NOISE ASSESSMENT

Terrano II
Multi-Family Development
City of Corona

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Attachments

GLOSSARY OF COMMON TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (Ldn): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for nighttime noise. Typically, Ldn's are measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise impacts associated with the development of the proposed Terrano II Multi-Family Residential project within the approved Dos Lagos Specific Plan EIR. The project consists of developing a 50-unit apartment complex on 2.96 acres. The project site is located east of Interstate 15, north of Dos Lagos Drive and West of Temescal Canyon Road in Planning Area 1 of the Dos Lagos Specific Plan in the City of Corona, CA.

Construction Noise

Construction noise levels at an average distance of 100 feet would attenuate or be reduced 6.0 dBA. Given this and the spatial separation of the equipment, the noise levels are projected to comply with the 75 dBA Leq exterior noise standard over 8 hours at the property lines. Additionally, Project construction noise levels are considered exempt if activities occur within the hours specified in the City of Corona Municipal Code, Section 17.84.040 of 7:00 a.m. and 8:00 p.m. Monday through Saturday and 10:00 a.m. 6:00 p.m. on Sundays and federal holidays. At the time of this analysis, no Project construction activity is planned outside of the specified hours. Therefore, no impacts are anticipated and no mitigation is required during construction of the proposed Project. Additionally, all equipment should be properly fitted with mufflers and all staging and maintenance should be conducted as far away for the existing residence as possible.

Construction Vibration

The Federal Transit Administration (FTA) has determined vibration levels that would cause annoyance to a substantial number of people and potential damage to building structures. The FTA criterion for vibration induced structural damage is 0.20 in/sec for the peak particle velocity (PPV). The FTA criterion for infrequent vibration induced annoyance is 80 Vibration Velocity (VdB) for residential uses.

The nearest vibration-sensitive uses are the residences located to the west, 50 feet or more from the proposed construction. The average vibration levels that would be experienced at the nearest vibration sensitive land uses to the east from temporary construction activities were found to be below 0.2 in/sec. Project construction activities would result in PPV levels below the FTA's criteria for vibration induced structural damage. Therefore, Project construction activities would not result in vibration induced structural damage to residential buildings near the demolition and construction areas. Construction activities were found to generate levels of vibration below 80 VdB and would not exceed the FTA criteria for nuisance for nearby residential uses. Therefore, vibration impacts would be less than significant.

Onsite Transportation Noise

It was determined that the outdoor use areas provided by the common recreation area and the private patios and balconies were found to comply with the City of Corona Noise standards of 65 dBA CNEL without mitigation measures.

An interior noise level reduction of 24 dBA CNEL is needed for the proposed residential units. Based on the preliminary architectural plans provided by Summa Architecture, to meet the 45 dBA CNEL interior noise standard, a minimum STC 28 rated dual pane windows and mechanical ventilation is needed to achieve the necessary interior noise reductions to meet the City's standard for the residential units.

Once the final architectural plans are prepared, the proposed project site will require an interior noise study be prepared prior to the issuance of building permits to determine the detailed components to reduce interior noise to 45 dBA CNEL.

Offsite Transportation Noise

The Project does not create a direct and cumulative noise increase of more than 3 dBA CNEL on the nearby roadways. Therefore, the Project's direct contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

1.0 PROJECT INTRODUCTION

1.1 Purpose of this Study

The purpose of this Noise study is to determine any potential noise impacts due to the proposed construction of the proposed project and also to determine potential noise impacts (if any) to the proposed project generated from offsite sources. Should impacts be determined, the intent of this study would be to recommend suitable mitigation measures to bring those impacts to a level that would be considered less then significant.

1.2 Project Location

The Project site is located in the City of Corona, in the western portion of Riverside County. A general project vicinity map is shown in Figure 1-A. The project site is located east of Interstate 15 and north of Dos Lagos Drive, at the northwest and southwest intersection of Temescal Canyon Road and Fashion Drive in Planning Area 1 of the Dos Lagos Specific Plan within the City of Corona. The project site is bounded to the north by the Home2 Suites by Hilton Hotel, to the west by existing apartments, to the south by a 76 gas station, and to the east by Temescal Canyon Road. Existing retail uses are located further north along Temescal Canyon Road. Existing residential uses are located to the east across Temescal Canyon Road.

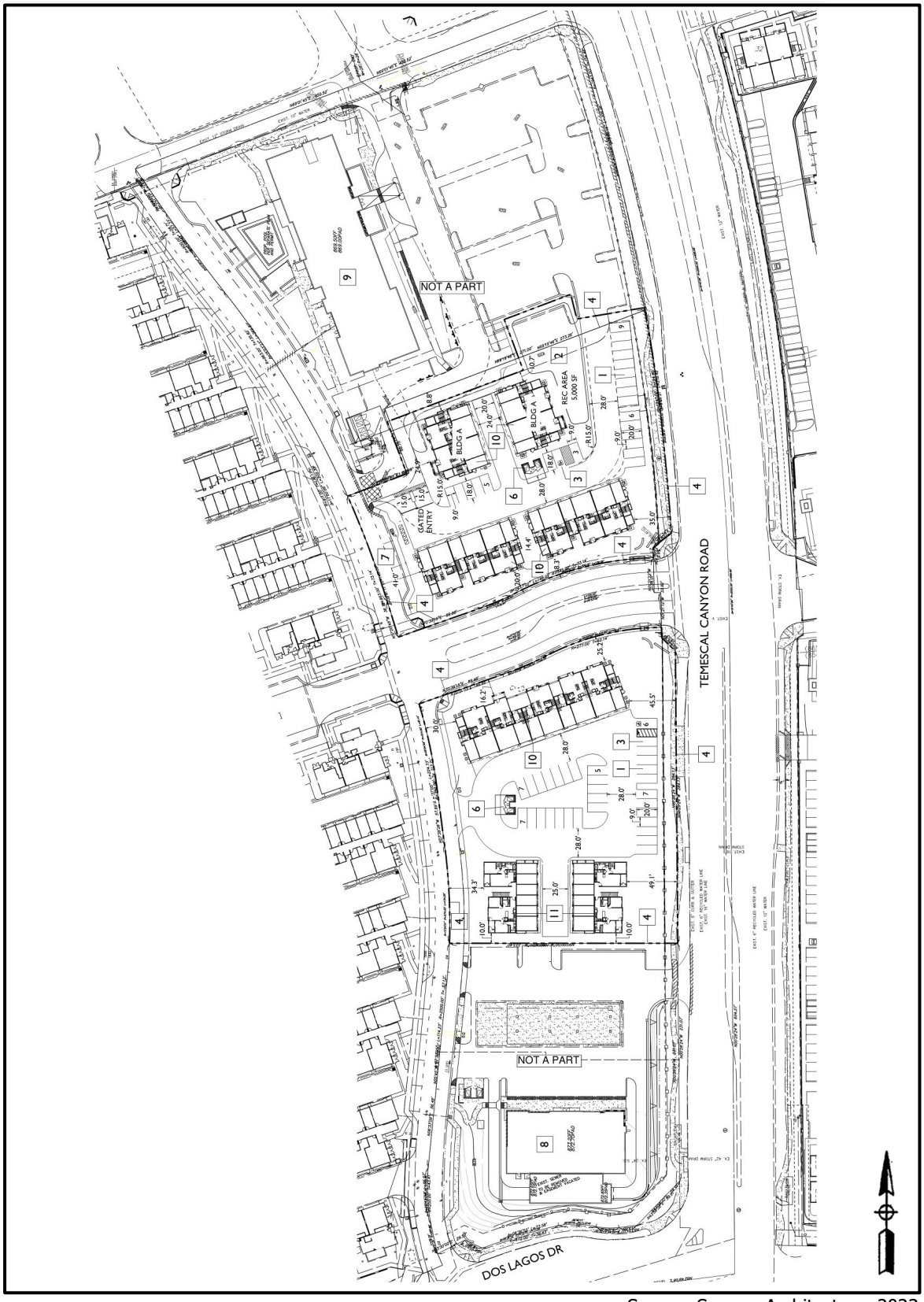
1.3 Project Description and Purpose

The proposed project will consist of 50 multi-family units consisting of two-story townhomes and three-story flats across 7 buildings as shown in the Project site configuration provided in Figure 1-B. The homes will range from approximately 700 square feet (s.f.) to 1,300 s.f. and feature one to three bedrooms, depending on the home plan and layout.

Figure 1-A: Project Vicinity Map

Source: Google Maps

Figure 1-B: Project Configuration



Source: Summa Architecture, 2023

2.0 FUNDAMENTALS

2.1 Acoustical Fundamentals

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is based on the sensitivity of that individual, the type of noise that occurs and when the noise occurs. Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24-hour A-weighted average for sound, with corrections or penalties for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sounds appear louder.

A vehicles noise level is generated from a combination of noise produced by the engine, exhaust and tires. The cumulative traffic noise levels along a roadway segment are based on three primary factors: the amount of traffic, the travel speed of the traffic, and the vehicle mix ratio or number of medium and heavy trucks. The intensity of traffic noise is increased by higher traffic volumes, greater speeds and increased number of trucks.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore, the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiant in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions.

Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as it travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods may be required to reduce noise levels to an acceptable level.

2.2 Vibration Fundamentals

Vibration is a trembling or oscillating motion of the ground. Like noise, vibration is transmitted in waves, but in this case through the ground or solid objects. Unlike noise, vibration is typically felt rather than heard. Vibration can be either natural as in the form of earthquakes, volcanic eruptions, or manmade as from explosions, heavy machinery, or trains. Both natural and manmade vibration may be continuous, such as from operating machinery; or infrequent, as from an explosion.

As with noise, vibration can be described by both its amplitude and frequency. Amplitude may be characterized in three ways: displacement, velocity, and acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position and for the purposes of soil displacement is typically measured in inches or millimeters. Particle velocity is the rate of speed at which soil particles move in inches per second or millimeters per second. Particle acceleration is the rate of change in velocity with respect to time and is measured in inches per second or millimeters per second. Typically, particle velocity (measured in inches or millimeters per second) and/or acceleration (measured in gravities) are used to describe vibration. Table 2-1 shows the human reaction to various levels of peak particle velocity.

Vibrations also vary in frequency and this affects perception. Typical construction vibrations fall in the 10 to 30 Hz range and usually occur around 15 Hz. Traffic vibrations exhibit a similar range of frequencies; however, due to their suspension systems, it is less common, to measure traffic frequencies above 30 Hz.

Propagation of ground-borne vibrations is complicated and difficult to predict because of the endless variations in the soil through which the waves travel. 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 dropping an object into water. P-waves, or compression waves, are waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal. 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 energy is spread over an ever-increasing area such that the energy level is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced

with distance as a result of material damping in the form of internal friction, soil layering, and special voids. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Table 2-1: Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity (in/sec)	Human Reaction	Effect on Buildings
0.006–0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people	Virtually no risk of "architectural" (i.e., not structural) damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk to "architectural" damage to normal dwelling – houses with plastered walls and ceilings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage
Source: Caltrans, Division of Environmental Analysis, *Transportation Related Earthborne Vibration, Caltrans Experiences*, Technical Advisory, Vibration, TAV-02-01-R9601, 2020 (Caltrans, 2020).		

3.0 SIGNIFICANCE THRESHOLDS AND STANDARDS

3.1 Construction Noise

To control noise impacts associated with the construction of the proposed Project, the City has established limits to the hours of operation. Section 17.84.040 of the City's Municipal Code indicates that construction noise is prohibited between the hours of 8:00 p.m. to 7:00 a.m., Monday through Saturday and 6:00 p.m. to 10:00 a.m. on Sundays and federal holidays. Construction noise is defined as noise which is disturbing, excessive or offensive and constitutes a nuisance involving discomfort or annoyance to persons of normal sensitivity residing in the area, which is generated by the use of any tools, machinery or equipment used in connection with construction operations. The City of Corona Municipal Code effectively considers construction noise as exempt if construction noise is limited to the permitted hours of activity.

Neither the General Plan nor Municipal Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes a substantial temporary or periodic noise increase. To allow for a quantified determination of what the City of Corona Municipal Code constitutes as noise that may be detrimental to the public health, safety or general welfare due to Project construction activity, relevant stationary source noise standards established in Table 1 of Section 17.84.040 are used in this analysis to assess the Project construction noise levels at nearby sensitive receivers. Table 1 of Section 17.84.040 establishes a maximum allowable exterior noise level standard for residential land use of 55 dBA L_{50} for a cumulative period of more 30 minutes in any hour. This same noise standard limits the exterior noise levels to the noise standard (55 dBA) plus 20 dBA for any period of time. This effectively limits the maximum noise level to 75 dBA L_{max}. Therefore, consistent with the City of Corona Municipal Code, an exterior noise level of 75 dBA L_{max} is used to describe the maximum acceptable threshold for determining the impacts due to Project construction for sensitive receivers.

3.2 Transportation Noise Standards

To control transportation related noise sources such as arterial roads, freeways, airports and railroads; the City of Corona has established guidelines for acceptable community noise levels in the City of Corona General Plan and Municipal Code. For noise sensitive residential uses, the City has established acceptable exterior noise levels of less than 65 dBA CNEL for outdoor living areas of multi-family dwellings. The applicable thresholds of the City of Corona are provided in Figure 3-A.

California Noise Insulation Standards (California Code of Regulations, Title 24) and the City of Corona Noise Code establish an interior noise standard of 45 dBA for multiple unit and hotel/motel structures. Acoustical studies must be prepared for multiple unit residential and hotel/motel

structures that are proposed to be located within the Community Noise Equivalent Level (CNEL) noise contours of 60 dBA or greater. In addition, the City requires all proposed residential structures located within the CNEL noise contours of 60 or greater to prepare an acoustical study. The studies must demonstrate that the building is designed to reduce interior noise to 45 dBA (CNEL) or lower.

Figure 3-A: Land Use Noise Compatibility Matrix

Land Use Categories		Community Noise Equivalent Level (CNEL)						
Categories	**Uses**	**<55**	**60**	**65**	**70**	**75**	**80>**	
Residential	Single Family, Duplex	A	A	B	B	D	D	D
	Multiple Family	A	A	B	B	C	D	D
	Hotel, Motel Lodging	A	A	B	C	C	D	D
Commercial Regional, District	Commercial Retail, Bank, Restaurant, Movie Theatre	A	A	B	B	C	C	D
Commercial Regional, Village District, Special	Commercial Retail, Bank, Restaurant, Movie Theatre	A	A	A	A	B	B	C
Commercial Office, Institution	Office Building, R&D, Professional Offices, City Office Building	A	A	A	B	B	C	D
Rec. Institutional Civic Center	Amphitheatre, Concert Auditorium, Meeting Hall	B	B	C	C	D	D	D
Commercial Recreation	Amusement Park, Miniature Golf, Sports Club, Equestrian Center	A	A	A	B	B	D	D
Commercial, General, Special, Industrial, and Institutional	Auto Service Station, Auto Dealer, Manu-facturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B
Institutional General	Hospital, Church, Library, Schools' Classroom	A	A	B	C	C	D	D
Open Space	Local, Community, and Regional Parks	A	A	A	B	C	D	D
Open Space	Golf Course, Cemetery, Nature Centers Wildlife Reserves and Habitat	A	A	A	A	B	C	C

Zone A: Clearly Compatible: Specified land use is satisfactory, based on the assumption that any buildings involved are of conventional construction without any special noise insulation requirements.
Zone B: Normally Compatible: New construction should be undertaken only after detailed analysis of the noise reduction requirements and needed noise insulation features are determined. Conventional construction, with closed windows and fresh air supply or air conditioning, will normally suffice.
Zone C: Normally Incompatible: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.
Zone D: Clearly Incompatible: New development should generally not be undertaken.

3.3 Construction Vibration Standards

The City of Corona has not identified or adopted vibration standards. However, the United States Department of Transportation Federal Transit Administration (FTA) provides guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines allow 80 VdB for human annoyance and 90 VdB for building damage at noise-sensitive uses and buildings where people normally sleep. Construction activity can result in varying degrees of ground-borne vibration, depending on the equipment and methods used, distance to the affected structures and soil type. Construction vibration is generally associated with pile driving and rock blasting. Occasionally large bulldozers and loaded trucks can cause perceptible vibration levels at close proximity. While not enforceable regulations within the City of Corona, the FTA guidelines of 80 VdB for annoyance and 90 VdB for building damage at sensitive land uses provide the basis for determining the relative significance of potential Project-related vibration impacts.

4.0 CONSTRUCTION NOISE AND VIBRATION

4.1 Construction Noise Methodology

Construction noise represents a short-term impact on the ambient noise levels. Noise generated by construction equipment includes haul trucks, water trucks, graders, dozers, loaders and scrapers can reach relatively high levels. Grading activities typically represent one of the highest potential sources for noise impacts. The most effective method of controlling construction noise is through local control of construction hours and by limiting the hours of construction to normal weekday working hours.

The U.S. Environmental Protection Agency (U.S. EPA) has compiled data regarding the noise generating characteristics of specific types of construction equipment. Noise levels generated by heavy construction equipment can range from 60 dBA to in excess of 100 dBA when measured at 50 feet. However, these noise levels diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 75 dBA measured at 50 feet from the noise source to the receptor would be reduced to 69 dBA at 100 feet from the source to the receptor and reduced to 63 dBA at 200 feet from the source. Additionally, sound levels are logarithmic not linear, so adding two sources of 68 dBA plus 68 dBA is equal to 71 dBA not 136 dBA.

Using a point-source noise prediction methodology, calculations of the expected construction noise impacts were completed using the equation below. The essential model input data for these performance equations include the source levels of each type of equipment, relative source to receiver horizontal and vertical separations, the amount of time the equipment is operating in a given day, also referred to as the duty-cycle and any transmission loss from topography or barriers.

$$L = 10 * Log\left(\sum_{i=1}^{n} 10^{\left(\frac{L_i}{10}\right)}\right)$$

For the grading phase, the equipment needed for the development will consist of a medium sized crawler type excavator, a small to medium sized road grader, a large rubber tired bulldozer, and two tractors/loaders/backhoes. Based on the EPA noise emissions, empirical data and the amount of equipment needed, worst case noise levels from the construction equipment for site preparation would occur during the grading operations.

4.2 Findings and Mitigation for Grading Activities

The grading activities will consist of the preparation of internal roadways, parking and the finished pads. The site has been previously mass graded and the existing grades are already at or near the proposed final grades, therefore, grading would be limited to precise grading activities. The

equipment will be spread out over the project site from distances near the occupied property lines to distances of 100 feet or more away. The nearest sensitive receptors are the existing residential land uses to the east. The list of equipment and the associated noise levels utilized in this analysis are shown in Table 4-1. The grading equipment will be spread out over the project site from distances near the occupied property lines to distances of 200 feet or more away. Based upon the site plan, on average, the grading operations will occur 100 feet from the property lines. This means that the average distance from all the equipment to the nearest property line is 100 feet. As can be seen in Table 4-1, at an average distance of 100 feet from the construction activities to the nearest property line would result in a noise attenuation of -6.0 dBA without shielding. Additionally, the amount of time equipment is operating during a normal work day, referred to as duty-cycle, was assumed to be 8 hours.

Table 4-1: Grading Construction Noise Levels

Construction Equipment	Quantity	Source Level @ 50-Feet (dBA Leq)[1]	Duty Cycle (Hours/Day)	Cumulative Noise Level @ 50-Feet (dBA Leq-8)
Rubber Tire Dozer	1	74	8	74.0
Excavator	1	72	8	72.0
Grader	1	73	8	73.0
Tractors/Loaders/Backhoes	2	72	8	75.0
			Cumulative Levels @ 50 Feet	79.7
			Average Distance to Property Line (Feet)	100
			Noise Reduction Due to Distance	-6.0
			NEAREST PROPERTY LINE NOISE LEVEL	**73.7**

[1] Source: Empirical Data

Given this, the noise levels will comply with the 75 dBA Leq exterior noise standard over 8 hours at the property lines. Additionally, Project construction noise levels are considered exempt if activities occur within the hours specified in the City of Corona Municipal Code, Section 17.84.040 of 7:00 a.m. and 8:00 p.m. Monday through Saturday and 10:00 a.m. 6:00 p.m. on Sundays and federal holidays. At the time of this analysis, no Project construction activity is planned outside of the specified hours. Therefore, no impacts are anticipated and no mitigation is required during construction of the proposed Project. Additionally, all equipment should be properly fitted with mufflers and all staging and maintenance should be conducted as far away from the existing residences as possible.

4.3 Findings and Mitigation for Construction Vibration

The nearest vibration-sensitive uses are the residences located to the west of the project site, 50 feet or more from the proposed construction. Table 4-2 lists the average vibration levels that would be experienced at the nearest vibration sensitive land uses to the east from temporary construction activities. Loaded trucks will be traveling along the western portion of the site and were assessed at a minimum distance of 50 feet from to be conservative.

The FTA has determined vibration levels that would cause annoyance to a substantial number of people and potential damage to building structures. The FTA criterion for vibration induced structural damage is 0.20 in/sec for the peak particle velocity (PPV). Project construction activities would result in PPV levels below the FTA's criteria for vibration induced structural damage. Therefore, Project construction activities would not result in vibration induced structural damage to residential buildings near the construction areas. The FTA criterion for infrequent vibration induced annoyance is 80 Vibration Velocity (VdB) for residential uses. Construction activities would generate levels of vibration that would not exceed the FTA criteria for nuisance for nearby residential uses. Therefore, vibration impacts would be less than significant.

Table 4-2: Vibration Levels from Construction Activities (Residential Receptors)

Equipment	Approximate Velocity Level at 25 Feet (VdB)	Approximate RMS Velocity at 25 Feet (in/sec)	Approximate Velocity Level at 50 Feet (VdB)[1]	Approximate RMS Velocity at 50 Feet (in/sec)[2]
Small bulldozer	58	0.003	46.0	0.0011
Jackhammer	79	0.035	67.0	0.0124
Loaded trucks	86	0.076	74.0	0.0269
Large bulldozer	87	0.089	75.0	0.0315
		FTA Criteria	80	0.2
		Significant Impact?	**No**	**No**

[1] VdB = VdB(25 feet) – 30log(d/25) provided by the FTA
[2] PPV at Distance D = PPVref x $(25/D)^{1.5}$ provided by the FTA

5.0 TRANSPORTATION NOISE

5.1 Existing Noise Environment Onsite

Noise measurements were taken using a Larson-Davis Model LxT Type 1 precision sound level meter, programmed, in "slow" mode, to record noise levels in "A" weighted form. The sound level meter and microphone were mounted on a tripod, five feet above the ground and equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200.

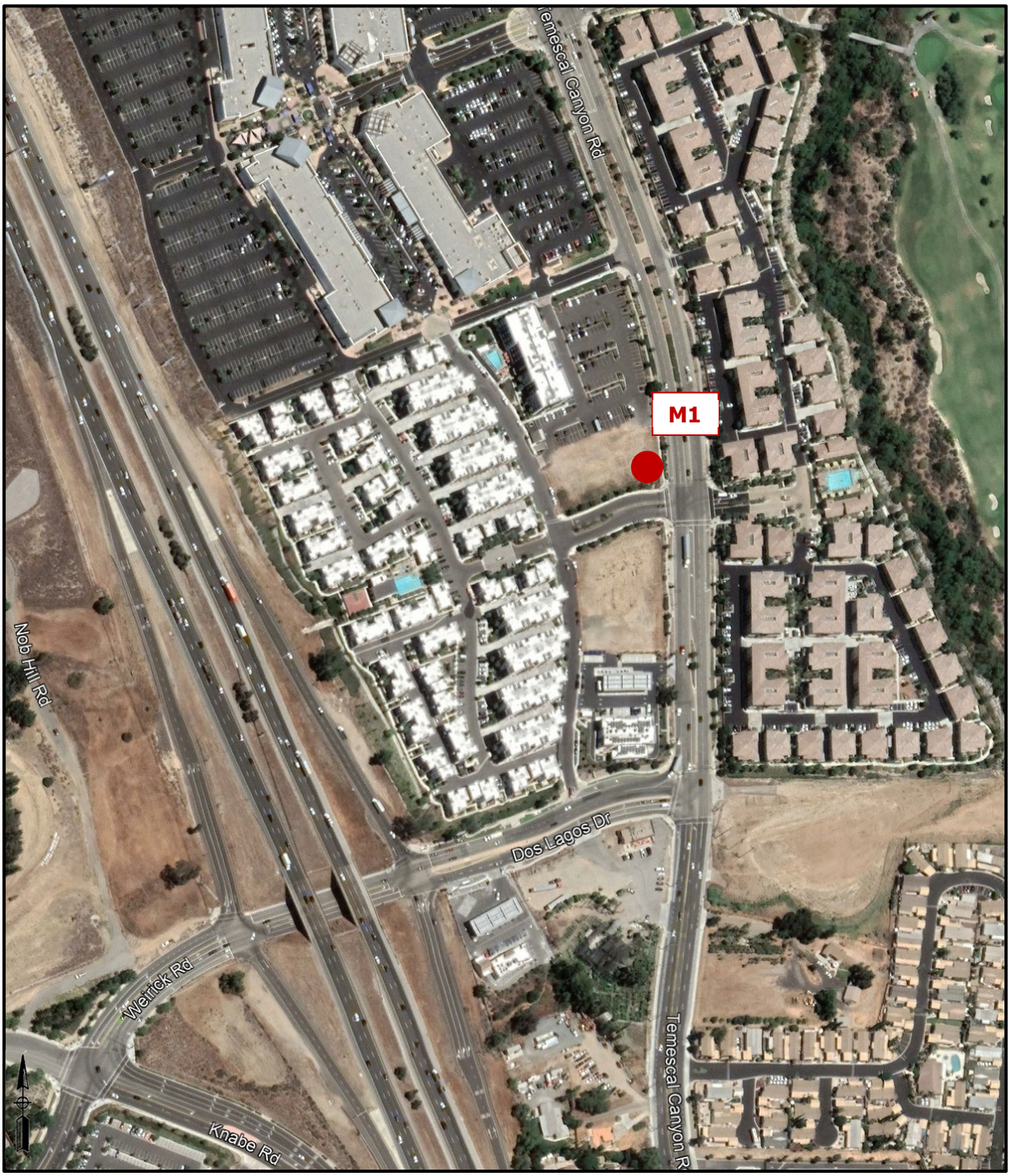
Monitoring location 1 (ML1) was located at the eastern portion of the project site. The results of the noise level measurement are presented in Table 5-1.

The noise measurement was monitored for a time period of 15 minutes during typical traffic conditions. The existing noise levels in the project area consisted primarily of traffic from Temescal Canyon Road. The ambient Leq noise levels measured in the area of the Project during the afternoon hours was found to be 59.8 dBA. The statistical indicators Lmax, Lmin, L10, L50 and L90, are given for the monitoring location. As can be seen from the L90 data, 90% of the time the noise level is approximately 54 dBA from Temescal Canyon Road. The noise monitoring locations are provided graphically in Figure 5-A.

Table 5-1: Measured Ambient Noise Levels

Measurement Identification	Description	Time	Noise Levels (dBA)					
			Leq_{15}	Lmax	Lmin	L10	L50	L90
M1	Temescal Canyon Road	11:00 – 11:15 a.m.	59.8	66.7	51.2	63.1	58.2	54.0
Source: Ldn Consulting November 29, 2022								

Figure 5-A: Ambient Monitoring Locations



5.2 Future Onsite Noise Prediction

To determine the future noise environment and impact potentials the Caltrans Sound32 noise model was utilized. The critical model input parameters, which determine the projected vehicular traffic noise levels, include vehicle travel speeds, the percentages of automobiles, medium trucks and heavy trucks in the roadway volume, the site conditions (hard or soft) and the peak hour traffic volume. The peak hour traffic volumes along most roadways range between 6-10% of the average daily traffic (ADT). The capacity in a single freeway lane is 1,950 vehicles per hour due to shortened headways between vehicles (Source: Caltrans). Thus, peak hour traffic values along Interstate 15 were calculated using a worst-case scenario capacity of 1,950 vehicles per hour per lane operating at a Level of Service C.

Table 5-2 presents the roadway parameters used in the analysis. The vehicle mix provides the hourly distribution percentages of automobile, medium trucks and heavy trucks. A traffic mix of 94.39/1.95/3.66 was utilized for Interstate 15 based on Caltrans Annual Average Truck Trip volumes. The Buildout peak hour traffic volume forecasts along Dos Lagos Drive and Temescal Canyon Road were provided in the Terrano at Dos Lagos Traffic Impact Analysis Report by LLG, 2015. The peak hour traffic volumes range between 6-12% of the average daily traffic (ADT). Per the Caltrans Technical Noise Supplement (November, 2009), 10 percent of the average daily traffic volumes were entered into the noise model to provide a CNEL-equivalent noise output.

The required coordinate information necessary for the Sound32 traffic noise prediction model input was taken from the conceptual site plans provided by Summa Architecture, January 2023. To determine the future noise levels, the site plans were used to identify the pad elevations, the roadway elevations and the relationship between the noise source(s) and the receptors. To evaluate the future potential noise impacts on the proposed development, outdoor observers were located in the outdoor areas and modeled observers were placed five feet above the finished pad elevation. The modeled observer locations for the most affected units are presented in Figure 5-B.

Table 5-2 on the following page describes the roadway parameters used in the analysis including the peak traffic volumes, vehicle speeds and the hourly traffic flow distribution (vehicle mix) for the future Buildout conditions. The vehicle mix provides the hourly percentages of automobile, medium trucks and heavy trucks for input into the model.

Figure 5-B: Modeled Receptor Locations

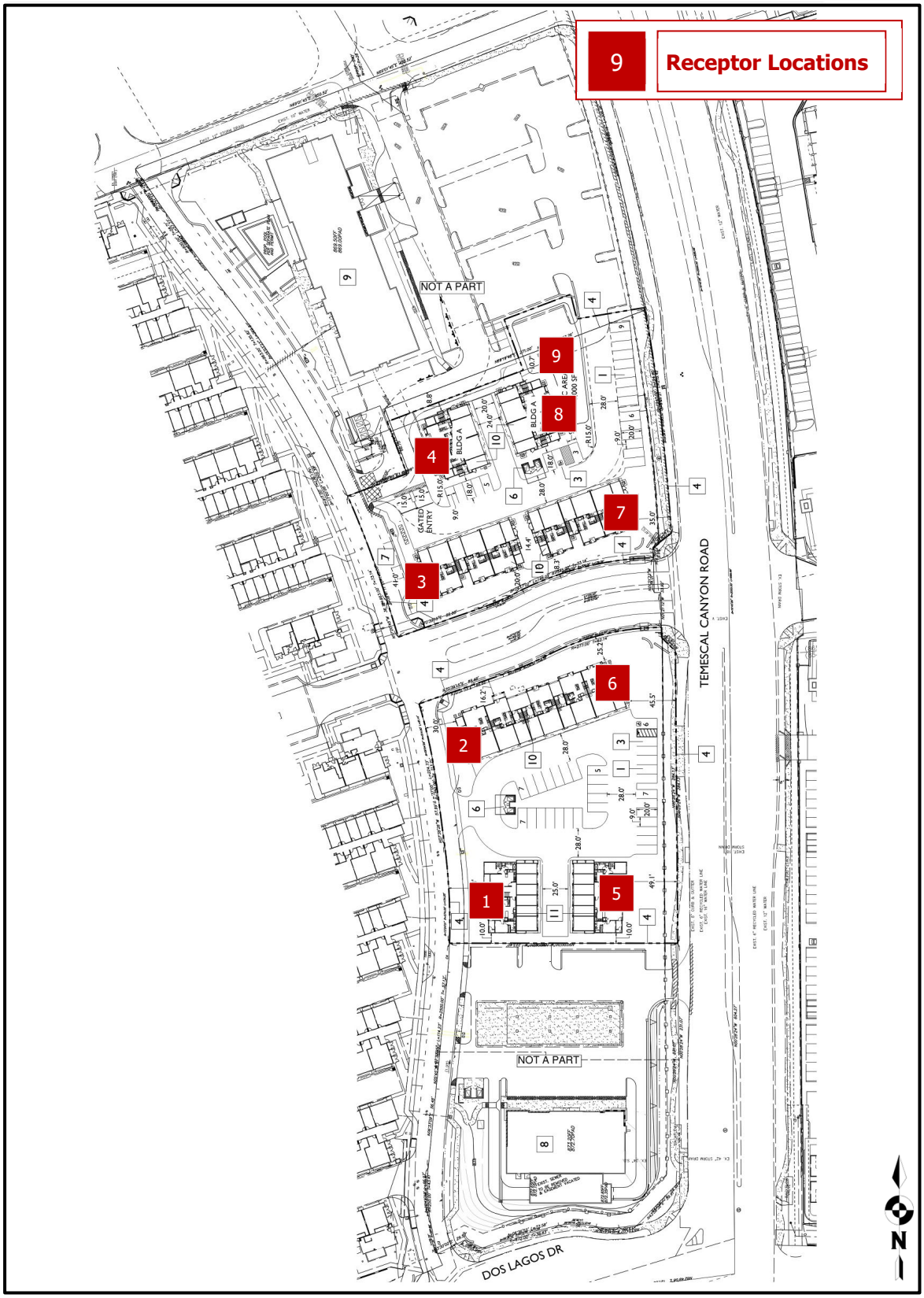


Table 5-2: Future Traffic Parameters

Roadway	Future Peak Hour Traffic (ADT)	Modeled Speeds (MPH)	Vehicle Mix % [2]		
			Auto	Medium Trucks	Heavy Trucks
Interstate 15	15,600	65	94.39	1.95	3.66
Temescal Canyon Road	2,315[1]	45	97.42	1.84	0.74
Dos Lagos Drive	1,238[1]	35	97.42	1.84	0.74

[1] Source: Terrano at Dos Lagos Traffic Study, LLG 2015

[2] Typical Vehicle Mixed observed in Southern California was used for local roadways.

Outdoor usable space is provided by the common recreational area located in the northeast portion of the project site and by the private patios and balconies at the units. The proposed patios and balconies will be partially shielded from the roadways by the proposed building facades. Typically, three decibels of attenuation is allowed for the first row of buildings when they block 40 to 65% of the line of sight to the noise source, and three to five decibels of attenuation is allowed when the buildings obstruct more than 65% of the line of sight (Source: CALTRANS Technical Noise Supplement Section N-5515). Based on the architectural plans, the proposed patios and balconies will be tucked into the building and will be shielded on one or both sides by the proposed building facades, therefore a factor of 5 dBA was taken into account.

5.3 Exterior Noise Findings and Mitigation

The modeling results for the Buildout analysis are quantitatively shown in Table 5-3. The line of sight at the patios and balconies will be blocked by the proposed building facades, therefore a factor of 5 dBA was taken into account. Therefore, the outdoor use areas were found to comply with the City of Corona's Noise Standard of 65 dBA CNEL without mitigation. The modeling inputs and outputs are provided as ***Attachment A***.

5.4 Interior Noise Levels

The City requires for residential developments an interior noise limit of 45 dBA CNEL for all residential uses. Based on numerous studies and efficiency standards in current residential Title 24 standards, residential structures provide 15 decibels of reduction with the windows open to the indoor uses and 25 decibels of reduction with the windows closed. This assumes a minimum sound transmission rating (STC) of 28 on the glass assemblies, which is a standard assembly. To maintain a 45 dBA noise level within the residential structures, the building façade noise should be 70 dBA or less. It should be noted: if better/higher STC rated glass assemblies are installed the noise levels would be reduced more than 25 decibels. Therefore, this is a conservative approach.

Table 5-3: Future Exterior Noise Levels

Receptor Number	First Floor Noise Levels (dBA CNEL)	Second Floor Noise Level (dBA CNEL)	Third Floor Noise Level (dBA CNEL)
1	62	65	65
2	61	64	65
3	61	63	64
4	61	63	64
5	66	69	69
6	66	69	69
7	67	69	69
8	64	67	67
Recreation Area	64	--	--
*Noise levels at the proposed patios/balconies will be reduced 5 dBA due to shielding from the building			

5.5 Project Related Offsite Transportation Noise

To determine if direct or cumulative off-site noise level increases associated with the development of the proposed project would create noise impacts. The traffic volumes for the existing conditions were compared with the traffic volume increase of existing plus the proposed project. According to the Project traffic study (Linscott Law & Greenspan, 2023), the project is estimated to only generate 337 daily trips with a peak hour volume of 26 trips. The existing average daily traffic (ADT) volumes on the area roadways are more than several thousand ADT. Typically it requires a project to double (or add 100%) the traffic volumes to have a direct impact of 3 dBA CNEL or be a major contributor to the cumulative traffic volumes. The project will add less than a 5% increase to the exiting roadway volumes and no direct or cumulative impacts are anticipated.

6.0 REFERENCES

Caltrans. (2006). *Technical Noise Supplement Section N-5515.* Retrieved from https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tcvgm-apr2020-a11y.pdf

Federal Transit Administration. (2018). *Transit Noise and Vibration Impact Assessment Manual.*

FHWA. (1978). *Highway Traffic Noise Prediction Model.* FHWA-RD-77-108.

Linscott Law & Greenspan. (2023). *Traffic Circulation Assessment for the Proposed Terrano II Apartments at Dos Lagos Project.* Retrieved from https://www.jurupavalley.org/DocumentCenter/View/1979/Appendix-N_Noise-Impact-Analysis?bidId=

ATTACHMENT A

DETAILED FUTURE NOISE MODEL INPUT AND OUTPUT FILES

TERRANO II GROUND LEVEL UNMITIGATED
T-PEAK HOUR TRAFFIC CONDITIONS, 1
5522 , 65 , 114 , 65 , 214 , 65
T-PEAK HOUR TRAFFIC CONDITIONS, 2
5522 , 65 , 114 , 65 , 214 , 65
T-PEAK HOUR TRAFFIC CONDITIONS, 3
2255 , 45 , 43 , 45 , 17 , 45
T-PEAK HOUR TRAFFIC CONDITIONS, 4
1206 , 35 , 23 , 35 , 9 , 35
T-PEAK HOUR TRAFFIC CONDITIONS, 5
1020 , 45 , 19 , 45 , 8 , 45
L-I-15 NB, 1
N,441,1342,930,
N,751,1476,931,
N,1907,1977,928,
N,2227,2116,927,
L-I-15 SB, 2
N,395,1448,930,
N,714,1586,931,
N,1862,2081,928,
N,2183,2220,927,
L-TEMESCAL CANYON, 3
N,654,675,870,
N,1003,677,869,
N,1627,682,866,
N,1849,695,867,
N,2104,742,868,
N,2343,817,869,
L-DOS LAGOS, 4
N,682,1680,913,
N,801,1328,900,
N,852,1179,895,
N,894,1071,889,
N,947,960,882,
N,978,857,874,
N,1003,677,868,
L-ON-RAMP, 5
N,801,1328,900,
N,1395.,1659,919,
N,1578.,1761,923,
N,1918.,1951,928,
B-FREEWAY TS-1, 1 , 2 , 0 ,0
449.,1323,930,930,
757.,1457,931,931,
B-FREEWAY TS-2, 2 , 2 , 0 ,0
759.,1458,931,931,
1915.,1958,928,928,
B-SITE TS WEST, 3 , 2 , 0 ,0
1102.,1432,910,910,
1251.,1522,913,913,
1257.,1568,913,913,
1410.,1653,919,919,
1588.,1751,923,923,
1639.,1709,923,923,
1752.,1777,927,927,
1954.,1881,928,928,
2270.,2025,927,927,
B-SITE TS EAST, 4 , 2 , 0 ,0
1063.,955,879,879,

1027.,935,879,879,
1032.,908,877,877,
1051.,832,873,873,
1049.,779,871,871,
1080.,735,869,869,
1622.,736,866,866,
1841.,750,867,867,
2086.,797,868,868,
2326.,876,869,869,
B-DL TS WEST, 5 , 1 , 0 ,0
1102.,1432,910,910,
958.,1354,901,901,
895.,1287,899,899,
931.,1170,893,893,
1009.,983,882,882,
1069.,995,881,881,
R, 1 , 65 ,10
1370,918,878.,
R, 2 , 65 ,10
1547,953,878.,
R, 3 , 65 ,10
1685,982,878.,
R, 4 , 65 ,10
1793,975,878.,
R, 5 , 65 ,10
1370,787,878.,
R, 6 , 65 ,10
1575,788,878.,
R, 7 , 65 ,10
1727,781,878.,
R, 8 , 65 ,10
1826,841,878.,
R, 9 , 65 ,10
1878,846,878.,REC
D, 4.5
1 ,ALL
D, 4.5
2 ,ALL
D, 4.5
3 ,ALL
D, 4.5
4 ,ALL
D, 4.5
5 ,ALL
K,-5
1 ,ALL
K,-5
2 ,ALL
K,-5
4 ,ALL
K,-5
5 ,ALL
C,C

SOUND32 - RELEASE 07/30/91

TITLE:
TERRANO II GROUND LEVEL UNMITIGATED

REC	REC ID	DNL	PEOPLE	LEQ(CAL)
1	R-1	65.	10.	61.8
2	R-2	65.	10.	61.3
3	R-3	65.	10.	60.9
4	R-4	65.	10.	60.8
5	R-5	65.	10.	66.3
6	R-6	65.	10.	66.3
7	R-7	65.	10.	67.1
8	R-8	65.	10.	64.4
9	REC	65.	10.	64.4

TERRANO II SECOND LEVEL UNMITIGATED
T-PEAK HOUR TRAFFIC CONDITIONS, 1
5522 , 65 , 114 , 65 , 214 , 65
T-PEAK HOUR TRAFFIC CONDITIONS, 2
5522 , 65 , 114 , 65 , 214 , 65
T-PEAK HOUR TRAFFIC CONDITIONS, 3
2255 , 45 , 43 , 45 , 17 , 45
T-PEAK HOUR TRAFFIC CONDITIONS, 4
1206 , 35 , 23 , 35 , 9 , 35
T-PEAK HOUR TRAFFIC CONDITIONS, 5
1020 , 45 , 19 , 45 , 8 , 45
L-I-15 NB, 1
N,441,1342,930,
N,751,1476,931,
N,1907,1977,928,
N,2227,2116,927,
L-I-15 SB, 2
N,395,1448,930,
N,714,1586,931,
N,1862,2081,928,
N,2183,2220,927,
L-TEMESCAL CANYON, 3
N,654,675,870,
N,1003,677,869,
N,1627,682,866,
N,1849,695,867,
N,2104,742,868,
N,2343,817,869,
L-DOS LAGOS, 4
N,682,1680,913,
N,801,1328,900,
N,852,1179,895,
N,894,1071,889,
N,947,960,882,
N,978,857,874,
N,1003,677,868,
L-ON-RAMP, 5
N,801,1328,900,
N,1395.,1659,919,
N,1578.,1761,923,
N,1918.,1951,928,
B-FREEWAY TS-1, 1 , 2 , 0 ,0
449.,1323,930,930,
757.,1457,931,931,
B-FREEWAY TS-2, 2 , 2 , 0 ,0
759.,1458,931,931,
1915.,1958,928,928,
B-SITE TS WEST, 3 , 2 , 0 ,0
1102.,1432,910,910,
1251.,1522,913,913,
1257.,1568,913,913,
1410.,1653,919,919,
1588.,1751,923,923,
1639.,1709,923,923,
1752.,1777,927,927,
1954.,1881,928,928,
2270.,2025,927,927,
B-SITE TS EAST, 4 , 2 , 0 ,0
1063.,955,879,879,

1027.,935,879,879,
1032.,908,877,877,
1051.,832,873,873,
1049.,779,871,871,
1080.,735,869,869,
1622.,736,866,866,
1841.,750,867,867,
2086.,797,868,868,
2326.,876,869,869,
B-DL TS WEST, 5 , 1 , 0 ,0
1102.,1432,910,910,
958.,1354,901,901,
895.,1287,899,899,
931.,1170,893,893,
1009.,983,882,882,
1069.,995,881,881,
R, 1 , 65 ,10
1370,918,888.,
R, 2 , 65 ,10
1547,953,888.,
R, 3 , 65 ,10
1685,982,888.,
R, 4 , 65 ,10
1793,975,888.,
R, 5 , 65 ,10
1370,787,888.,
R, 6 , 65 ,10
1575,788,888.,
R, 7 , 65 ,10
1727,781,888.,
R, 8 , 65 ,10
1826,841,888.,
D, 4.5
1 ,ALL
D, 4.5
2 ,ALL
D, 4.5
4 ,ALL
D, 4.5
5 ,ALL
K,-5
1 ,ALL
K,-5
2 ,ALL
K,-5
4 ,ALL
K,-5
5 ,ALL
C,C

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TITLE:
TERRANO II SECOND LEVEL UNMITIGATED

REC	REC ID	DNL	PEOPLE	LEQ(CAL)
1	R-1	65.	10.	64.9
2	R-2	65.	10.	63.5
3	R-3	65.	10.	62.8
4	R-4	65.	10.	63.1
5	R-5	65.	10.	68.6
6	R-6	65.	10.	68.6
7	R-7	65.	10.	69.2
8	R-8	65.	10.	67.2

TERRANO II THIRD LEVEL UNMITIGATED
T-PEAK HOUR TRAFFIC CONDITIONS, 1
5522 , 65 , 114 , 65 , 214 , 65
T-PEAK HOUR TRAFFIC CONDITIONS, 2
5522 , 65 , 114 , 65 , 214 , 65
T-PEAK HOUR TRAFFIC CONDITIONS, 3
2255 , 45 , 43 , 45 , 17 , 45
T-PEAK HOUR TRAFFIC CONDITIONS, 4
1206 , 35 , 23 , 35 , 9 , 35
T-PEAK HOUR TRAFFIC CONDITIONS, 5
1020 , 45 , 19 , 45 , 8 , 45
L-I-15 NB, 1
N,441,1342,930,
N,751,1476,931,
N,1907,1977,928,
N,2227,2116,927,
L-I-15 SB, 2
N,395,1448,930,
N,714,1586,931,
N,1862,2081,928,
N,2183,2220,927,
L-TEMESCAL CANYON, 3
N,654,675,870,
N,1003,677,869,
N,1627,682,866,
N,1849,695,867,
N,2104,742,868,
N,2343,817,869,
L-DOS LAGOS, 4
N,682,1680,913,
N,801,1328,900,
N,852,1179,895,
N,894,1071,889,
N,947,960,882,
N,978,857,874,
N,1003,677,868,
L-ON-RAMP, 5
N,801,1328,900,
N,1395.,1659,919,
N,1578.,1761,923,
N,1918.,1951,928,
B-FREEWAY TS-1, 1 , 2 , 0 ,0
449.,1323,930,930,
757.,1457,931,931,
B-FREEWAY TS-2, 2 , 2 , 0 ,0
759.,1458,931,931,
1915.,1958,928,928,
B-SITE TS WEST, 3 , 2 , 0 ,0
1102.,1432,910,910,
1251.,1522,913,913,
1257.,1568,913,913,
1410.,1653,919,919,
1588.,1751,923,923,
1639.,1709,923,923,
1752.,1777,927,927,
1954.,1881,928,928,
2270.,2025,927,927,
B-SITE TS EAST, 4 , 2 , 0 ,0
1063.,955,879,879,

1027.,935,879,879,
1032.,908,877,877,
1051.,832,873,873,
1049.,779,871,871,
1080.,735,869,869,
1622.,736,866,866,
1841.,750,867,867,
2086.,797,868,868,
2326.,876,869,869,
B-DL TS WEST, 5 , 1 , 0 ,0
1102.,1432,910,910,
958.,1354,901,901,
895.,1287,899,899,
931.,1170,893,893,
1009.,983,882,882,
1069.,995,881,881,
R, 1 , 65 ,10
1370,918,898.,
R, 2 , 65 ,10
1547,953,898.,
R, 3 , 65 ,10
1685,982,898.,
R, 4 , 65 ,10
1793,975,898.,
R, 5 , 65 ,10
1370,787,898.,
R, 6 , 65 ,10
1575,788,898.,
R, 7 , 65 ,10
1727,781,898.,
R, 8 , 65 ,10
1826,841,898.,
D, 4.5
1 ,ALL
D, 4.5
2 ,ALL
D, 4.5
4 ,ALL
D, 4.5
5 ,ALL
K,-5
1 ,ALL
K,-5
2 ,ALL
K,-5
4 ,ALL
K,-5
5 ,ALL
C,C

SOUND32 - RELEASE 07/30/91

TITLE:
TERRANO II THIRD LEVEL UNMITIGATED

REC	REC ID	DNL	PEOPLE	LEQ(CAL)
1	R-1	65.	10.	65.2
2	R-2	65.	10.	64.6
3	R-3	65.	10.	64.1
4	R-4	65.	10.	64.3
5	R-5	65.	10.	68.5
6	R-6	65.	10.	68.5
7	R-7	65.	10.	69.0
8	R-8	65.	10.	67.2