No	77
Scrapers	No	85
Cranes	No	85
Portable Generators	No	82
Rollers	No	85

Type of Equipment	Impact Device? (Yes/No)	Specification Maximum Sound Levels for Analysis (dBA at 50 feet)
Bulldozers	No	85
Tractors	No	84
Front-End Loaders	No	80
Backhoe	No	80
Excavators	No	85
Graders	No	85
Air Compressors	No	80
Dump Truck	No	84
Concrete Mixer Truck	No	85
Pickup Truck	No	55

Notes:
dBA = A-weighted decibel
Source: Federal Highway Administration (FHWA). 2006. Highway Construction Noise Handbook. August.

2.1.5 - Noise from Multiple Sources

Because sound pressure levels in decibels are based on a logarithmic scale, they cannot be added or subtracted in the usual arithmetical way. Therefore, sound pressure levels in decibels are logarithmically added on an energy summation basis. In other words, adding a new noise source to an existing noise source, both producing noise at the same level, will not double the noise level. Instead, if the difference between two noise sources is 10 dBA or more, the louder noise source will dominate and the resultant noise level will be equal to the noise level of the louder source. In general, if the difference between two noise sources is 0–1 dBA, the resultant noise level will be 3 dBA higher than the louder noise source, or both sources if they are equal. If the difference between two noise sources is 2–3 dBA, the resultant noise level will be 2 dBA above the louder noise source. If the difference between two noise sources is 4–10 dBA, the resultant noise level will be 1 dBA higher than the louder noise source.

2.2 - Characteristics of Groundborne Vibration and Noise

Groundborne vibration consists of rapidly fluctuating motion through a solid medium, specifically the ground, that has an average motion of zero and in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. The effects of groundborne vibration typically only causes a nuisance to people, but in extreme cases, excessive groundborne vibration has the potential to cause structural damage to buildings. Although groundborne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Groundborne noise is an effect of groundborne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room, and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude such as the maximum instantaneous peak in the vibrations velocity, which is known as the peak particle velocity (PPV) or the root mean square (rms) amplitude of the vibration velocity. Because of the typically small amplitudes of vibrations, vibration velocity is often expressed in decibels—denoted as LV—and is based on the reference quantity of 1 micro inch per second. To distinguish these vibration levels referenced in decibels from noise levels referenced in decibels, the unit is written as "VdB."

Although groundborne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. When assessing annoyance from groundborne vibration, vibration is typically expressed as rms velocity in units of decibels of 1 micro-inch per second, with the unit written in VdB. Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. Human perception to vibration starts at levels as low as 67 VdB. Annoyance due to vibration in residential settings starts at approximately 70 VdB.

Off-site sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible groundborne noise or vibration. Construction activities, such as blasting, pile driving and operating heavy earthmoving equipment, are common sources of groundborne vibration. Construction vibration impacts on building structures are generally assessed in terms of PPV. Typical vibration source levels from construction equipment are shown in Table 3.

Table 3: Vibration Levels of Construction Equipment

Construction Equipment	PPV at 25 Feet (inches/second)	rms Velocity in Decibels (VdB) at 25 Feet
Water Trucks	0.001	57
Scraper	0.002	58
Bulldozer—small	0.003	58
Jackhammer	0.035	79
Concrete Mixer	0.046	81
Concrete Pump	0.046	81
Paver	0.046	81
Pickup Truck	0.046	81
Auger Drill Rig	0.051	82
Backhoe	0.051	82
Crane (Mobile)	0.051	82
Excavator	0.051	82
Grader	0.051	82
Loader	0.051	82
Loaded Trucks	0.076	86

Construction Equipment	PPV at 25 Feet (inches/second)	rms Velocity in Decibels (VdB) at 25 Feet
Bulldozer—Large	0.089	87
Caisson drilling	0.089	87
Vibratory Roller (small)	0.101	88
Compactor	0.138	90
Clam shovel drop	0.202	94
Vibratory Roller (large)	0.210	94
Pile Driver (impact-typical)	0.644	104
Pile Driver (impact-upper range)	1.518	112

Notes:
PPV = peak particle velocity
VdB = velocity in decibels
Rms = root mean square
Source: Compilation of scientific and academic literature, generated by the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA).

The propagation of groundborne vibration is not as simple to model as airborne noise. This is because noise in the air travels through a relatively uniform medium, while groundborne vibrations travel through the earth, which may contain significant geological differences. Factors that influence groundborne vibration include:

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

Among these factors that influence groundborne vibration, there are significant differences in the vibration characteristics when the source is underground compared to at the ground surface. In addition, soil conditions are known to have a strong influence on the levels of groundborne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Vibration propagation is more efficient in stiff clay soils than in loose sandy soils, and shallow rock seems to concentrate the vibration energy close to the surface, and can result in groundborne vibration problems at large distance from the source. Factors such as layering of the soil and depth to the water table can have significant effects on the propagation of groundborne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils. There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves

are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil type, but it has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests. The vibration level (calculated below as PPV) at a distance from a point source can generally be calculated using the vibration reference equation:

$$PPV = PPV_{ref} * (25/D)^n \text{ (in/sec)}$$

Where:

PPV_{ref} = reference measurement at 25 feet from vibration source
D = distance from equipment to property line
n = vibration attenuation rate through ground

According to Section 7 of the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual, an "n" value of 1.5 is recommended to calculate vibration propagation through typical soil conditions.[1]

[1] Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

SECTION 3: REGULATORY SETTING

3.1 - Federal Regulations

3.1.1 - United States Environmental Protection Agency

In 1972, Congress enacted the Noise Control Act. This act authorized the United States Environmental Protection Agency (EPA) to publish descriptive data on the effects of noise and establish levels of sound "requisite to protect the public welfare with an adequate margin of safety." These levels are separated into health (hearing loss levels) and welfare (annoyance levels) categories, as shown in Table 4. The EPA cautions that these identified levels are not standards because they do not take into account the cost or feasibility of the levels.

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

Table 4: Summary of EPA Recommended Noise Levels to Protect Public Welfare

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

Notes:
L_{eq} = equivalent noise/sound level
dB = decibel
(24) signifies an L_{eq} duration of 24 hours.
Source: United States Environmental Protection Agency. 1978. Protective Noise Levels, EPA 550/9-79-100. November.

3.1.2 - Federal Transit Administration

The FTA has established industry accepted standards for vibration impact criteria and impact assessment. These guidelines are published in its Transit Noise and Vibration Impact Assessment

Manual.[2] The FTA guidelines include thresholds for construction vibration impacts for various structural categories as shown in Table 5.

Table 5: Federal Transit Administration Construction Vibration Impact Criteria

Building Category	PPV (in/sec)	Approximate VdB
I. Reinforced—Concrete, Steel or Timber (no plaster)	0.5	102
II. Engineered Concrete and Masonry (no plaster)	0.3	98
III. Non-Engineered Timber and Masonry Buildings	0.2	94
IV. Buildings Extremely Susceptible to Vibration Damage	0.12	90

Notes:
VdB = vibration measured as rms velocity in decibels of 1 micro-inch per second
PPV = peak particle velocity
Source: Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

3.2 - State Regulations

The State of California has established regulations that help prevent adverse impacts to occupants of buildings located near noise sources. Referred to as the "State Noise Insulation Standard," it requires buildings to meet performance standards through design and/or building materials that would offset any noise source in the vicinity of the receptor. State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are found in the California Code of Regulations, Title 24 (known as the Building Standards Administrative Code), Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor-ceiling assemblies must block or absorb sound. For limiting noise from exterior noise sources, the noise insulation standards set an interior standard of 45 dBA CNEL in any habitable room with all doors and windows closed. In addition, the standards require preparation of an acoustical analysis demonstrating the manner in which dwelling units have been designed to meet this interior standard, where such units are proposed in an area with exterior noise levels greater than 60 dBA CNEL.

The State has also established land use compatibility guidelines for determining acceptable noise levels for specified land uses. The City of Anaheim has adopted and modified those guidelines as described as follows.

[2] Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

3.3 - Local Regulations

The project site is located within the City of Anaheim and this analysis was performed using the City's noise regulations. The City of Anaheim addresses noise in the Noise Element of its General Plan (2004) and in the City of Anaheim Municipal Code (2017).

General Plan

The City has adopted the State of California's exterior noise and land use compatibility standards for land use development in the Noise Element of its General Plan, as shown in Table 6. The land use category that is applicable to this project is Residential Multiple Family. Under this designation, noise environments with ambient noise levels up to 65 dBA CNEL are considered "Normally Acceptable" for Residential Multiple Family land uses. Noise environments with ambient noise levels from 60 dBA to 70 dBA CNEL are considered "Conditionally Acceptable" for new Residential Multiple Family land uses developments; under this circumstance, development may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features are included in the proposed project design. Conventional construction, but with closed windows and a fresh air supply system or air conditioning, will normally suffice as a noise insulation feature for these conditionally acceptable environments.

In addition to the land use compatibility standards established by the City, the City of Anaheim has adopted the State of California's interior and exterior noise standards, as shown in Table 6. According to this standard, for a hotel, interior noise levels up to 45 dBA CNEL are considered acceptable.

The City of Anaheim General Plan contains goals and policies that address noise. The following goals and policies are presented in the City's General Plan and are applicable to the proposed project:

Goal 1.1 Protect sensitive land uses from excessive noise through diligent planning and regulation.

Policies

3) Consider the compatibility of proposed land uses with the noise environment when preparing, revising or reviewing development proposals.

4) Require mitigation where sensitive uses are to be placed along transportation routes to ensure that noise levels are minimized through appropriate means of mitigation thereby maintaining quality of life standards.

5) Encourage proper site planning and architecture to reduce noise impacts.

6) Discourage the siting of sensitive uses in areas in excess of 65 dBA CNEL without appropriate mitigation.

7) Require that site-specific noise studies be conducted by a qualified acoustic consultant utilizing acceptable methodologies while reviewing the development of sensitive land uses or development that has the potential to impact sensitive land uses.

Goal 2.1 Encourage the reduction of noise from transportation-related noise sources such as motor vehicles, aircraft operations, and railroad movements.

Policies

3) Require that development generating increased traffic and subsequent increases in the ambient noise level adjacent to noise-sensitive land uses provide appropriate mitigation measures.

5) Require sound walls, berms and landscaping along existing and future freeways and railroad rights-of-way to beautify the landscape and reduce noise, where appropriate.

Goal 3.1 Protect residents from the effects of "spill over" or nuisance noise emanating from the City's activity centers.

Policies

1) Discourage new projects located in commercial or entertainment areas from exceeding stationary-source noise standards at the property line of proximate residential or commercial uses, as appropriate.

3) Enforce standards to regulate noise from construction activities. Particular emphasis shall be placed on the restriction of the hours in which work other than emergency work may occur. Discourage construction on weekends or holidays except in the case of construction proximate to schools where these operations could disturb the classroom environment.

4) Require that construction equipment operate with mufflers and intake silencers no less effective than originally equipped.

5) Encourage the use of portable noise barriers for heavy equipment operations performed within 100 feet of existing residences or make applicant provide evidence as to why the use of such barriers is infeasible.

Table 6: Land Use Compatibility for Community Noise Exposure (dBA CNEL or L_{dn})

Land Use Category	55	60	65	70	75	80
Residential—Low-Density Single-Family, Duplex, and Mobile Homes						
Residential—Multi-Family						

Land Use Category	55	60	65	70	75	80
Transient Lodging—Hotels, Motels						
Schools, Libraries, Churches, Hospitals, Nursing Homes						
Auditoriums, Concert Halls, Amphitheaters						
Sports Arenas, Outdoor Spectator Sports						
Playgrounds, Neighborhood Parks						
Golf Courses, Riding Stables, Water Recreation, Cemeteries						
Office Buildings, Businesses, Commercial and Professional						
Industrial, Manufacturing, Utilities, Agriculture						

Source: Governor's Office of Planning and Research. 2003. State of California General Plan Guidelines, Appendix C, Guidelines for the Preparation and Content of the Noise Element of the General Plan. October 2003.

Key:

	Normally Acceptable: Specified land use is satisfactory based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice. Outdoor environment will seem noisy.

Land Use Category	55	60	65	70	75	80
	Normally Unacceptable: New construction and development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made with needed noise insulation features included in the design. Outdoor areas must be shielded.					
	Clearly Unacceptable: New construction or development should generally not be undertaken. Construction costs to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable.					

Table 7: State of California Interior and Exterior Noise Standards

Land Use		CNEL (dBA)	
Categories	**Uses**	**Interior[1]**	**Exterior[2]**
Residential	Single- and multiple-family, duplex	45[3]	65
	Mobile homes	—	65[4]
Commercial	Hotel, motel, transient housing	45	—
	Commercial retail, bank, restaurant	55	—
	Office building, research and development, professional offices	50	—
	Amphitheater, concert hall, auditorium, movie theater	45	—
	Gymnasium (Multipurpose)	50	—
	Sports Club	55	—
	Manufacturing, warehousing, wholesale, utilities	65	—
	Movie Theaters	45	—
Institutional/Public	Hospital, school classrooms/playgrounds	45	65
	Church, library	45	—
Open Space	Parks	—	65

Notes:
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibel
[1] Indoor environment excluding: bathrooms, kitchens, toilets, closets, and corridors
[2] Outdoor environment limited to:
- Private yard of single-family dwellings
- Multiple-family private patios or balconies accessed from within the dwelling (Balconies 6 feet deep or less are exempt)
- Mobile home parks
- Park picnic areas
- School playgrounds
- Hospital patios

[3] Noise level requirement with closed windows, mechanical ventilation or other means of natural ventilation shall be provided as per Chapter 12, Section 1205 of the Uniform Building Code.
[4] Exterior noise levels should be such that interior noise levels will not exceed 45 dBA CNEL.
Source: City of Anaheim 2004.

Municipal Code

The City of Anaheim Municipal Code addresses noise in Title 18, Zoning, Chapter 18.40, General Development Standards, Section 18.40.090, Sound Attenuation for Residential Developments, and Sound Pressure Levels in Title 5, Public Health and Safety, Chapter 6.70, Sound Pressure Levels, Section 6.70.010, Established. These ordinances are summarized below.

According to the noise ordinances, sound produced in excess of the sound pressure levels permitted by the Municipal Code are objectionable and constitute an infringement upon the right and quiet enjoyment of property in the City. No person within the City shall create any sound radiated for extended periods from any premises that produces a sound pressure level at any point on the property line in excess of 60 dBA in accordance with the noise measurement requirements listed in this noise ordinance.

The City has provided certain exemptions for various noise sources from its noise performance standards. For example, sound created by construction or building repair of any premises within the City shall be exempt from the applications of this chapter during the hours of 7:00 a.m. to 7:00 p.m. Additional work hours may be permitted if deemed necessary by the Director of Public Works or Building Official.

For construction of residential development projects of single-family attached or multiple-family dwellings, exterior noise within common recreation areas shall be attenuated to a maximum of 65 dB CNEL, and interior noise levels shall be attenuated to a maximum of 45 dB CNEL, or to a level designated by the Uniform Building Code, as adopted by the City. When measures to attenuate noise to the prescribed levels would compromise or conflict with the aesthetic value of the project, the Planning Commission may grant a deviation of 5 dB CNEL above prescribed exterior noise levels; such granted deviations do not pertain to interior noise levels.

Program EIR No. 330

The following mitigation measures would apply to the proposed project:

MM 5.10-1 Prior to the issuance of building permits for any project generating over 100 peak-hour trips, the project property owner/developers shall submit a final acoustical report prepared to the satisfaction of the Planning Director. The report shall show that the development will be sound-attenuated against present and projected noise levels, including roadway, aircraft, helicopter and railroad, to meet City interior and exterior noise standards.

MM 5.10-2 Prior to issuance of a building permit, new development project property owner/developers shall use the most current available Airport Environs Land Use Plan (AELUP) as a planning resource for evaluating heliport and airport operations as well as land use compatibility and land use intensity in the proximity of Los Alamitos Joint Training Base and Fullerton Municipal Airport.

Supplemental EIR No. 346

Supplemental EIR No. 346 concluded that, similar to Program EIR No. 330, due to the scale of development activity associated with the Housing Opportunity Sites, many roadways within the City would still be expected to generate significant and unavoidable noise impacts. However, the analysis concluded that all other impacts would be reduced to less than significant with implementation of the General Plan Noise Element policies, Municipal Code Standards, and MM 5.10-1 and MM 5.10-2 of Program EIR NO. 330. No new significant impacts and no new mitigation were identified.

SECTION 4: EXISTING NOISE CONDITIONS

The following section describes the existing ambient noise environment of the project vicinity.

4.1 - Existing Stationary Noise Sources

The proposed project site is located in the City of Anaheim, California. The project site is bounded by a proposed townhome development to the west, a mobile home park to the south, South Anaheim Boulevard to the east, and West Midway Drive to the north.

Other stationary noise sources in the project vicinity include an elementary school and a maintenance facility equipment parking lot across Midway Drive. These surrounding land uses generate noise from typical parking lot activities and mechanical ventilation systems.

4.2 - Existing Mobile Noise Sources

The primary noise source in the project area is traffic noise on South Anaheim Boulevard and West Midway Drive, while aircraft noise and train noise contribute minimally.

A Noise Impact Analysis Memorandum was prepared for the proposed project by LSA Associates, dated April 9, 2021, that analyzed mobile source noise impacts to the proposed project to satisfy the United States Department of Housing and Urban Development (HUD) requirements for a project-specific noise impact analysis. The report is provided in Appendix B of this report.

The analysis showed that combined exterior noise levels at all outdoor use areas (including the proposed pool, outdoor lounge, and courtyard patio areas) are expected to be below 65 CNEL. However, combined exterior noise levels at proposed building façades facing adjacent roadways are expected to range in excess of 65 dBA CNEL, and up to approximately 73 dBA CNEL.[3]

[3] Noise levels in the memorandum were calculated to meet HUD noise requirements and were therefore expressed in terms of L_{dn}. As noted in the characteristics of noise discussion, CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. In order to provide a conservative analysis, 1 dB was added to the calculated L_{dn} noise levels to estimate the CNEL noise level.

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SECTION 5: THRESHOLDS OF SIGNIFICANCE AND IMPACT ANALYSIS

5.1 - Thresholds of Significance

According to California Environmental Quality Act (CEQA) Guidelines Appendix G, to determine whether impacts related to noise and vibration are significant environmental effects, the following questions are analyzed and evaluated.

It should be noted that the significance criteria question (a), below, is from the Land Use and Planning section of the CEQA Guidelines Appendix G checklist questions. However, this question addresses impacts related to conflicts with land use plans, which would include project-related conflicts to the noise land use compatibility standards of the Noise Element of the General Plan. Therefore, these impacts are addressed here.

Would the proposed plan:

a) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

b) 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?

c) Generate excessive groundborne vibration or groundborne noise levels?

d) 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?

5.2 - Noise Levels That Would Conflict with Any Land Use Plan, Policy, or Regulation

A significant impact would occur for the proposed Residential-Multiple Family land use development if the project would be exposed to transportation noise levels in excess of the City's "normally acceptable" land use compatibility standard of 65 dBA CNEL or if the project were exposed to interior noise levels that would exceed the State of California's interior noise standard of 45 dBA CNEL.

According to the Noise Element of the General Plan, environments with ambient noise levels up to 65 dBA CNEL are considered "Normally Acceptable" for Residential-Multiple Family land uses and environments with ambient noise levels from 60 dBA to 70 dBA CNEL are considered "Conditionally Acceptable." In the event that conditions for the proposed type of land use have been designated "Conditionally Acceptable," construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply

systems or air conditioning, will normally suffice. Environments with ambient noise levels from 70 dBA to 75 dBA CNEL are considered "Normally Unacceptable," while environments with ambient noise levels above 75 dBA CNEL are considered "Clearly Unacceptable," for Residential-Multiple Family land uses.

The dominant noise source on the project site is noise from traffic on local roadways adjacent to the project site. Thus, this land use compatibility analysis is conducted in comparison to the projected traffic noise levels that the proposed project would be exposed to.

A Noise Impact Analysis memorandum was prepared for the proposed project by LSA Associates, dated April 9, 2021, that analyzed mobile source noise impacts to the proposed project to satisfy the HUD requirements for a project-specific noise impact analysis. The report is provided in Appendix B of this report.

The analysis showed that combined mobile source exterior noise levels at all outdoor use areas are expected to be below 65 dBA CNEL due to shield from proposed structures. These noise levels are in compliance with the City of Anaheim noise regulations, and no mitigation is necessary. However, combined mobile source exterior noise levels at proposed building façades are expected to range in excess of 65 dBA CNEL. The façades within 100-feet of the nearest travel lane of South Anaheim Boulevard could experience traffic noise levels of approximately 73 dBA CNEL.[4]

Based on these mobile source exterior noise level conditions, the calculated interior noise levels, would be reduced to below 45 CNEL in all interior-courtyard facing units, provided windows can remain closed. Therefore, mechanical ventilation will be required for all units on-site in order to permit windows to remain closed for prolonged periods and to maintain acceptable interior noise levels. The proposed mechanical ventilation system must meet the criteria of the California Mechanical Code, including the capability to provide appropriate ventilation rates. The ventilation system shall not compromise the sound insulation capability of the exterior wall or be dependent on ventilation through windows.

However, even with windows closed, habitable spaces of units with façades that have a direct line-of-site and are within 100-feet of the nearest travel lane of South Anaheim Boulevard would still experience noise levels in excess of the normally acceptable interior noise level standard of 45 dBA CNEL. Therefore, the exterior wall assembly for these units shall be required to meet an overall exterior wall assembly Standard Transmission Class (STC) rating of STC-31. This exterior wall assembly may include, but is not limited to, fiber cement board siding or three-coat cement plaster, one layer of 0.5-inch-thick plywood or oriented strand board (OSB), 2-inch x 4-inch wood stud wall channels spaced at 16 inches and a minimum of R-19 fiberglass insulation, and one layer of 5/8-inch-thick Type X gypsum board. All windows for residential dwelling units in noise-sensitive rooms facing South Anaheim Boulevard shall have a minimum STC rating of 31. All other windows for residential dwelling units in noise-sensitive rooms shall have a minimum STC rating of 28. With implementation

[4] Noise levels in the memorandum were calculated to meet HUD noise requirements and were therefore expressed in terms of L_{dn}. As noted in the characteristics of noise discussion, CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. In order to provide a conservative analysis, 1 dB was added to the calculated L_{dn} noise levels to estimate the CNEL noise level.

of the recommended measures as outlined above, interior noise levels would be below the normally acceptable interior noise standard of 45 dBA CNEL.

Therefore, with implementation of MM NOI-1, traffic noise impacts to the proposed project would be reduced to ensure compliance with the City's 45 dBA CNEL interior noise standard.

This analysis satisfies the requirements of Program EIR No. 330 MM 5.10-1 which requires the preparation of a site-specific acoustical analysis that shows that the development will be sound-attenuated against present and projected noise levels, including roadway, aircraft, helicopter and railroad, to meet City interior and exterior noise standards.

Mitigation Measures

MM NOI-1 To reduce potential traffic noise impacts that conflict with land use compatibility, the following mitigation measure shall be implemented for the project:

- Mechanical ventilation systems such as air conditioning are required for all residential dwelling units so that windows can remain closed for a prolonged period of time.
- The exterior wall assembly of all units facing and within 100-feet of the nearest travel lane of South Anaheim Boulevard shall meet or exceed an assumed exterior wall assembly that includes fiber cement board siding or three-coat cement plaster, one layer of 0.5-inch-thick plywood or oriented strand board (OSB), 2-inch x 4-inch wood stud wall channels spaced at 16 inches and a minimum of R-19 fiberglass insulation, and one layer of 5/8-inch-thick Type X gypsum board. All windows for residential dwelling units in noise-sensitive rooms directly facing South Anaheim Boulevard shall have a minimum Standard Transmission Class (STC) rating of 31. All other windows for residential dwelling units in noise-sensitive rooms shall have a minimum STC rating of 28.

5.3 - Substantial Noise Increase in Excess of Standards

5.3.1 - Construction Noise Impacts

For purposes of this analysis, a significant impact would occur if construction activities would result in a substantial temporary increase in ambient noise levels outside of the permissible hours for construction (7:00 a.m. to 8:00 p.m. on weekdays or Saturdays, except for on national holidays) that would result in annoyance or sleep disturbance of nearby sensitive receptors.

Construction-related Traffic Noise

Noise impacts from construction activities associated with the proposed project would be a function of the noise generated by construction equipment, equipment location, sensitivity of nearby land uses, and the timing and duration of the construction activities. One type of short-term noise impact that could occur during project construction would result from the increase in traffic flow on local streets, associated with the transport of workers, equipment, and materials to and from the project

site. The transport of workers and construction equipment and materials to the project site would incrementally increase noise levels on access roads leading to the site. Because workers and construction equipment would use existing routes, noise from passing trucks would be similar to existing vehicle-generated noise on these local roadways. Typically, a doubling of the Average Daily Traffic (ADT) hourly volumes on a roadway segment is required in order to result in an increase of 3 dBA in traffic noise levels; which, as discussed in the characteristics of nose discussion above, is the lowest change that can be perceptible to the human ear in outdoor environments. Project-related construction trips would not be expected to double the hourly or daily traffic volumes along any roadway segment in the project vicinity. For this reason, short-term intermittent noise from construction trips would not be expected to result in a perceptible increase in hourly- or daily-average traffic noise levels in the project vicinity. Therefore, short-term construction-related noise impacts associated with the transportation of workers and equipment to the project site would be less than significant.

Construction Equipment Operational Noise

The second type of short-term noise impact is related to noise generated during construction on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction related noise ranges to be categorized by work phase. Table 1 lists typical construction equipment noise levels, based on a distance of 50 feet between the equipment and a noise receptor. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings. Impact equipment such as pile drivers are not expected to be used during construction of this project.

The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery and compacting equipment, such as bulldozers, draglines, backhoes, front loaders, roller compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 or 4 minutes at lower power settings.

Construction of the proposed project is expected to require the use of scrapers, bulldozers, water trucks, haul trucks, and pickup trucks. Based on the information provided in Table 2, the maximum noise level generated by each scraper is assumed to be 85 dBA L_{max} at 50 feet from this equipment. Each bulldozer would also generate 85 dBA L_{max} at 50 feet. The maximum noise level generated by graders is approximately 85 dBA L_{max} at 50 feet. A characteristic of sound is that each doubling of sound sources with equal strength increases a sound level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, a reasonable worst-case combined noise level during this phase of construction would be 90 dBA L_{max} at a distance of 50 feet from the acoustic center of a construction area. This would result in a reasonable worst-case hourly average of 86 dBA L_{eq}. The acoustic center reference is used, because construction equipment must operate at

some distance from one another on a project site, and the combined noise level as measured at a point equidistant from the sources would (acoustic center) be the worst-case maximum noise level. The effect on sensitive receptors is evaluated below.

The nearest off-site receptors are mobile homes located to the north of the project site, approximately 75 feet from the nearest acoustic center of construction activity where heavy construction equipment would operate during construction of the proposed project. At this distance, construction noise levels would range up to approximately 87 dBA L_{max}, with a relative worst-case hourly average of 83 dBA L_{eq}, if multiple pieces of heavy construction equipment operate simultaneously during construction of the proposed private street.

Although there could be a relatively high single event noise exposure potential causing an intermittent noise nuisance, the effect of construction activities on longer-term (hourly or daily) ambient noise levels would be small but could result in a temporary increase in ambient noise levels in the project vicinity that could result in annoyance or sleep disturbance of nearby sensitive receptors. Therefore, limiting construction activities to the daytime hours would reduce the effects of noise levels produced by these activities on longer-term (hourly or daily) ambient noise levels, and would reduce potential impacts that could result in annoyance or sleep disturbances at nearby sensitive receptors. The City of Anaheim Municipal Code outlines the City's standards for noise-producing construction activities. According to this ordinance, construction and building repair activities are exempt from the applications of the Municipal Code between the hours of 7:00 a.m. and 7:00 p.m. Therefore, compliance with the City's Municipal Code required restrictions on permissible hours for construction activities would ensure that construction noise impacts would not result in substantial temporary increases at the off-site sensitive receptors above standards established in the General Plan or Municipal Code, and construction noise impacts on sensitive receptors in the project vicinity would be reduced to less than significant, and no mitigation would be required.

This finding is consistent with the findings of Program EIR No. 330 and Supplemental EIR No. 346. The analysis of these EIRs determined that potential impacts related to substantial temporary or permanent increases in ambient noise levels at sensitive receptors would be less than significant. No additional analysis is required.

5.3.2 - Mobile Source Operational Noise Impacts

A significant impact would occur if the proposed project would result in a substantial increase in ambient noise levels compared with those that would exist without the proposed project. As noted in the characteristics of noise discussion, audible increases in noise levels generally refer to a change of 3 dBA or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. A change of 5 dBA is considered the minimum readily perceptible change to the human ear in outdoor environments. Therefore, for purposes of this analysis, an increase of 5 dBA or greater would be considered a substantial permanent increase in ambient noise levels.

A Traffic Statement Memorandum was prepared for the proposed project by Kimley-Horn and Associates, Inc., dated April 15, 2021. According to this report, the proposed project is estimated to generate approximately 34 trips in the AM peak-hour, 42 trips in the PM peak-hour, and 517 daily trips.

According to existing traffic conditions there are approximately 1,900 average daily trips on Midway Drive, between the project entrance and South Anaheim Boulevard, and approximately 25,020 average daily trips on South Anaheim Boulevard south of Midway Drive.[5] Therefore, the estimated project trips would not result in a doubling of traffic volumes along any roadway segment in the project vicinity on an hourly or on a 24-hour average basis.

A characteristic of noise is that a doubling of sound sources with equal strength is required to result in a perceptible increase (defined to be a 3 dBA or greater) in noise levels. As a result, the proposed project would not result in even a perceptible increase in traffic noise levels along any roadway segment in the project vicinity, and any increase would be well below the 5 dBA increase that would be considered substantial. Therefore, impacts from project-related traffic noise levels would not result in a substantial permanent increase in traffic noise levels in excess of applicable standards, and the impact would be less than significant, and no mitigation would be required.

This finding is consistent with the findings of Program EIR No. 330 and Supplemental EIR No. 346. The analysis of these EIRs determined that potential impacts related to substantial temporary or permanent increases in ambient noise levels at sensitive receptors would be less than significant. No additional analysis is required.

5.3.3 - Stationary Source Operational Noise Impacts

The proposed project would include new stationary noise sources, such as typical parking lot activities and mechanical ventilation systems. A significant impact would occur if the proposed parking lot or mechanical ventilation systems exceed the City's noise performance standard. According to the City's noise ordinances, no person within the City shall create any sound radiated for extended periods from any premises that produces a sound pressure level at any point on the property line in excess of 60 dBA L_{eq} in accordance with the noise measurement requirements listed in the noise ordinance.

Mobile home residences on D Street, immediately south of the proposed project, would be located approximately 40-feet from the acoustic center of the nearest proposed parking area on the project site. Representative parking activities, such as vehicles cruising at slow speeds, door slamming, or cars starting, would generate approximately 60 dBA to 70 dBA L_{max} at 50 feet. Typical parking events take an average of less than one minute. Assuming a reasonable worst-case of a parking event occurring at each parking stall within 75-feet of a receptor in a single hour, the combined parking lot activity would generate reasonable worst-case hourly average noise levels of up to 57 dBA L_{eq} as measured at the nearest receptor. This calculated noise levels assumes a conservative 6 dBA shielding reduction due to the proposed 6-foot-high masonry wall that would be constructed along the proposed project's southern property line. Therefore, reasonable worst-case parking lot activities would not exceed the City's noise performance standard of 60 dBA L_{eq}. The impact of project-related parking lot activities on sensitive off-site receptors would be less than significant.

[5] Iteris, Inc., 2021. Project at 110-229 W Midway Drive Traffic Impact Study. January 12.

The parking lot noise calculation spreadsheet with the detailed modeling assumptions is included in Appendix A of this report.

Proposed mechanical ventilation systems would also be a new stationary noise source on the project site. Noise levels from typical mechanical ventilation and pool pump equipment are anticipated to range up to approximately 60 dBA L_{eq} at a distance of 25 feet. The nearest off-site receptors are mobile home residences on D street, immediately south of the project site. Proposed mechanical ventilation systems could be located approximately 90 feet from the nearest receptor, and the pool pump equipment would be inside a walled-in structure and located approximately 160 feet from this nearest receptor. At these distances, noise generated by mechanical ventilation and pool pump equipment operating simultaneously at full power would attenuate to approximately 44 dBA L_{eq} at the nearest off-site residential receptors. This calculated noise levels assumes a conservative 6 dBA shielding reduction for pool equipment operational noise due to the proposed enclosure around the pool equipment and the proposed 6-foot-high masonry wall that would be constructed along the proposed project's southern property line. No shielding reduction was assumed for the mechanical ventilation equipment which could be located on the exterior walls or roof of the proposed residential units, permitting a more direct line of sight to the nearest receptor. Therefore, the combined mechanical ventilation and pool pump equipment operational noise levels would not exceed the City's noise performance standard of 60 dBA L_{eq}. The impact of mechanical ventilation equipment operational noise levels on sensitive off-site receptors would be less than significant, and no mitigation would be required.

The mechanical equipment noise calculation spreadsheet with the detailed modeling assumptions is included in Appendix A of this report.

These findings are consistent with the findings of Program EIR No. 330 and Supplemental EIR No. 346. The analysis of these EIRs determined that potential impacts related to substantial temporary or permanent increases in ambient noise levels at sensitive receptors would be less than significant. No additional analysis is required.

5.4 - Groundborne Vibration/Noise Levels

This section analyzes both construction and operational groundborne vibration and noise impacts. Groundborne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. Vibrating objects in contact with the ground radiate vibration waves through various soil and rock strata to the foundations of nearby buildings. Groundborne noise is generated when vibrating building components radiate sound, or noise generated by groundborne vibration. In general, if groundborne vibration levels do not exceed levels considered to be perceptible, then groundborne noise levels would not be perceptible in most interior environments. Therefore, this analysis focuses on determining exceedances of groundborne vibration levels.

The City of Anaheim has not adopted a provision addressing the impacts of groundborne vibration levels. Therefore, for purposes of this analysis, the FTA's vibration impact criteria are utilized. The FTA has established industry accepted standards for vibration impact criteria and impact assessment.

These guidelines are published in its Transit Noise and Vibration Impact Assessment Manual.[6] These guidelines are summarized in Table 5.

5.4.1 - Short-term Construction Vibration Impacts

A significant impact would occur if existing structures at the project site or in the project vicinity would be exposed to groundborne vibration levels in excess of levels established by the FTA's Construction Vibration Damage Criteria for the listed type of structure.

Of the variety of equipment used during construction, the small vibratory rollers that are anticipated to be used in the site preparation phase of construction would produce the greatest groundborne vibration levels. As shown in Table 3, small vibratory rollers produce groundborne vibration levels ranging up to 0.101 inch per second (in/sec) PPV at 25 feet from the operating equipment.

The nearest off-site receptors are the residential homes located north-west of the project site, approximately 30 feet from the nearest construction footprint where vibratory rollers would potentially operate. At this distance, groundborne vibration levels could range up to 0.08 PPV from operation of a vibratory roller. This is below the FTA's construction vibration damage criteria of 0.2 PPV for this type of structure—buildings of non-engineered timber and masonry construction. Therefore, construction-related groundborne vibration impacts would be considered less than significant as measured at the nearest residential land use, and no mitigation would be required.

This less than significant impact finding is consistent with the groundborne vibration impact findings of Program EIR No. 330 and Supplemental EIR No. 346. These EIRs concluded that groundborne vibration impacts would be less than significant. No additional analysis is required.

5.4.2 - Operational Vibration Impacts

Implementation of the proposed project would not include any permanent sources that would expose persons in the project vicinity to groundborne vibration levels that could be perceptible without instruments at any existing sensitive land use in the project vicinity. Therefore, project operational activities would not generate excessive groundborne vibration levels as measured at off-site receptors, and the impact would be less than significant, and no mitigation would be required.

In addition, there are no existing significant permanent sources of groundborne vibration in the project vicinity to which the proposed project would be exposed.

This less than significant impact finding is consistent with the groundborne vibration impact findings of Program EIR No. 330 and Supplemental EIR No. 346. These EIRs concluded that groundborne vibration impacts would be less than significant. No additional analysis is required.

[6] Federal Transit Administration (FTA). 2018. Transit Noise and Vibration Impact Assessment Manual. September.

5.5 - Excessive Noise Levels from Airport Activity

A significant impact would occur if the proposed project would expose people residing or working in the project area to excessive noise levels for a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport.

The nearest public airport to the project site is the Fullerton Municipal Airport, located approximately 5.71 miles northwest of the project site. Because of the distance from and orientation of the airport runways, the project site is located well outside of the 65 dBA CNEL airport noise contours. The project site is also not located within the vicinity of a private airstrip. While aircraft noise is occasionally audible on the project site from aircraft flyovers, aircraft noise associated with nearby airport activity would not expose people residing or working near the project site to excessive noise levels. Therefore, implementation of the proposed project would not expose persons residing or working in the project vicinity to noise levels from airport activity that would be in excess of normally acceptable standards for multi-family residential land use development. Impacts associated with public airport noise would be less than significant, and no mitigation would be required.

This analysis satisfies the requirements of Program EIR No. 330 MM 5.10-2 which requires the preparation of a site-specific acoustical analysis that shows that uses the most current available Airport Environs Land Use Plan (AELUP) as a planning resource for evaluating heliport and airport operations as well as land use compatibility and land use intensity in the proximity of Los Alamitos Joint Training Base and Fullerton Municipal Airport. No further analysis is required.

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Appendix A:
Noise Modeling Data

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Parking Lot activity

Receptor: Closest Residence - south of Project

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage factor[1]	Distance to Receptor	Ground Effect[2]	Shielding (dBA)[3]	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
1	parking lot activity	70	5	1	40	1	6	65.9	53.9	245301.4093
2	parking lot activity	70	6	1	50	1	6	64.0	51.8	150713.1859
3	parking lot activity	70	6	1	70	1	6	61.1	47.4	54924.63043
4										
5										
6										
7										
8										
9										
10										
							Lmax[4]	**66**	**Leq**	**57**

Notes:

[1] Percentage of time activity occurs each hour

[2] Soft ground terrain between project site and receptor.

[3] Minimum shielding due to proposed 6-foot high block wall along southern property line.

[4] Calculated Lmax is the Loudest value.

Mechanical Equipment Noise Calculation

Receptor: Closest Residence - south of Project

		Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements								
		Reference (dBA) 25 ft		Usage	Distance to	Ground	Shielding	Calculated (dBA)		
No.	Equipment Description	Lmax	Quantity	factor[1]	Receptor	Effect[2]	(dBA)[3]	Lmax	Leq	Energy
1	Commercial grade mechanical ventilation equipment	60	1	100	90	1	0	48.9	43.3	21433.47051
2	Pool Equipment	60	1	100	160	1	6	37.9	29.8	958.2086302
3										
4										
5										
6										
7										
8										
9										
10										
							Lmax[4]	49	Leq	44

Notes:

[1] Percentage of time activity occurs each hour

[2] Soft ground terrain between project site and receptor.

[3] Shielding due to terrain or structures

[4] Calculated Lmax is the Loudest value.

Appendix B:
Noise Impact Analysis Memorandum by LSA Associates

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CARLSBAD
FRESNO
IRVINE
LOS ANGELES
PALM SPRINGS
POINT RICHMOND
RIVERSIDE
ROSEVILLE
SAN LUIS OBISPO

MEMORANDUM

DATE: April 9, 2020

TO: Stephen Stoewer, Senior Project Manager, City of Anaheim

FROM: Jason Lui, Associate Senior Noise Specialist

SUBJECT: Noise Impact Analysis for the Anaheim Midway Affordable Housing Project

INTRODUCTION

This Noise Impact Analysis memorandum for the Anaheim Midway Affordable Housing Project (project) in Anaheim has been prepared to satisfy the Housing and Urban Development (HUD) requirements for a project-specific noise impact analysis by examining the impacts of the proposed uses on the project site and evaluating the noise reduction measures required by the project. All references used in this assessment are provided in Attachment A.

PROJECT LOCATION

The project site is located at 1441–1455 South Anaheim Boulevard on the southwest corner of South Anaheim Boulevard and West Midway Drive. The site is a vacant lot with a single building and was previously used for short-term recreational vehicle (RV) parking. Figure 1 shows the project location (all figures are provided in Attachment B).

PROJECT DESCRIPTION

The project would construct a new four-story residential building that will house 85 affordable workforce housing units with one manager unit for a total of 86 units. Each unit would have a patio or balcony. The units would provide workforce housing for families and individuals whose earnings are at 60 percent or below the area mean income. Figure 2 shows the project site plan.

REGULATORY SETTING

This Noise Impact Analysis focuses on the federal and City of Anaheim (City) noise requirements as discussed below.

Federal Regulations

Title 24, Part 51B of the Code of Federal Regulations (24 CFR 51B) provides the noise regulations under the HUD noise program, which includes actual standards, assigns implementation responsibilities, describes review and approval procedures, and identifies special situations that may warrant waivers of procedures or standards. The guidelines and procedures in HUD's 2009 *Noise Guidebook* were used to comply with 24 CFR 51B and evaluate potential noise impacts on the

proposed project. HUD has exterior and interior noise goals of 55 and 45 A-weighted decibels (dBA) day-night average noise level (L_{dn}), respectively. These goals are recommended by the United States Environmental Protection Agency (EPA) but are not standards. Attenuation measures to meet the interior noise goal shall be employed where feasible. To meet other program objectives, sites exposed to a noise level not exceeding 65 dBA are acceptable and allowable as shown in Table A, below. This table shows HUD's site acceptability standards. The levels of acceptability are divided into three noise zones: (1) acceptable; (2) normally unacceptable; and (3) unacceptable. As Table A shows, sites that are exposed to noise levels not exceeding 65 dBA are normally acceptable. The acceptable threshold may be shifted to 70 dBA in special circumstances pursuant to Section 51.105(a) in 24 CFR 51B. Noise levels that are above 65 dBA but not exceeding 75 dBA are normally unacceptable, and noise levels that are above 75 dBA are unacceptable. For normally unacceptable and unacceptable sites, special approvals and environmental review are required. In addition, sites located in the normally unacceptable noise zone require a minimum 5 dBA additional noise attenuation if noise levels are greater than 65 dBA but not exceeding 70 dBA or require a minimum 10 dBA additional noise attenuation if noise levels are greater than 70 dBA but not exceeding 75 dBA. Also, attenuation measures for sites located in the unacceptable noise zone require the approval of HUD's Assistant Secretary for Community Planning and Development.

Table A: Site Acceptability Standards

Noise Zones	Day-Night Average Noise Level (dBA)	Special Approvals and Requirements
Acceptable	Not exceeding 65 dBA[1]	None
Normally Unacceptable	Above 65 dBA but not exceeding 75 dBA	Special Approvals[2] Environmental Review[3] Attenuation[4]
Unacceptable	Above 75 dBA	Special Approvals[2] Environmental Review[3] Attenuation[5]

Source: HUD Noise Guidebook (HUD 2009).

[1] The acceptable threshold may be shifted to 70 dBA in special circumstances pursuant to Section 51.105(a) in 24 CFR 51B.

[2] See Section 51.104(b) in 24 CFR 51B for requirements.

[3] See Section 51.104(b) in 24 CFR 51B for requirements.

[4] 5 dBA additional attenuation is required for sites above 65 dBA but not exceeding 70 dBA ,and 10 dBA additional attenuation is required for sites above 70 dBA but not exceeding 75 dBA (see Section 51.104(a) in 24 CFR 51B).

[5] Attenuation measures are to be submitted to the Assistant Secretary for Community Planning and Development for approval on a case-by-case basis.

24 CFR 51B = Title 24, Part 51B of the Code of Federal Regulations

dBA = A-weighted decibels

City of Anaheim

The City's General Plan Noise Element has an exterior and interior noise standard of 65 and 45 dBA Community Noise Equivalent Level (CNEL), respectively (City of Anaheim 2004). Outdoor environments for multifamily residences are limited to private patios or balconies accessed from within the dwelling. Balconies 6 feet (ft) deep or less are exempt. The interior noise standard for multifamily residences are based on closed windows and mechanical ventilation, or other means of natural ventilation shall be provided based on Chapter 12, Section 1205, of the Uniform Building Code.

EXISTING SETTING

Overview of the Existing Noise Environment

The primary existing noise sources in the project area are from vehicular traffic and train noise. Vehicles traveling on South Anaheim Boulevard, West Midway Drive, Interstate 5 (I-5), and other roadways in the project vicinity contribute to traffic noise in the project area. Existing rail operations located east of the project site include passenger and freight trains. Passenger trains include Metrolink and Amtrak. Other sources of noise in the project area include noise generated from Paul Revere Elementary School and commercial uses.

IMPACTS

Long-Term Noise Impacts

Exterior Noise Levels

The HUD Noise Guidebook (HUD 2009) was used to assess potential noise impacts on the proposed on-site residential uses. Noise sources assessed on the proposed project site include aircraft, traffic, and rail noise. Below is a detailed discussion of the three noise sources:

- **Aircraft Noise:** Airports within 15 miles of the project site include Fullerton Municipal Airport, John Wayne Airport, and Long Beach Airport. The airport noise contour for Fullerton Municipal Airport was obtained from the Airport Environs Land Use Plan for Fullerton Municipal Airport (ALUC 2019). The airport noise contour for John Wayne Airport was obtained from the Airport Environs Land Use Plan for John Wayne Airport (ALUC 2008). The airport noise contour for Long Beach Airport was obtained from the Los Angeles County Airport Land Use Plan (ALUC 2004). The total noise level from all airports at the project site is calculated at 48.3 dBA L_{dn}. The detailed calculation worksheets are provided in Attachment C.

- **Traffic Noise:** Major roadways within 1,000 ft of the project site include South Anaheim Boulevard and West Midway Drive. Also, I-5 is within 1,000 ft of the western portion of the project. Based on the Project at 110–229 W. Midway Drive Traffic Impact Study (Iteris 2021), South Anaheim Boulevard and West Midway Drive have an average daily traffic (ADT) volume of 39,880 and 5,231 trips, respectively, under the General Plan (2035) Buildout With Project condition. Receptors R-1 through R-7 represent the residential dwelling units, Receptor R-8 represents the roof deck, Receptor R-9 represents the outdoor patio and tot lot, and Receptor R-10 represents the pool area. The total traffic noise levels at Receptors R-1 through R-7 range between 67.2 and 72.2 dBA L_{dn}, while total traffic noise levels at Receptors R-8 through R-10 range between 60.7 and 62.7 dBA L_{dn}. The detailed calculation worksheets are provided in Attachment C.

- **Rail Noise:** Railways within 3,000 ft of the project site include the Southern California Regional Rail (SCRRA) Orange County line. This railway is located east of the project, and trains that operate on this line include Metrolink, Amtrak, and freight trains. Train horns are not routinely sounded at at-grade crossings in the project area because the area is designated as a quiet zone. The numbers of trips per day for Metrolink and Amtrak were determined based on the October 14, 2019, timetable for a worst-case scenario. The numbers of freight trains each day were

estimated based on Federal Railroad Administration (FRA) Office of Safety Analysis Rail Crossing Inventory Data. The combined train noise level at Receptors R-1 through R-10 is 52.5 dBA L_{dn}. The detailed calculation worksheets are provided in Attachment C.

Table B shows the exterior noise level from each of the three noise sources and the combined noise level from the three noise sources for each receptor (Receptors R-1 through R-10). As discussed above, Receptors R-1 through R-7 represent the ground-floor and upper-floor residential dwelling units, and Receptors R-8, R-9, and R-10 represent the roof deck, outdoor patio/tot lot, and pool, respectively. The locations of the receptors are shown on Figure 3.

Table B: Exterior Noise Levels

Receptor No.	Noise Levels (dBA L_{dn})			
	Aircraft	Train	Traffic	Total
R-1	48.3	52.5	71.4	71.5
R-2	48.3	52.5	72.2	72.3
R-3	48.3	52.5	68.3	68.4
R-4	48.3	52.5	67.6	67.8
R-5	48.3	52.5	67.2	67.4
R-6	48.3	52.5	67.5	67.7
R-7	48.3	52.5	67.6	67.8
R-8	48.3	52.5	62.0	62.6
R-9	48.3	52.5	62.2	62.7
R-10	48.3	52.5	59.9	60.7

Source: Compiled by LSA Associates, Inc. (2021).
dBA = A-weighted decibels
L_{dn} = day-night average noise level

As Table B shows, exterior noise levels at Receptors R-8 through R-10, which represent outdoor use areas, range between 60.7 and 62.7 dBA L_{dn}. The noise levels at these receptors are considered acceptable based on HUD's Site Acceptability Standards because noise levels do not exceed 65 dBA L_{dn}. As such, no noise reduction measures are required for the proposed residential outdoor use areas.

However, exterior noise levels at Receptors R-1 through R-7 range between 67.4 and 72.3 dBA L_{dn} and are considered normally unacceptable based on HUD's Site Acceptability Standards because noise levels are above 65 dBA L_{dn} but do not exceed 75 dBA L_{dn}. Ground-floor patio and upper-floor balcony barriers that have a minimum height of 6 ft would provide a minimum noise attenuation of 5 dBA. Based on the City's requirement for multifamily residences, balconies that are 6 ft deep or less are exempt from the City's exterior noise standard, which is similar to HUD's Site Acceptability Standards. Therefore, no exterior noise impacts would occur with the implementation of patio barriers that have a minimum height of 6 ft for all ground-floor residential dwelling units and balcony barriers that have a minimum height of 6 ft and are more than 6 ft deep for all upper-floor residential dwelling units.

Interior Noise Levels

Table C shows the interior noise levels with windows open for each residential receptor (Receptors R-1 through R-7). Interior noise levels were calculated using an exterior-to-interior noise reduction of 12 dBA with windows open based on the EPA's *Protective Noise Levels* (EPA 1978) and standard

Table C: Interior Noise Levels

Receptor No.	Noise Levels (dBA L_{dn})		Reduction to Achieve 45 dBA L_{dn} (dBA)
	Exterior	Interior[1]	
R-1	71.5	**59.5**[2]	26.5
R-2	72.3	**60.3**	27.3
R-3	68.4	**56.4**	23.4
R-4	67.8	**55.8**	22.8
R-5	67.4	**55.4**	22.6
R-6	67.7	**55.7**	22.7
R-7	67.8	**55.8**	22.8
R-8	62.6	—[3]	—
R-9	62.7	—	—
R-10	60.7	—	—

Source: Compiled by LSA Associates, Inc. (2021).
[1] Interior noise level with windows open.
[2] Numbers in bold represent noise levels that exceed the interior noise goal of 45 dBA L_{dn}.
[3] This receptor represents a multifamily residential outdoor use area and has no interior spaces.
dBA = A-weighted decibels
L_{dn} = day-night average noise level

construction for Southern California (warm climate) with a combination of exterior walls, doors, and windows. As shown in Table C, all seven receptors (Receptors R-1 through R-7) representing the ground-floor and upper-floor residential dwelling units would have interior noise levels with windows open that range between 55.4 and 60.3 dBA L_{dn}. These noise levels would exceed the interior noise goal of 45 dBA L_{dn}. Therefore, mechanical ventilation systems such as air conditioning would be required for all residential dwelling units on the project site so that windows can remain closed for a prolonged period of time.

Also, Table C shows that an exterior-to-interior noise reduction of 22.4 to 27.3 dBA is required to meet the interior noise goal of 45 dBA L_{dn}. To calculate and estimate the noise reduction provided by an exterior wall assembly, the transmission loss at the octave band frequencies for wall material by type is combined to provide an overall noise reduction. The rating of the wall and window or windows within the assembly will have a rating often referred to as a sound transmission class (STC) rating. The program INSUL was used to estimate the window ratings to ensure that compliance is achieved. Based on standard building construction in Southern California, the following elements make up the assumed exterior wall assembly:

- Fiber cement board siding or three-coat cement plaster
- One layer of 0.5-inch-thick plywood or oriented strand board (OSB)

- 2-inch x 4-inch wood stud wall channels spaced at 16 inches and a minimum of R-19 fiberglass insulation
- One layer of 5/8-inch-thick Type X gypsum board

In addition to the wall construction details, information from the VPI Quality Windows Endurance Series, which is energy and sound rated, was used to determine window STC ratings. The required window STC ratings and the composite noise level reduction are based on the project site plan along with assumed floor plans and project details. Assuming windows that have a minimum STC rating of 28, a noise reduction of 27.7 dBA would occur at noise-sensitive rooms, such as living rooms and bedrooms, containing two exposed walls and two windows resulting in an interior noise level of 44.6 dBA L_{dn} (72.3 dBA - 27.7 dBA = 44.6 dBA). Because noise levels are less than 0.5 dBA under the required threshold, it is recommended that noise-sensitive rooms facing South Anaheim Boulevard be upgraded to a minimum STC of 31. For standard noise-sensitive rooms with one exposed wall and one window, a noise reduction of 30.1 dBA would occur, and interior noise levels would be less than noise-sensitive rooms with two exposed walls and two windows. The results of the INSUL model are shown in Appendix D. Should architectural details in the final design plans be less adequate than those assumed above, a supplemental memorandum may be required to confirm that interior noise levels are reduced to 45 dBA L_{dn} or below.

NOISE REDUCTION MEASURES

The following measures would be required for the proposed project:

- Mechanical ventilation systems such as air conditioning are required for all residential dwelling units so that windows can remain closed for a prolonged period of time.

- All ground-floor residential dwelling units shall have a patio barrier that has a minimum height of 6 ft, and all upper-floor residential dwelling units with balconies greater than 6 ft in depth shall have a balcony barrier that has a minimum height of 6 ft.

- The exterior wall assembly shall meet or exceed the assumed exterior wall assembly that includes fiber cement board siding or three-coat cement plaster, one layer of 0.5-inch-thick plywood or OSB, 2-inch x 4-inch wood stud wall channels spaced at 16 inches and a minimum of R-19 fiberglass insulation, and one layer of 5/8-inch-thick Type X gypsum board. All windows for residential dwelling units in noise-sensitive rooms facing South Anaheim Boulevard shall have a minimum STC rating of 31. All other windows for residential dwelling units in noise-sensitive rooms shall have a minimum STC rating of 28.

CONCLUSION

The primary noise source in the project area is traffic noise on South Anaheim Boulevard and West Midway Drive, while aircraft noise and train noise contribute minimally. Exterior noise levels for Receptors R-1 through R-7, representing the multifamily residential dwelling units, are in the normally unacceptable range between 60.7 and 72.3 dBA L_{dn}, while exterior noise levels for Receptors R-8 through R-10, representing the multifamily residential outdoor use areas (roof deck, patio/tot lot, and pool), are in the acceptable range between 60.7 and 62.7 dBA L_{dn}. Based on these

noise levels, in order to meet the minimum HUD standards for attenuation, mechanical ventilation systems such as air conditioning would be required for all residential dwelling units so that windows can remain closed for a prolonged period of time. All ground-floor residential dwelling units would require a patio barrier that has a minimum height of 6 ft, and all upper-floor residential dwelling units with balconies greater than 6 ft in depth, would require a balcony barrier that has a minimum height of 6 ft. To meet the HUD 45 dBA L_{dn} interior standard, the exterior wall assembly shall meet or exceed the assumed exterior wall assembly that includes fiber cement board siding or three-coat cement plaster, one layer of 0.5-inch-thick plywood or OSB, 2-inch x 4-inch wood stud wall channels spaced at 16 inches and a minimum of R-19 fiberglass insulation, and one layer of 5/8-inch-thick Type X gypsum board. All windows for residential dwelling units in noise-sensitive rooms facing South Anaheim Boulevard shall have a minimum STC rating of 31. All other windows for residential dwelling units in noise-sensitive rooms shall have a minimum STC rating of 28. With implementation of the recommended measures as outlined above, interior noise levels would be below the HUD interior noise standard of 45 dBA L_{dn}.

Attachments: A: References
B: Figures 1 through 3
C: HUD Noise Worksheets
D: INSUL Model Printouts

ATTACHMENT A

REFERENCES

Airport Land Use Commission (ALUC). 2004. Los Angeles County Airport Land Use Plan. December 1. Website: http://planning.lacounty.gov/assets/upl/data/pd_alup.pdf (accessed April 2021).

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_____. 2019. Airport Environs Land Use Plan for Fullerton Municipal Airport. February 21. Website: https://www.ocair.com/commissions/aluc/docs/AELUP%20for%20FMA%2005092019.pdf (accessed April 2021).

City of Anaheim. 2004. General Plan Noise Element. May.

Federal Railroad Administration (FRA). Office of Safety Analysis. Crossing Inventory and Accident Reports. Website: https://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx (accessed April 2020).

Iteris, Inc. 2021. Project at 110–229 W. Midway Drive Traffic Impact Study. January 12.

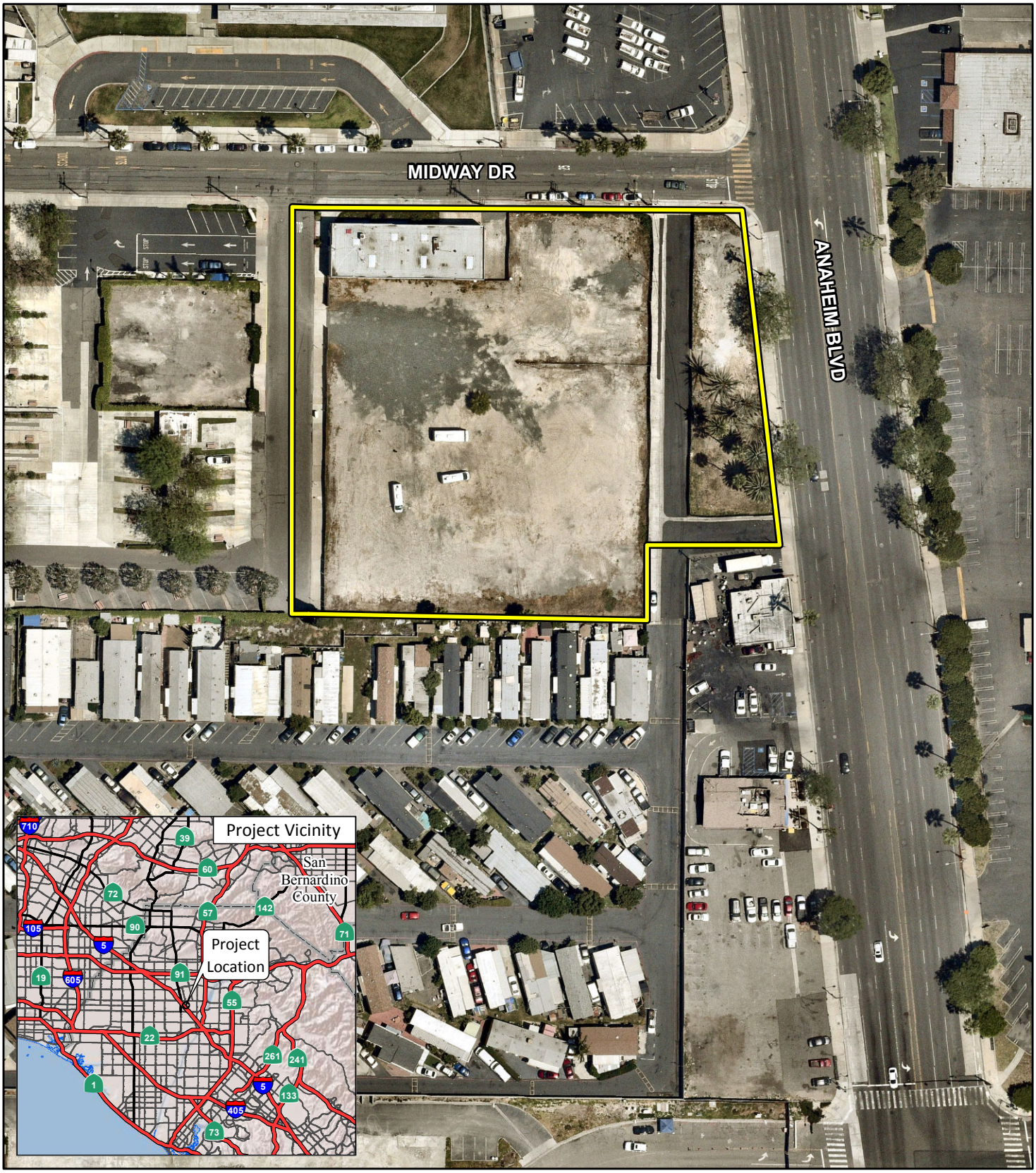
United States Department of Housing and Urban Development (HUD). 2009. HUD Noise Guidebook. Website: https://www.hudexchange.info/resource/313/hud-noise-guidebook/ (accessed April 2021).

United States Environmental Protection Agency (EPA). 1978. Protective Noise Levels, Condensed Version of EPA Levels Document, EPA 550/9-79-100. November.

ATTACHMENT B

FIGURES 1 THROUGH 3

Figure 1: Project Location and Vicinity
Figure 2: Site Plan
Figure 3: Receptor Locations



LSA

LEGEND

Project Location

FIGURE 1

N

0 50 100

FEET

SOURCE: Nearmap (05/16/2020)

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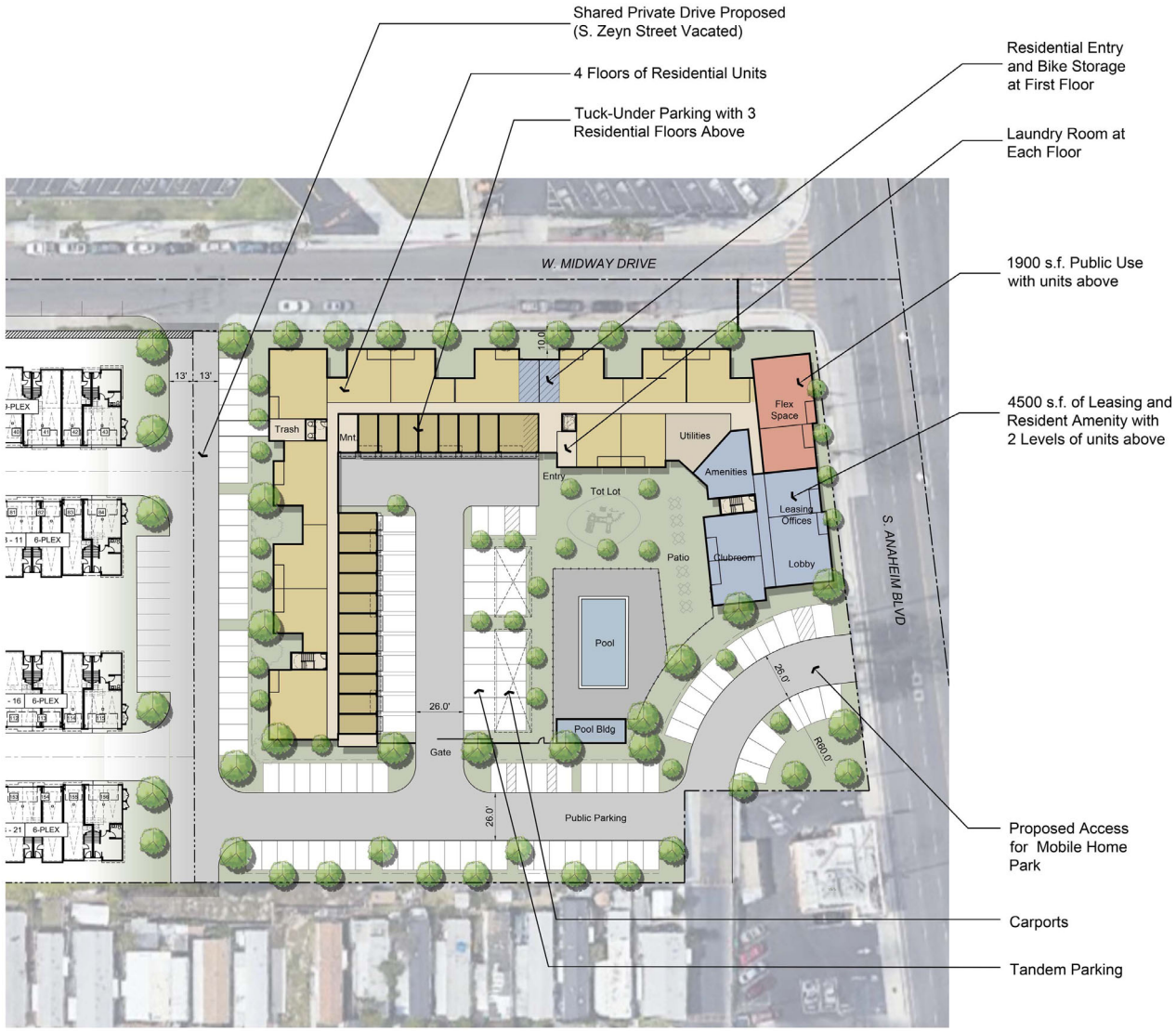
Anaheim Midway Affordable Housing Project

Project Location and Vicinity



LSA

FIGURE 2

N

0 50 100

FEET

SOURCE: KTGY Architecture + Planning

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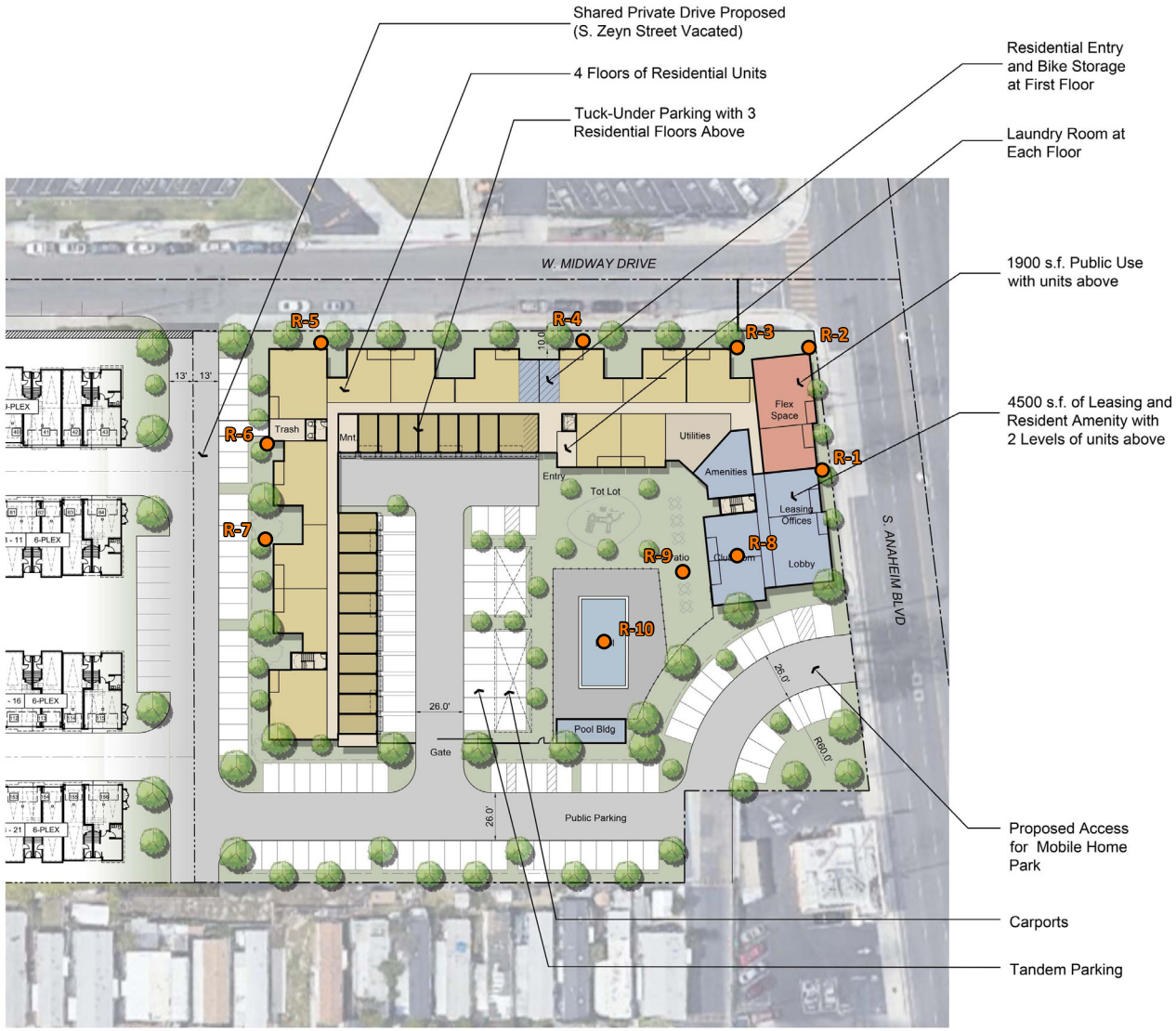
Anaheim Midway Affordable Housing Project

Site Plan



LSA

LEGEND

R-1 Receptor Location

FIGURE 3

0 50 100

FEET

SOURCE: KTGY Architecture + Planning

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Anaheim Midway Affordable Housing Project

Receptor Locations

ATTACHMENT C

HUD NOISE WORKSHEETS

Noise (EA Level Reviews)

General requirements	Legislation	Regulation
HUD's noise regulations protect residential properties from excessive noise exposure. HUD encourages mitigation as appropriate.	Noise Control Act of 1972 General Services Administration Federal Management Circular 75-2: "Compatible Land Uses at Federal Airfields"	Title 24 CFR 51 Subpart B
References		
https://www.hudexchange.info/programs/environmental-review/noise-abatement-and-control		

1. **What activities does your project involve? Check all that apply:**

☒ New construction for residential use
NOTE: HUD assistance to new construction projects is generally prohibited if they are located in an Unacceptable zone, and HUD discourages assistance for new construction projects in Normally Unacceptable zones. See 24 CFR 51.101(a)(3) for further details.
→ *Continue to Question 2.*

☐ Rehabilitation of an existing residential property
NOTE: For major or substantial rehabilitation in Normally Unacceptable zones, HUD encourages mitigation to reduce levels to acceptable compliance standards. For major rehabilitation in Unacceptable zones, HUD strongly encourages mitigation to reduce levels to acceptable compliance standards. See 24 CFR 51 Subpart B for further details.
→ *Continue to Question 2.*

☐ A research demonstration project which does not result in new construction or reconstruction, interstate, land sales registration, or any timely emergency assistance under disaster assistance provisions or appropriations which are provided to save lives, protect property, protect public health and safety, remove debris and wreckage, or assistance that has the effect of restoring facilities substantially as they existed prior to the disaster
→ *Based on the response, the review is in compliance with this section. Continue to the Worksheet Summary below.*

☐ None of the above
→ *Based on the response, the review is in compliance with this section. Continue to the Worksheet Summary below.*

2. **Complete the Preliminary Screening to identify potential noise generators in the vicinity (1000' from a major road, 3000' from a railroad, or 15 miles from an airport). Indicate the findings of the Preliminary Screening below:**

☐ There are no noise generators found within the threshold distances above.

→ *Based on the response, the review is in compliance with this section. Continue to the Worksheet Summary below. Provide a map showing the location of the project relative to any noise generators.*

☒ Noise generators were found within the threshold distances.

→ *Continue to Question 3.*

3. **Complete the Noise Assessment Guidelines to quantify the noise exposure. Indicate the findings of the Noise Assessment below:**

☐ Acceptable: (65 decibels or less; the ceiling may be shifted to 70 decibels in circumstances described in §24 CFR 51.105(a))

Indicate noise level here: [ ]

→ *Based on the response, the review is in compliance with this section. Continue to the Worksheet Summary below. Provide noise analysis, including noise level and data used to complete the analysis.*

☒ Normally Unacceptable: (Above 65 decibels but not exceeding 75 decibels; the floor may be shifted to 70 decibels in circumstances described in 24 CFR 51.105(a))

Indicate noise level here: [67.4 to 72.3 dBA L_{dn}]

<u>If project is rehabilitation:</u>

→ *Continue to Question 4. Provide noise analysis, including noise level and data used to complete the analysis.*

<u>If project is new construction:</u>

Is the project in a largely undeveloped area[1]?

☒ No

→ *Continue to Question 4. Provide noise analysis, including noise level and data used to complete the analysis, and any other relevant information.*

[1] A largely undeveloped area means the area within 2 miles of the project site is less than 50 percent developed with urban uses and does not have water and sewer capacity to serve the project.

☐ Yes

→*Your project requires completion of an Environmental Impact Statement (EIS) pursuant to 51.104(b)(1)(i). Elevate this review to an EIS-level review.*

☐ Unacceptable: (Above 75 decibels)

Indicate noise level here: [ ]

If project is rehabilitation:

HUD strongly encourages conversion of noise-exposed sites to land uses compatible with high noise levels. Consider converting this property to a non-residential use compatible with high noise levels.

→ *Continue to Question 4. Provide noise analysis, including noise level and data used to complete the analysis, and any other relevant information.*

If project is new construction:

Your project requires completion of an Environmental Impact Statement (EIS) pursuant to 51.104(b)(1)(i). You may either complete an EIS or provide a waiver signed by the appropriate authority. Indicate your choice:

☐ Convert to an EIS

→ *Provide noise analysis, including noise level and data used to complete the analysis.*

Continue to Question 4.

☐ Provide waiver

→ *Provide an Environmental Impact Statement waiver from the Certifying Officer or the Assistant Secretary for Community Planning and Development per 24 CFR 51.104(b)(2) and noise analysis, including noise level and data used to complete the analysis.*

Continue to Question 4.

4. **HUD strongly encourages mitigation be used to eliminate adverse noise impacts. Explain in detail the exact measures that must be implemented to mitigate for the impact or effect, including the timeline for implementation. This information will be automatically included in the Mitigation summary for the environmental review.**

☒ Mitigation as follows will be implemented:

1) Mechanical ventilation systems such as air conditioning are required for all residential dwelling units. 2) A minimum 6 ft high ground floor patio and upper floor balcony barriers are required for all residential dwelling units. 3) Building façade upgrades such as higher than standard construction or double-paned windows are required for all residential dwelling units . See Noise Impact Analysis memorandum.

→ *Provide drawings, specifications, and other materials as needed to describe the project's noise mitigation measures. Continue to the Worksheet Summary.*

☐ No mitigation is necessary.

Explain why mitigation will not be made here:

→ *Continue to the Worksheet Summary.*

Worksheet Summary

Compliance Determination

Provide a clear description of your determination and a synopsis of the information that it was based on, such as:

- Map panel numbers and dates
- Names of all consulted parties and relevant consultation dates
- Names of plans or reports and relevant page numbers
- Any additional requirements specific to your region

See Noise Impact Analysis memorandum.

Are formal compliance steps or mitigation required?

☒ Yes

☐ No

Worksheet A
Site Evaluation

Noise Assessment Guidelines

1441, 1445, and 1455 S. Anaheim Boulevard, Anaheim, CA 92805

Site Location

Program

Anaheim Midway Affordable Housing Project

Project Name

City of Anaheim

Locality

File Number

Sponsor's Name

Phone

Street Address

City, State

	Acceptability Category	DNL	Predicted for Operations in Year
1. Roadway Noise	Acceptable	59.9 to 72.2	2035
2. Aircraft Noise	Acceptable	48.3	2021
3. Railway Noise	Normally Unacceptable	52.5	2019
		60.7 to 72.3	

Value of DNL for all noise sources: (see page 3 for combination procedure)

Final Site Evaluation (circle one)

Acceptable

Normally Unacceptable

Unacceptable

Signature Jason Liu

Date 4/9/2021

Clip this worksheet to the top of a package containing Worksheets B-E and Worksheets 1-7 that are used in the site evaluations

List all airports within 15 miles of the site:

1. Fullerton Municipal Airport
2. John Wayne Airport
3. Long Beach

Necessary Information:	Airport 1	Airport 2	Airport 3
1. Are DNL, NEF or CNR contours available? (yes/no)	Yes	Yes	Yes
2. Any supersonic aircraft operations? (yes/no)	No	No	No
3. Estimating approximate contours from Figure 3:			
a. number of nighttime jet operations	N/A	N/A	N/A
b. number of daytime jet operations	N/A	N/A	N/A
c. effective number of operations (10 times a + b)	N/A	N/A	N/A
d. distance A for 65 dB			
70dB			
75 dB			
e. distance B for 65 dB			
70 dB			
75 dB			
4. Estimating DNL from Table 2:			
a. distance from 65 dB contour to flight path, D^1	480	2,880	2,135
b. distance from NAL to flight path, D^2	20,040	49,420	69,800
c. D^2 divided by D^1	62.6	17.2	32.7
d. DNL	38.1	46.5	42.3
5. Operations projected for what year?	2019	2008	2004
6. Total DNL from all airports		48.3	

Signed Jason Lui Date 4/9/2021

Receptor R-1

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,168	13	87	
b. farthest lane	1,396	96	123	
c. average (effective distance)	1,282	54	105	
2. Distance to stop sign	N/A	N/A	85	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-1

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		63.5	–	3	=	60.5
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		69.0	–	0	=	69.0
Road No. 3	0.23	x	0.3	x	0.79	x	6,221	=	339		48.0	–	15	=	33.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20	21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659												
Road No. 1								Add	4,659	x	2.3	x	0.81	=	8,680	62.3	–	3	= 59.3
Downhill		x		=															
Uphill	1	x	0.81	x	148	=	119												
Road No. 2								Add	119	x	1.8	x	0.79	=	169	66.0	–	0	= 66.0
Downhill		x		=															
Uphill	1	x	0.81	x	20	=	16												
Road No. 3								Add	16	x	1.8	x	0.79	=	23	56.0	–	15	= 41.0
Downhill		x		=															
Uphill		x		x		=													
Road No. 4								Add		x		x		=			–		=
Downhill		x		=															

Combined Automobile & Heavy Truck DNL

Road No. 1 63.0 Road No. 2 70.8 Road No. 3 41.6 Road No. 4 _____ Total DNL for All Roads 71.4

Signature _____ Date 4/9/2020

Receptor R-2

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,206	11	21	
b. farthest lane	1,434	94	57	
c. average (effective distance)	1,320	52	39	
2. Distance to stop sign	N/A	N/A	20	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-2

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		63.0	–	3	=	60.0
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		69.5	–	0	=	69.5
Road No. 3	0.13	x	0.3	x	0.79	x	6,221	=	192		52.0	–	0	=	52.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20		21		22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659														
Road No. 1									Add	4,659	x	2.3	x	0.81	=	8,680	62.2	–	3	=	59.2
Downhill		x		=																	
Uphill	1	x	0.81	x	148	=	119														
Road No. 2									Add	119	x	1.8	x	0.79	=	170	66.3	–	0	=	66.3
Downhill		x		=																	
Uphill	1	x	0.81	x	20	=	16														
Road No. 3									Add	16	x	1.8	x	0.79	=	23	62.0	–	0	=	62.0
Downhill		x		=																	
Uphill		x		x		=															
Road No. 4									Add		x		x		=			–		=	
Downhill		x		=																	

Combined Automobile & Heavy Truck DNL

Road No. 1 62.6 Road No. 2 71.2 Road No. 3 62.4 Road No. 4 _____ Total DNL for All Roads 72.2

Signature _____ Date 4/9/2020

Receptor R-3

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,176	50	21	
b. farthest lane	1,404	133	57	
c. average (effective distance)	1,290	92	39	
2. Distance to stop sign	N/A	N/A	25	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-3

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		63.5	–	3	=	60.5
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		66.0	–	3	=	63.0
Road No. 3	0.14	x	0.3	x	0.79	x	6,221	=	206		53.0	–	0	=	53.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20		21		22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659														
Road No. 1									Add	4,659	x	2.3	x	0.81	=	8,680	62.3	–	3	=	59.3
Downhill		x		=																	
Uphill	1	x	0.81	x	148	=	119														
Road No. 2									Add	119	x	1.8	x	0.79	=	170	62.8	–	3	=	59.8
Downhill		x		=																	
Uphill	1	x	0.81	x	20	=	16														
Road No. 3									Add	16	x	1.8	x	0.79	=	23	62.0	–	0	=	62.0
Downhill		x		=																	
Uphill		x		x		=															
Road No. 4									Add		x		x		=			–		=	
Downhill		x		=																	

Combined Automobile & Heavy Truck DNL

Road No. 1 63.0 Road No. 2 64.7 Road No. 3 62.5 Road No. 4 _____ Total DNL for All Roads 68.3

Signature Jason Lui Date 4/9/2020

Receptor R-4

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,115	132	17	
b. farthest lane	1,343	215	55	
c. average (effective distance)	1,229	174	36	
2. Distance to stop sign	N/A	N/A	105	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-4

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	X	1.4	X	0.81	X	387,052	=	438,917		63.5	–	3	=	60.5
Road No. 2	1	X	0.4	X	0.79	X	46,191	=	14,596		62.8	–	3	=	59.8
Road No. 3	0.26	X	0.3	X	0.79	X	6,221	=	383		56.0	–	0	=	56.0
Road No. 4		X		X		X		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20	21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	X	1	X	4,659	=	4,659												
Road No. 1								Add	4,659	X	2.3	X	0.81	=	8,680	62.5	–	3	= 59.3
Downhill		X		=															
Uphill	1	X	0.81	X	148	=	119												
Road No. 2								Add	119	X	1.8	X	0.79	=	170	58.7	–	3	= 55.7
Downhill		X		=															
Uphill	1	X	0.81	X	20	=	16												
Road No. 3								Add	16	X	1.8	X	0.79	=	23	63.0	–	0	= 63.0
Downhill		X		=															
Uphill		X		X		=													
Road No. 4								Add		X		X		=			–		=
Downhill		X		=															

Combined Automobile & Heavy Truck DNL

Road No. 1 63.0 Road No. 2 61.2 Road No. 3 63.8 Road No. 4 _____ Total DNL for All Roads 67.6

Signature Jason Lui Date 4/9/2020

Receptor R-5

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,009	272	16	
b. farthest lane	1,237	355	55	
c. average (effective distance)	1,123	314	35	
2. Distance to stop sign	N/A	N/A	245	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-5

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		64.3	–	3	=	61.3
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		58.0	–	15	=	43.0
Road No. 3	0.47	x	0.3	x	0.79	x	6,221	=	693		59.0	–	0	=	59.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20		21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659													
Road No. 1									Add 4,659	x	2.3	x	0.81	=	8,680	63.3	–	3	=	60.3
Downhill		x		=																
Uphill	1	x	0.81	x	148	=	119													
Road No. 2									Add 119	x	1.8	x	0.79	=	170	54.5	–	15	=	39.5
Downhill		x		=																
Uphill	1	x	0.81	x	20	=	16													
Road No. 3									Add 16	x	1.8	x	0.79	=	23	63.0	–	0	=	63.0
Downhill		x		=																
Uphill		x		x		=														
Road No. 4									Add	x		x		=			–		=	
Downhill		x		=																

Combined Automobile & Heavy Truck DNL

Road No. 1 63.8 Road No. 2 44.6 Road No. 3 64.5 Road No. 4 _____ Total DNL for All Roads 67.2

Signature _____ Date 4/9/2020

Receptor R-6

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	948	312	71	
b. farthest lane	1,176	395	110	
c. average (effective distance)	1,062	353	90	
2. Distance to stop sign	N/A	N/A	285	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-6

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		65.0	–	0	=	65.0
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		57.0	–	15	=	42.0
Road No. 3	0.47	x	0.3	x	0.79	x	6,221	=	693		53.0	–	5	=	48.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20	21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659												
Road No. 1								Add	4,659	x	2.3	x	0.81	=	8,680	63.5	– 0	=	63.5
Downhill		x		=															
Uphill	1	x	0.81	x	148	=	119												
Road No. 2								Add	119	x	1.8	x	0.79	=	170	50.0	– 15	=	35.0
Downhill		x		=															
Uphill	1	x	0.81	x	20	=	16												
Road No. 3								Add	16	x	1.8	x	0.79	=	23	57.0	– 5	=	52.0
Downhill		x		=															
Uphill		x		x		=													
Road No. 4								Add		x		x		=			–	=	
Downhill		x		=															

Combined Automobile & Heavy Truck DNL

Road No. 1 67.3 Road No. 2 42.8 Road No. 3 53.5 Road No. 4 _____ Total DNL for All Roads 67.5

Signature _____ Date 4/9/2020

Receptor R-7

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	915	318	122	
b. farthest lane	1,143	401	161	
c. average (effective distance)	1,029	360	141	
2. Distance to stop sign	N/A	N/A	305	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-7

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		65.2	–	0	=	65.2
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		57.0	–	15	=	42.0
Road No. 3	0.56	x	0.3	x	0.79	x	6,221	=	826		50.0	–	6	=	44.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20	21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659												
Road No. 1								Add 4,659	x	2.3	x	0.81	=	8,680	63.8	–	0	=	63.8
Downhill		x		=															
Uphill	1	x	0.81	x	148	=	119												
Road No. 2								Add 119	x	1.8	x	0.79	=	170	50.0	–	15	=	35.0
Downhill		x		=															
Uphill	1	x	0.81	x	20	=	16												
Road No. 3								Add 16	x	1.8	x	0.79	=	23	54.0	–	6	=	48.0
Downhill		x		=															
Uphill		x		x		=													
Road No. 4								Add	x		x		=			–		=	
Downhill		x		=															

Combined Automobile & Heavy Truck DNL

Road No. 1 67.6 Road No. 2 42.8 Road No. 3 49.5 Road No. 4 _____ Total DNL for All Roads 67.6

Signature _____ Date 4/9/2020

Receptor R-8

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,101	66	134	
b. farthest lane	1,329	150	171	
c. average (effective distance)	1,215	108	152	
2. Distance to stop sign	N/A	N/A	132	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-8

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		63.5	–	15	=	48.5
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		65.0	–	5	=	60.0
Road No. 3	0.3	x	0.3	x	0.79	x	6,221	=	442		47.0	–	15	=	32.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20	21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659												
Road No. 1								Add 4,659	x	2.3	x	0.81	=	8,680	63.5	–	15	=	48.5
Downhill		x		=															
Uphill	1	x	0.81	x	148	=	119												
Road No. 2								Add 119	x	1.8	x	0.79	=	170	61.0	–	5	=	56.5
Downhill		x		=															
Uphill	1	x	0.81	x	20	=	16												
Road No. 3								Add 16	x	1.8	x	0.79	=	23	53.0	–	15	=	38.0
Downhill		x		=															
Uphill		x		x		=													
Road No. 4								Add	x		x		=			–		=	
Downhill		x		=															

Combined Automobile & Heavy Truck DNL

Road No. 1 51.5 Road No. 2 61.6 Road No. 3 39.0 Road No. 4 _____ Total DNL for All Roads 62.0

Signature _____ Date 4/9/2020

Receptor R-9

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,074	96	141	
b. farthest lane	1,302	180	178	
c. average (effective distance)	1,188	138	159	
2. Distance to stop sign	N/A	N/A	145	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-9

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		64.0	–	15	=	49.0
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		63.0	–	3	=	60.0
Road No. 3	0.32	x	0.3	x	0.79	x	6,221	=	472		52.0	–	15	=	37.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20	21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659												
Road No. 1								Add 4,659	x	2.3	x	0.81	=	8,680	63.5	–	15	=	48.5
Downhill		x		=															
Uphill	1	x	0.81	x	148	=	119												
Road No. 2								Add 119	x	1.8	x	0.79	=	170	60.0	–	3	=	57.0
Downhill		x		=															
Uphill	1	x	0.81	x	20	=	16												
Road No. 3								Add 16	x	1.8	x	0.79	=	23	50.0	–	15	=	35.0
Downhill		x		=															
Uphill		x		x		=													
Road No. 4								Add	x		x		=			–		=	
Downhill		x		=															

Combined Automobile & Heavy Truck DNL

Road No. 1 51.8 Road No. 2 61.8 Road No. 3 39.1 Road No. 4 _____ Total DNL for All Roads 62.2

Signature _____ Date 4/9/2020

Receptor R-10

List all major roads within 1000 feet of the site:

1. Interstate 5 (I-5)
2. South Anaheim Boulevard
3. West Midway Drive
4.

Necessary Information	Road 1	Road 2	Road 3	Road 4
1. Distance in feet from the NAL to the edge of the road				
a. nearest lane	1,017	143	178	
b. farthest lane	1,245	228	216	
c. average (effective distance)	1,131	185	197	
2. Distance to stop sign	N/A	N/A	200	
3. Road gradient in percent	0	0	0	
4. Average speed in mph				
a. Automobiles	65	35	30	
b. heavy trucks - uphill	55	35	30	
c. heavy trucks - downhill	55	35	30	
5. 24 hour average number of automobiles and medium trucks in both directions (ADT)				
a. automobiles	233,557	38,851	5,231	
b. medium trucks	15,350	734	99	
c. effective ADT (a + {10xb})	387,052	46,191	6,221	
6. 24 hour average number of heavy trucks				
a. uphill				
b. downhill				
c. total	9,319	295	40	
7. Fraction of nighttime traffic (10 p.m. to 7 a.m.)	9.7	9.6	9.6	
8. Traffic projected for what year?	2019	2035	2035	

Receptor R-10

Adjustments for Automobile Traffic

	9 Stop and-go Table 3		10 Average Speed Table 4		11 Night-Time Table 5		12 Auto ADT (line 5c)		13 Adjusted Auto ADT		14 DNL (Workchart 1)		15 Barrier Attenuation		16 Partial DNL
Road No. 1	1	x	1.4	x	0.81	x	387,052	=	438,917		64.5	–	15	=	49.5
Road No. 2	1	x	0.4	x	0.79	x	46,191	=	14,596		60.0	–	3	=	57.0
Road No. 3	0.4	x	0.3	x	0.79	x	6,221	=	590		51.0	–	15	=	36.0
Road No. 4		x		x		x		=				–		=	

Adjustments for Heavy Truck Traffic

	17 Gradient Table 6		18 Average Speed Table 7		19 Truck ADT / 2		20	21	22 Stop and-go Table 8		23 Night-Time Table 5		24 Adjusted Truck ADT		25 DNL (Work-chart 2)		26 Barrier Attn.		27 Partial DNL
Uphill	1	x	1	x	4,659	=	4,659												
Road No. 1								Add	4,659	x	2.3	x	0.81	=	8,680	63.0	– 15	=	48.0
Downhill		x		=															
Uphill	1	x	0.81	x	148	=	119												
Road No. 2								Add	119	x	1.8	x	0.79	=	170	58.0	– 3	=	55.0
Downhill		x		=															
Uphill	1	x	0.81	x	20	=	16												
Road No. 3								Add	16	x	1.8	x	0.79	=	23	49.0	– 15	=	34.0
Downhill		x		=															
Uphill		x		x		=													
Road No. 4								Add		x		x		=			–	=	
Downhill		x		=															

Combined Automobile & Heavy Truck DNL

Road No. 1 51.8 Road No. 2 59.1 Road No. 3 38.1 Road No. 4 _____ Total DNL for All Roads 59.9

Signature Jason Lui Date 4/9/2020

Receptor R-1 through R-10

List All Railways within 3000 feet of the site:

1. Southern California Regional Rail Authority - Transit
2. Southern California Regional Rail Authority - Freight
3.

Necessary Information:	Railway No. 1	Railway No. 2	Railway No. 3
1. Distance in feet from the NAL to the railway track:	2,500	2,500	
2. Number of trains in 24 hours:			
a. diesel	64	29	
b. electrified	0	0	
3. Fraction of operations occuring at night (10 p.m. -- 7 a.m.):	0.171	0.448	
4. Number of diesel locomotives per train:	1	1	
5. Number of rail cars per train:			
a. diesel trains	5	50	
b. electrified trains	0	0	
6. Average train speed:	50	50	
7. Is track welded or bolted?	Bolted	Bolted	
8. Are whistles or horns required for grade crossings?	No	No	

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	Anaheim Midway Affordable Housing Project
Record Date	04/02/2021
User's Name	Jason Lui

Road # 1 Name:	

Road #1

Vehicle Type	Cars ☐	Medium Trucks ☐	Heavy Trucks ☐
Effective Distance			
Distance to Stop Sign			
Average Speed			
Average Daily Trips (ADT)			
Night Fraction of ADT			
Road Gradient (%)			
Vehicle DNL			
Calculate Road #1 DNL		Reset	

Railroad #1 Track Identifier:	**SCRRA - Transit**

Rail # 1

Train Type	Electric ☐	Diesel ☑
Effective Distance		2500
Average Train Speed		50
Engines per Train		1
Railway cars per Train		5
Average Train Operations (ATO)		64
Night Fraction of ATO		17
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☑ No: ☐

Train DNL	0	47
Calculate Rail #1 DNL	47	Reset

Railroad #2 Track Identifier:	**SCRRA - Freight**

Rail # 2

Train Type	**Electric** ☐	**Diesel** ☑
Effective Distance		2500
Average Train Speed		50
Engines per Train		1
Railway cars per Train		50
Average Train Operations (ATO)		29
Night Fraction of ATO		45
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Train DNL	0	51
Calculate Rail #2 DNL	51	Reset

Add Road Source | Add Rail Source

Airport Noise Level	

Loud Impulse Sounds?

○**Yes** ○**No**

Combined DNL for all Road and Rail sources	**0**
Combined DNL including Airport	
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

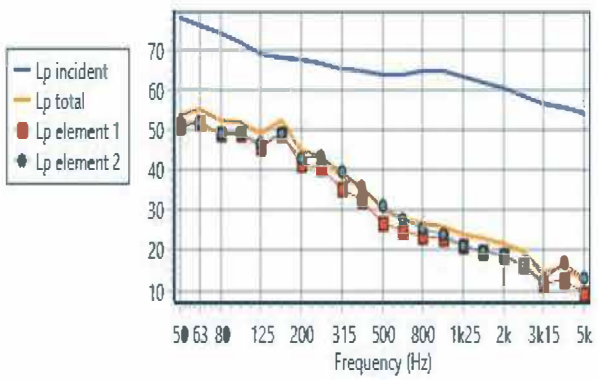
Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

ATTACHMENT D

INSUL MODEL PRINTOUTS

Outdoor To Indoor Sound Transmission (v9.0.22)

Margin of error is generally within STC ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:4/6/2021
File Name:MidwayAffordableExtWall_SAnaheim.cns

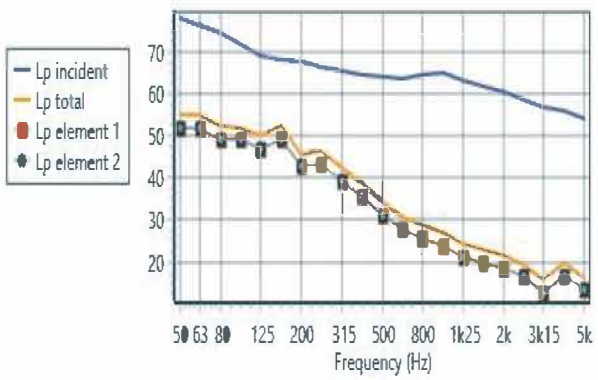


Comment: Two Exposed Walls and Two Windows Facing South Anaheim Bouelvard

Source	Octave Band Centre Frequency (Hz)																				Overall dBA
	63		125		250		500		1k		2k		4k								
Incident sound level (freefield)	78.0	76.0	74.3	71.9	68.9	68.2	67.7	66.4	65.4	64.6	64.0	63.7	64.6	64.8	63.2	61.8	60.6	58.5	56.6	55.8	54.3	73
Path																					
Element 1 , STL	-27	-24	-25	-23	-23	-19	-26	-26	-30	-32	-37	-39	-41	-42	-42	-42	-42	-42	-45	-43	-45	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area(+10LogA) [116 ft2]	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
Element sound level contribution	51	52	49	49	46	49	42	40	35	33	27	25	24	23	21	20	19	17	12	13	9	41
Element 2 , STL	-27	-24	-25	-23	-23	-19	-26	-26	-30	-32	-37	-39	-41	-42	-42	-42	-42	-42	-45	-43	-45	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area(+10LogA) [116 ft2]	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
Element sound level contribution	52	52	49	49	47	49	43	43	39	36	31	28	26	24	21	20	19	17	13	17	13	42
Receiver																					
Room volume(-10LogV) [1400 ft3]	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	
Reverberation time (s)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
RT (+10LogT)	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	54	55	52	52	49	52	45	43	38	36	30	28	27	26	24	23	22	20	15	16	12	44

Outdoor To Indoor Sound Transmission (v9.0.22)

Margin of error is generally within STC ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:4/6/2021
File Name:MidwayAffordableExtWall.cns



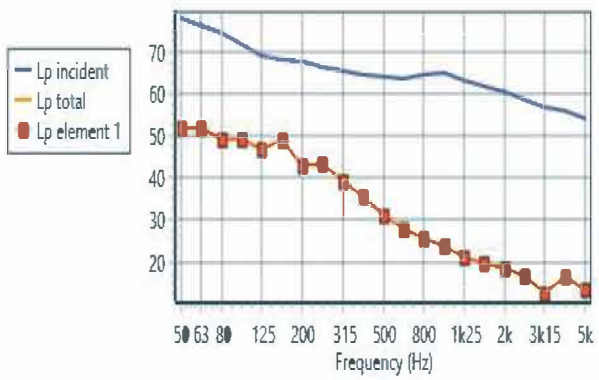
Comment: One Exposed Wall and One Window Facing South Anaheim Boulevard

Source	Octave Band Centre Frequency (Hz)																				Overall dBA
	63		125		250		500		1k		2k		4k								
Incident sound level (freefield)	78.0	76.0	74.3	71.9	68.9	68.2	67.7	66.4	65.4	64.6	64.0	63.7	64.6	64.8	63.2	61.8	60.6	58.5	56.6	55.8	54.3	73
Path																					
Element 1 , STL	-26	-24	-25	-23	-22	-19	-25	-23	-26	-29	-33	-36	-39	-41	-42	-42	-42	-42	-44	-39	-41	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area(+10LogA) [116 ft2]	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
Element sound level contribution	52	52	49	49	47	49	43	43	39	36	31	28	26	24	21	20	19	17	13	17	13	42
Element 2 , STL	-26	-24	-25	-23	-22	-19	-25	-23	-26	-29	-33	-36	-39	-41	-42	-42	-42	-42	-44	-39	-41	
Facade Shape factor Level diff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Area(+10LogA) [116 ft2]	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	
Element sound level contribution	52	52	49	49	47	49	43	43	39	36	31	28	26	24	21	20	19	17	13	17	13	42
Receiver																					
Room volume(-10LogV) [1400 ft3]	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	-31	
Reverberation time (s)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
RT (+10LogT)	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2	
Equation Constant	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
Room sound level	55	55	52	52	50	52	46	46	42	39	34	31	29	27	24	23	22	20	16	20	16	45

Outdoor To Indoor Sound Transmission (v9.0.22)

Margin of error is generally within STC ±3 dB
- Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:4/6/2021
File Name:MidwayAffordableStandardExtWall.cns

Comment: StandardExtWall Two Exposed Walls and Two Windows



Source	Octave Band Centre Frequency (Hz) 63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	78.0 76.0 74.3 71.9 68.9 68.2 67.7 66.4 65.4 64.6 64.0 63.7 64.6 64.8 63.2 61.8 60.6 58.5 56.6 55.8 54.3							73
Path								
Element 1 , STL	-26 -24 -25 -23 -22 -19 -25 -23 -26 -29 -33 -36 -39 -41 -42 -42 -42 -42 -44 -39 -41							
Facade Shape factor Level diff.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
Insertion Loss	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
Area(+10LogA) [116 ft2]	21 21 21 21 21 21 21 21 21 21 21 21 21 21 21 21 21 21 21 21 21							
Element sound level contribution	52 52 49 49 47 49 43 43 39 36 31 28 26 24 21 20 19 17 13 17 13							NAN
Receiver								
Room volume(-10LogV) [1400 ft3]	-31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31 -31							
Reverberation time (s)	0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3							
RT (+10LogT)	-5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2 -5.2							
Equation Constant	16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16							
Room sound level	52 52 49 49 47 49 43 43 39 36 31 28 26 24 21 20 19 17 13 17 13							42