NOISE STUDY

FOR THE

PACIFIC BMW DEALERSHIP EXPANSION

901 – 919 South Brand Boulevard
(Also 112 – 118 West Garfield Avenue & 119 West Acacia Avenue)

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EXECUTIVE SUMMARY

This Noise Study provides the City of Glendale (City) with an expanded evaluation of potential construction and operational noise impacts associated with the Pacific BMW Dealership Expansion Project from the analysis provided in Mitigated Negative Declaration (MND) prepared in August 2021.

The Applicant is proposing to construct a new 5-story, 171,140 square-foot above-ground parking structure with rooftop parking on an existing 81,148 square-foot Project site located in the CA-Commercial Auto Zone.

In accordance with requirements under the California Environmental Quality Act (CEQA), this Noise Study estimates future noise and vibration levels at surrounding land uses resulting from construction and operation of the Project. The report includes the categories and types of noise and vibration sources resulting from the Project, the calculation procedures used in the analysis, and any assumptions or limitations.

This report summarizes the potential for the Project to generate a substantial temporary or permanent increase in ambient noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies; generate excessive groundborne vibration or groundborne noise levels; or expose people residing or working in the project area to excessive noise levels. The findings of the analyses are summarized at a high-level as follows, with additional discussion in the body of the analysis:

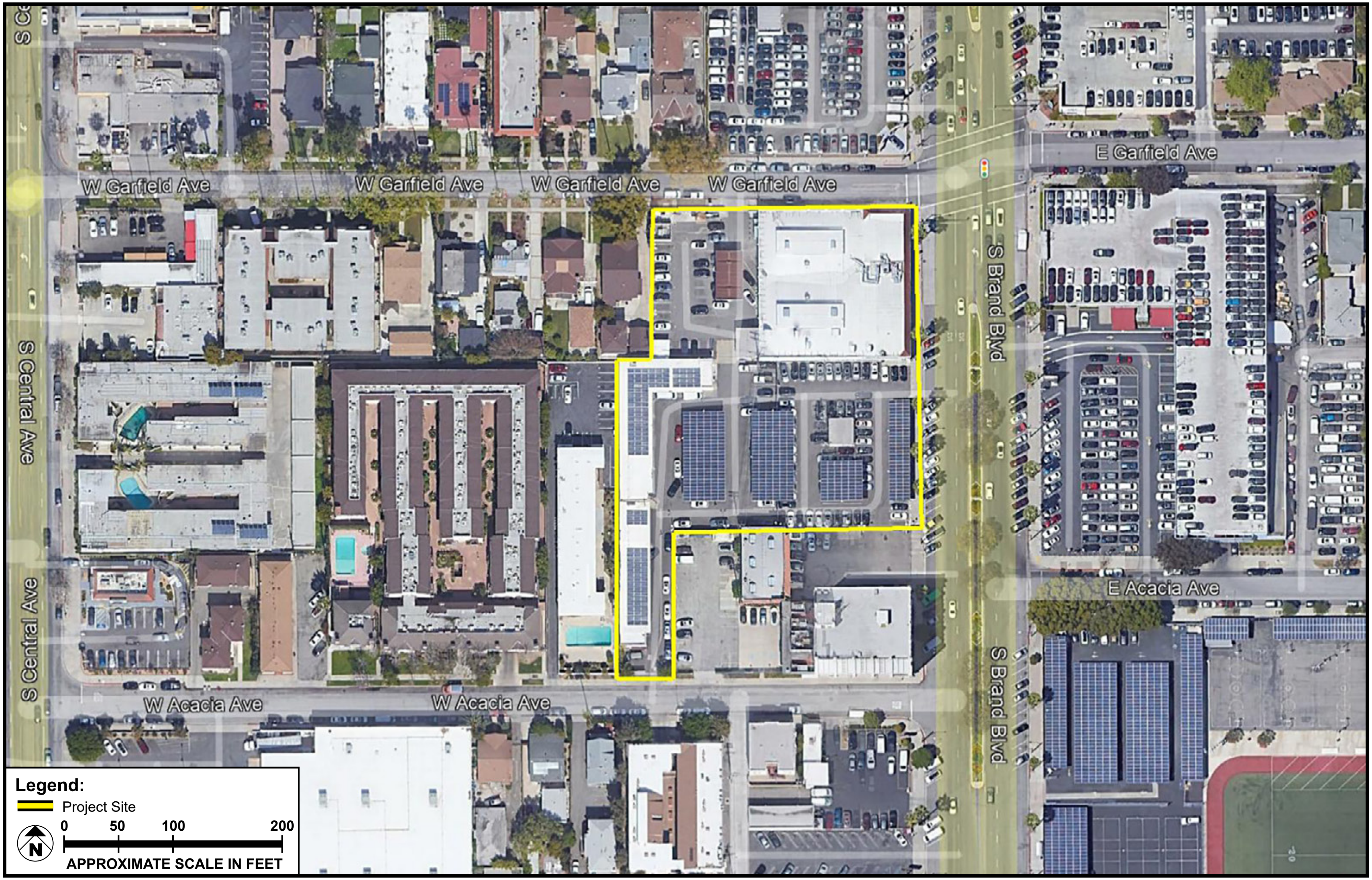
- **Construction Noise**: The City's MND determined that the Project would result in less than significant impacts and would adhere to Chapter 8.36 of the Glendale Municipal Code (GMC) which prohibits construction activities between the hours of 7:00 PM on one date and 7:00 AM of the next day or from 7:00 PM on Saturday to 7:00 AM on Monday or from 7:00 PM preceding a holiday. This analysis assesses whether any new significant construction impacts would occur with up-to-date assumptions. The construction schedule would be shifted approximately 4 months however the duration and activities would be similar to that described in the City's MND. The Project would include demolition of an at-grade asphalt parking lot and the existing accessory building, totaling to removal of approximately 34,661 square feet of material. Additionally, excavation activities would include approximately 1,750 cubic yards of export. This analysis concludes construction of the new parking structure would not result in significant noise impacts and would be below the significance threshold.
- **Construction Vibration**: The City's MND determined that the Project would result in less than significant impacts. This analysis provides an assessment related to human perception from construction equipment. Vibration source levels were taken from the Federal Transit Authority (FTA) Transit Noise and Vibration Impact Assessment Manual. This analysis concludes construction of the new parking structure would adhere to Section 8.36.210 of the GMC and would not result in significant vibration impacts.

PROJECT DESCRIPTION

The Project site is located at 901 – 919 South Brand Boulevard (also 112-118 West Garfield Avenue & 119 West Acacia Avenue), consists of six lots, and is irregularly shaped with frontage on South Brand Boulevard, West Acacia Avenue, and West Garfield Avenue, as shown in **Figure 1: Local Vicinity Map**. There are currently three detached commercial buildings on the Project site: a one-story, 18,367 square-foot building originally constructed in 1924 (901 South Brand Boulevard), a one-story 9,192 square-foot building originally constructed in 1964 (915 South Brand Boulevard), and the one-story 561 square-foot accessory building that was relocated to the site in 1964 (919 South Brand Boulevard).

The Applicant is proposing to construct a new 5-story, 171,140 square-foot above-ground parking structure with rooftop parking on an existing 81,148 square-foot Project site located in the CA-Commercial Auto Zone, as shown in **Figure 2: Site Plan**. The proposed Project involves the demolition of the existing surface parking lot, an existing 561 square-foot accessory building (relocated to the site in 1964) and removal of existing solar panel structure that will be relocated to the rooftop of the new structure. The new parking structure will feature 450 parking spaces and is proposed for vehicle inventory for the Pacific BMW Car Dealership.

Surrounding land uses include a vehicle dealership (Nissan) and multi-family residential development to the north, storage facility, vehicle rental (Hertz) and multi-family residential development to the south, vehicle dealership (Chrysler/Dodge/Jeep/Ram) to the east and multi-family residential development to the west.



SOURCE: Google Earth - 2022

FIGURE 1

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Local Vicinity Map

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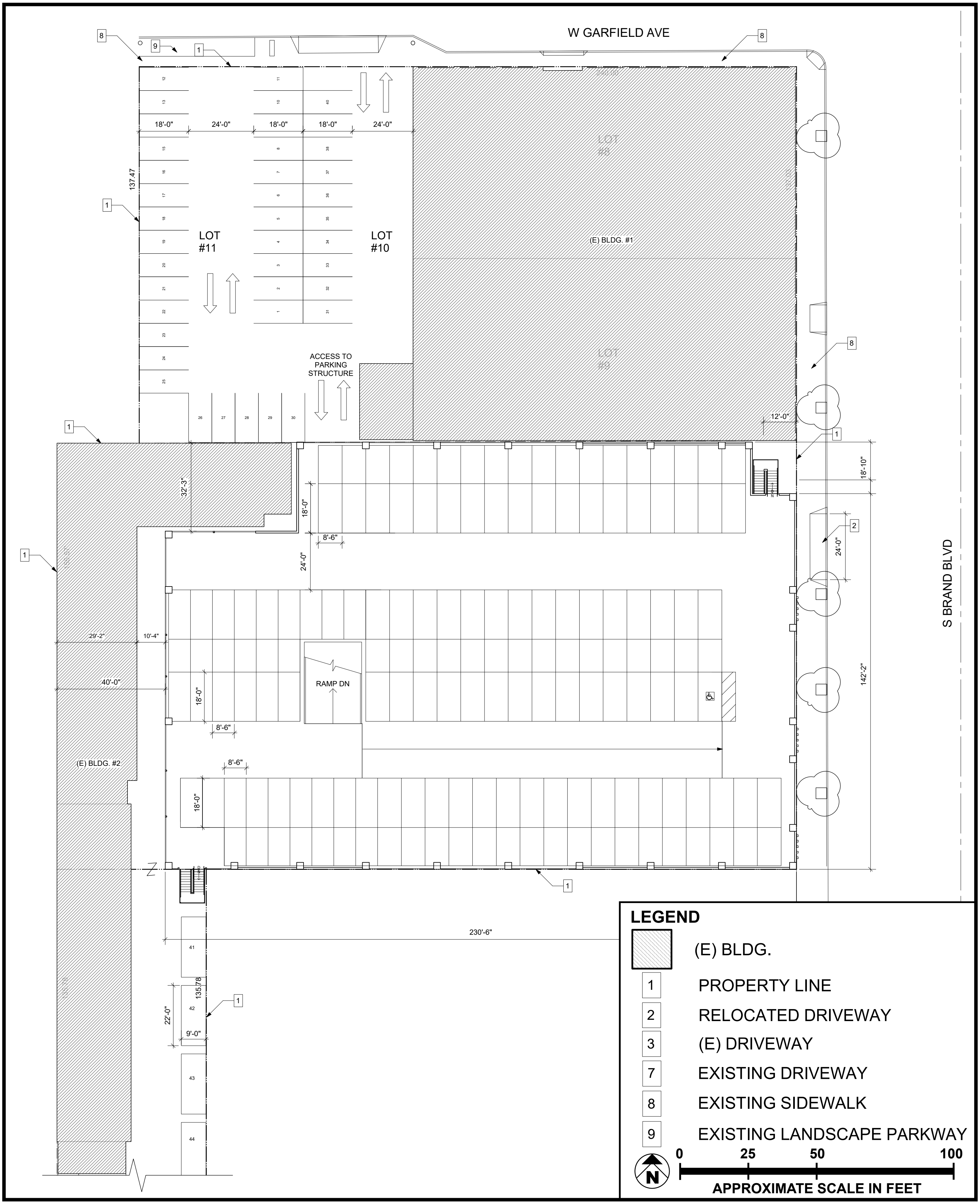

SOURCE: FLEX Design Group - 5-3-2021

FIGURE **2**

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Site Map

BACKGROUND INFORMATION REGARDING NOISE AND VIBRATION

Noise Descriptors

Noise levels are measured using a variety of scientific metrics. As a result of extensive research into the characteristics of noise and human response, standard noise descriptors have been developed for noise exposure analyses. All noise levels provided in this Noise Report are for outdoor conditions, unless otherwise stated specifically to be interior noise levels.

A-Weighted Sound Pressure Level (dBA): The decibel (dB) is a unit used to describe sound pressure level. When expressed in dBA, the sound has been filtered to reduce the effect of very low and very high frequency sounds, much as the human ear filters sound frequencies. Without this filtering, calculated and measured sound levels would include events that the human ear cannot hear (e.g., dog whistles and low-frequency sounds, such as the groaning sounds emanating from large buildings with changes in temperature and wind). With A-weighting, calculations and sound-monitoring equipment approximate the sensitivity of the human ear to sounds of different frequencies.

Maximum Noise Level (Lmax): Lmax is the maximum or peak sound level during a noise event. The metric accounts only for the instantaneous peak intensity of the sound, and not for the duration of the event. As a vehicle passes by an observer, the sound level increases to a maximum level and then decreases. Some sound level meters measure and record the maximum or Lmax level.

Sound Exposure Level (SEL): SEL, expressed in dBA, is a time-integrated measure, expressed in decibels, of the sound energy of a single noise event at a reference duration of 1 second. The sound level is integrated over the period that the level exceeds a threshold. Therefore, SEL accounts for both the maximum sound level and the duration of the sound. The standardization of discrete noise events into a 1-second duration allows calculation of the cumulative noise exposure of a series of noise events that occur over a period of time.

Equivalent Continuous Noise Level (Leq): Leq is the sound level, expressed in dBA, of a steady sound that has the same A-weighted sound energy as the time-varying sound over the averaging period. Unlike SEL, Leq is the average sound level for a specified time period (e.g., 24 hours, 8 hours, 1 hour). Leq is calculated by integrating the sound energy from all noise events over a given time period and applying a factor for the number of events. Leq can be expressed for any time interval; for example, the Leq representing an averaged level over an 8-hour period would be expressed as Leq(8).

Community Noise Equivalent Level (CNEL): CNEL, expressed in dBA, is a rating of community noise exposure to all sources of sound that differentiates between daytime (7:00 AM to 7:00 PM), evening (7:00 PM to 10:00 PM), and nighttime (10:00 PM to 7:00 AM) noise exposure. CNEL includes penalties applied to noise events occurring after 7:00 PM and before 7:00 AM, when noise is considered more intrusive. The penalized time period is further subdivided into an evening period with an addition of 5 dBA to measured or forecasted noise levels and a nighttime period with an addition of 10 dB to measured or forecasted noise levels. The evening weighting is the only difference between CNEL and day-night average sound level (DNL).

Effects of Noise on Humans

Human response to sound is highly individualized. Annoyance is the most common issue associated with community noise levels. Many factors influence the response to noise including the character of the noise, the variability of the sound level, the presence of tones or impulses, and the time of day of the occurrence. Additionally, nonacoustical factors, such as an individual's opinion of the noise source, the ability to adapt to the noise, the attitude towards the source and those associated with it, and the predictability of the noise, all influence the response to noise. These factors result in the reaction to noise being highly subjective, with the perceived effect of a particular noise varying widely among individuals in a community. The effects of noise can be grouped into three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction;
- Interference with activities such as speech, sleep, and learning; and
- Physiological effects such as starting hearing loss.

Noise-induced hearing loss usually takes years to develop. Hearing loss is one of the most obvious and easily quantifiable effects of excessive exposure to noise. While the loss may be temporary at first, it can become permanent after continued exposure. When combined with hearing loss associated with aging, the amount of hearing loss directly due to the environment is difficult to quantify. Although the major cause of noise induced hearing loss is occupational, nonoccupational sources may also be a factor.

Noise can mask important sounds and disrupt communication between individuals in a variety of settings. This process can cause anything from a slight irritation to a serious safety hazard, depending on the circumstance. Noise can disrupt face-to-face communication and telephone communication, and the enjoyment of music and television in the home. Interference with communication has proved to be one of the most important components of noise-related annoyance.

Noise-induced sleep interference is one of the critical components of community annoyance. Sound level, frequency distribution, duration, repetition, and variability can make it difficult to fall asleep and may cause momentary shifts in the natural sleep pattern or level of sleep. It can produce short-term effects, with the possibility of more serious effects on health if it continues over long periods.

Annoyance can be defined as the expression of negative feelings resulting from interference with activities, as well as the disruption of one's peace of mind and the enjoyment of one's environment. The consequences of noise-induced annoyance are privately held dissatisfaction, publicly expressed complaints to authorities, and potential adverse health effects, as discussed previously.

Some common sounds on the dBA scale, relative to ordinary conversation, are provided in **Table 1: Common Sounds on the A-Weighted Decibel Scale**. As shown, the relative perceived loudness of sound doubles for each increase of 10 dBA, although a 10 dBA change corresponds to a factor of 10 in relative sound energy. Generally, sounds with differences of 3 dBA or less are not perceived to be noticeably different by most listeners.

TABLE 1
COMMON SOUNDS ON THE A-WEIGHTED DECIBEL SCALE

Sound	Sound Level (dBA)	Noise Environments	Subjective Evaluations[1]
Near Jet Engine	140	Deafening	128 times as loud
Civil defense siren	130	Threshold of pain	64 times as loud
Hard rock band	120	Threshold of feeling	32 times as loud
Accelerating motorcycle a few feet away	110	Very Loud	16 times as loud
Pile driver; noisy urban street/heavy city traffic	100	Very Loud	8 times as loud
Ambulance siren; food blender	95	Very Loud	--
Garbage disposal	90	Very Loud	4 times as loud
Freight cars; living room music	85	Loud	--
Pneumatic drill; vacuum cleaner	80	Loud	2 times as loud
Busy restaurant	75	Moderately loud	--
Near freeway auto traffic	70	Moderately loud	Reference level
Average office	60	Quiet	½ as loud
Suburban street	55	Quiet	--
Light traffic; soft radio music in apartment	50	Quiet	¼ as loud
Large transformer	45	Quiet	--
Average residence without stereo playing	40	Faint	1/8 as loud
Soft whisper	30	Faint	--
Rusting leaves	20	Very faint	--
Human breathing	10	Very faint	Threshold of hearing
--	0	Very faint	--

Note: [1] Subjective evaluations based on reference level of near freeway auto traffic.

Fundamentals of Vibration

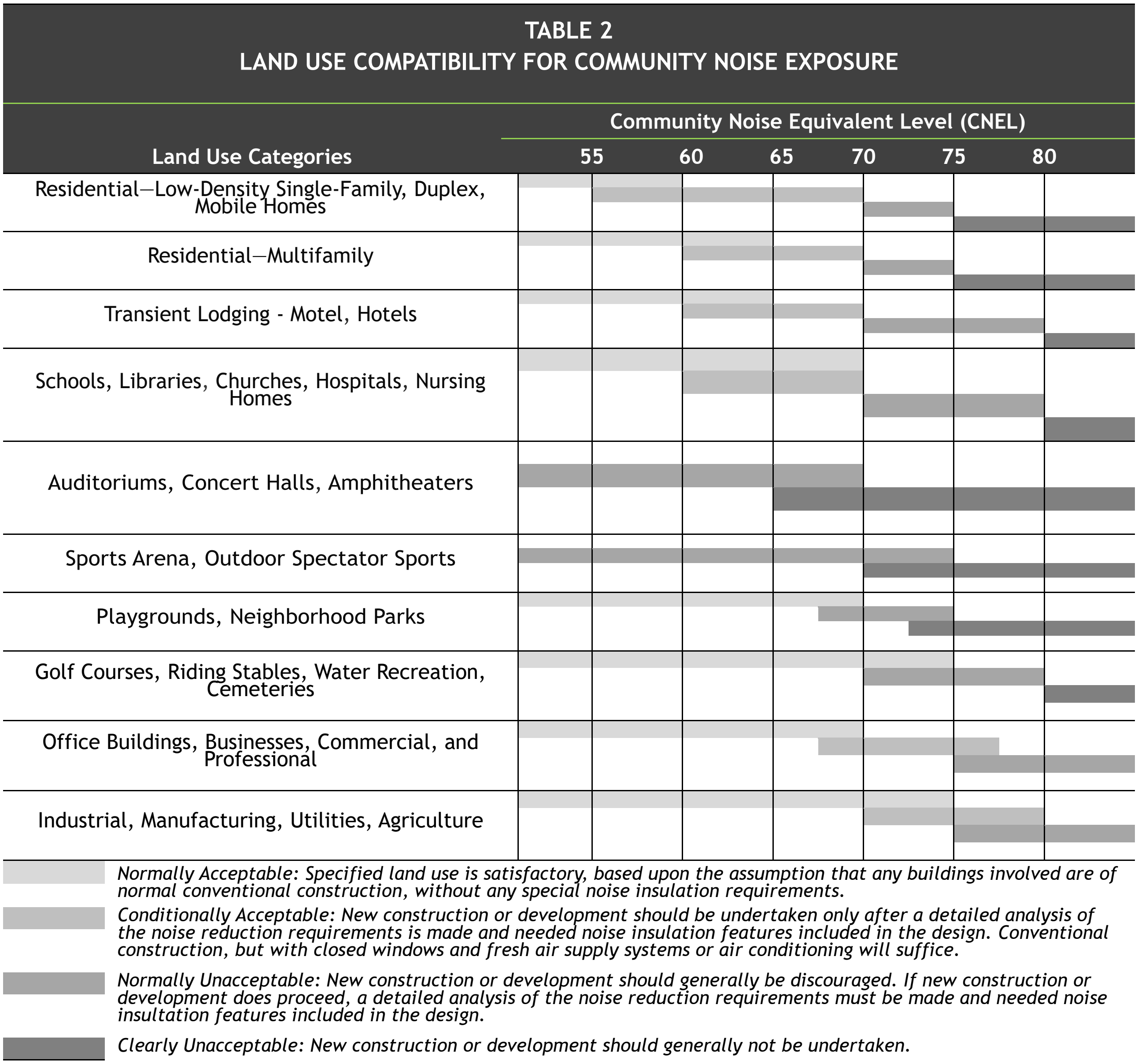
Vibration is commonly defined as an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. The peak particle velocity (PPV) or root-mean-square (RMS) velocity is typically used to describe vibration amplitudes. PPV is defined as the maximum instantaneous peak of the vibration signal, while RMS is defined as the square root of the average of the squared amplitude of the signal. PPV is typically used for evaluating potential building damage, whereas RMS is typically more suitable for evaluating human response to ground-borne vibration. The RMS vibration velocity level can be presented in inches per second (ips) or in VdB (a decibel unit referenced to 1 microinch per second). Commonly, ground-borne vibration generated by man-made activities (i.e., road traffic, construction) attenuates rapidly with distance from the source of the vibration.

REGULATORY SETTING

City of Glendale General Plan Noise Element

The City of Glendale General Plan Noise Element establishes noise criteria for the various land uses throughout the City.[1] **Table 2: Land Use Compatibility for Community Noise Exposure**, identifies the acceptable limit of noise exposure for various land-use categories within the City. Noise exposure for commercial uses is "normally acceptable" when the CNEL at exterior commercial locations is equal to or below 70 dBA, "conditionally acceptable" when the CNEL is between 67.5 to 77.5 dBA, and "normally unacceptable" when the CNEL exceeds 75 dBA. Noise exposure for low density residential uses is "normally acceptable" when the CNEL at exterior residential locations is equal to or below 60 dBA, "conditionally acceptable" when the CNEL is between 55 to 70 dBA, "normally unacceptable" when the CNEL is between 70 to 75 dBA, and "clearly unacceptable" when the CNEL exceeds 75 dBA. These guidelines apply to noise sources such as vehicular traffic, aircraft, and rail movements.

1 City of Glendale, *General Plan,* "Noise Element" (2007).



Source: City of Glendale, General Plan, "Noise Element" (2007).

City of Glendale Municipal Code

Noise

Noise standards for specific land uses are identified in the City of Glendale's Noise Ordinance, which is located in Chapter 8.36, Section 8.36.040 of the Glendale Municipal Code (GMC). Under Section 8.36.040 of the Noise Ordinance, exterior and interior noise is regulated by reference to "presumed noise standards," which are presented in **Table 3: Interior and Exterior Presumed Noise Standards**. Under Section 8.36.050 of the Noise Ordinance, where noise levels are below the presumed noise standards, the actual ambient noise level controls, and any noise more than 5 dBA above the actual ambient noise level is considered a violation of the Noise Ordinance. Where the actual ambient noise level exceeds the presumed noise standard, the actual ambient noise level is used, and any noise more than 5 dBA above the actual ambient noise level is considered a violation of the Noise Ordinance. However, under the Noise Ordinance, the actual ambient noise levels are not allowed to exceed the presumed noise level by more than 5 dBA.

The City does not have regulations that establish maximum construction noise levels. However, Section 8.36.080 of the GMC states that it is unlawful for any person within a residential zone, or within a radius of five hundred feet therefrom, to operate equipment or perform any outside construction or repair work on buildings, structures, or projects within the City between the hours of 7:00 PM on one day and 7:00 AM of the next day, or from 7:00 PM on Saturday to 7:00 AM on Monday, or from 7:00 PM preceding a holiday. Moreover, Section 8.36.290(K) of the GMC provides an exemption from the Noise Ordinance for any activity, operation, or noise, which cannot be brought into compliance (with the Noise Ordinance) because it is technically infeasible to do so. "Technical infeasibility" for the purpose of this section means that noise limitations cannot be complied with despite the use of mufflers, shields, sound barriers, and/or any other noise reduction devices or techniques during the operation of the equipment.

TABLE 3
INTERIOR AND EXTERIOR PRESUMED NOISE STANDARDS

Land Use Category		Noise Standards	
Category	**Uses**	**Interior CNEL**	**Exterior CNEL**
Residential	Single Family	45[1]	65[2]
	Multifamily	45[1]	65[3]
	Residential within Mixed Use	45[1]	-
Commercial	Hotel, Motel, Transient, Lodging	45[1]	-
Institutional	Hospital, School, Church, Library	45	-
Open Space	Parks[4]	-	65[1]

Source: City of Glendale General Plan Noise Element, 2007.
[1] Applies to the indoor environment excluding bathrooms, toilets, closets, and corridors
[2] Applies to the outdoor environment limited to the private yard of single family residences (normally the rear yard).
[3] Applies to the patio area where there is an expectation of privacy (i.e., not a patio area which also serves as, or is adjacent to, the primary entrance to the unit).
[4] Only applies to parks where peace and quiet are determined to be of prime importance, such as hillside open space areas to the public. Generally, would not apply to urban parks or active-use parks.

Vibration

Section 8.36.210 of the GMC provides that vibration created by the operation of any device would be a violation of City standards if such vibration were above the vibration perception threshold of an individual at or beyond the property boundary of a source on private property. For sources on a public space or public right-of-way, a violation would occur if the vibration perception threshold of an individual were exceeded at a distance of 150 feet from the source. The Noise Ordinance does not define the level of vibration that is deemed perceptible by an individual and does not establish maximum allowable vibration levels.

EXISTING CONDITIONS

The predominant noise source in the City come from mobile noise sources, including motor vehicles. A number of freeways and arterial roadways expose the City to significant noise levels. The Union Pacific Railroad along the west side of the City also contributes to the overall noise environment. Aircraft operating in the area are not a major contributor of noise in the area. The noise environment in Glendale varies from the busy, high-density corridor along freeways and major arterials to the lower density, residential communities on the hillsides. Other sources of noise within the City are from non-transportation sources including commercial and construction activities.[2]

Ambient Noise Levels

Noise monitoring was conducted at two (2) locations within the Project site adjacent to the nearest sensitive residential uses to the west to measure the ambient sound environment (refer to **Figure 3: Noise Monitoring Locations.** As shown in **Table 4: Ambient Noise Measurements**, maximum hourly noise levels ranged from 59.5 dBA (Leq-1hour) at the southwest portion of the Project site adjacent to the multi-family residential use located at 147 Acacia Avenue to 63.8 dBA (Leq-1hour) at the northwest portion of the Project site adjacent to the single-family residential use located at 124 Garfield Avenue. Additionally, 8-hour averages ranged from 52.4 dBA (Leq-8hour) to 54.1 dBA (Leq-8hour). 24-hour CNEL noise levels ranged from 57.1 – 58.2 dBA CNEL at both measured locations. Ambient noise levels were below the presumed exterior noise standard of 65 dBA CNEL for single- and multi-family residential uses.

TABLE 4
AMBIENT NOISE MEASUREMENTS

Monitoring Site Number/Description		Time Period	Maximum Hourly Leq (Leq-1hour)	Leq-8hour	24-hour CNEL
1	Southwest portion of the Project site adjacent to the multi-family residential use located at 147 W. Acacia Avenue	June 8 – June 9, 2022	59.5	52.4	58.2
2	Northwest portion of the Project site adjacent to the single-family residential use located at 124 W. Garfield Avenue	June 8 – June 9, 2022	63.8	54.1	57.1

*Note: Refer to **Appendix A** for noise monitoring worksheets.*

Sensitive Uses

As mentioned previously, the Project site is zoned CA-Commercial Auto Zone. Surrounding land uses include a vehicle dealership (Nissan) and multi-family residential development to the north, storage facility, vehicle rental (Hertz) and multi-family residential development to the south, vehicle dealership (Chrysler/Dodge/Jeep/Ram) to the east and multi-family residential development to the west. An

2 City of Glendale, Noise Element, May 2007, accessed November 2021, https://www.glendaleca.gov/home/showpublisheddocument/828/635231021922170000

overview of the sensitive land uses adjacent to the Project site (refer to **Figure 4: Sensitive Receptor Map**) is provided below:

- 112 W. Acacia Avenue: Multi-family residential building located south of the Project site across W. Acacia Avenue.
- 123 W. Acacia Avenue: Multi-family residential building located west of the Project site.
- 119 W. Garfield Avenue: Single-family residential building located north of the Project site across Garfield Avenue.
- 124 W. Garfield Avenue: Single-family residential building located west of the Project site.

Vibration Conditions

Based on field observations, the primary source of existing ground-borne vibration in the vicinity of the Project site is vehicle traffic on local roadways and SR-134. According to the Federal Transit Administration,[3] typical road traffic-induced vibration levels are unlikely to be perceptible by people. Trucks and buses typically generate ground-borne vibration velocity levels of approximately 63 VdB (at a 50-foot distance), and these levels could reach 72 VdB when trucks and buses pass over bumps in the road. A vibration level of 72 VdB is above the 60 VdB level of perceptibility.

3 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, FTA report no. 0123 (September 2018), https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf, accessed August 2021.

North

West

South

East

SOURCE: Google Earth - 2022

FIGURE **3a**

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Noise Monitoring Location (Location 1)

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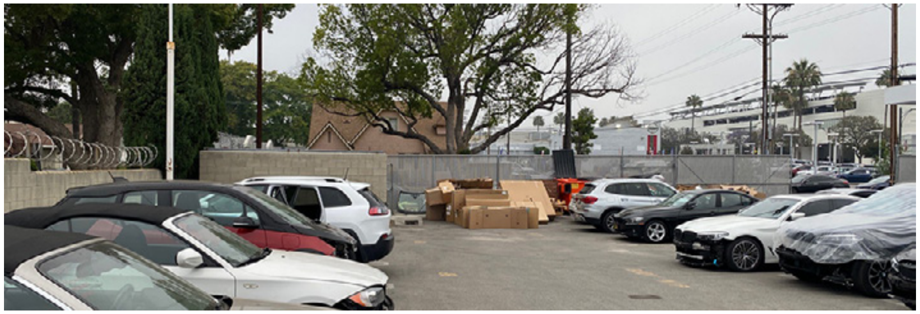
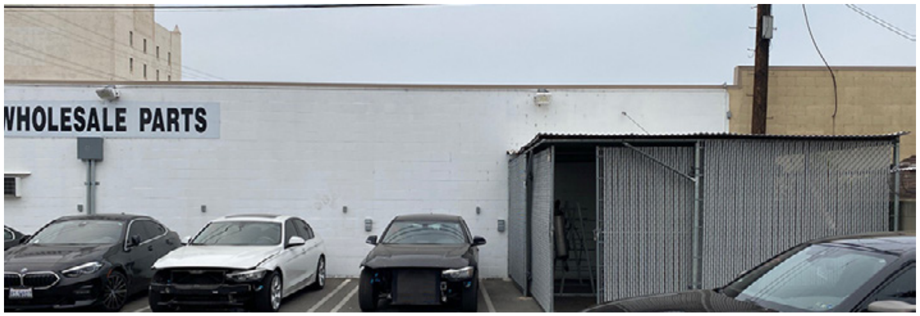
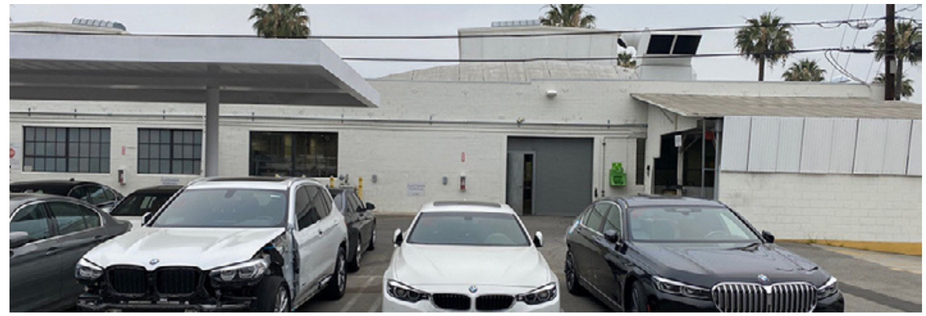


North

West



South



East

SOURCE: Google Earth - 2022

FIGURE **3b**

Meridian Consultants

Noise Monitoring Location (Location 2)

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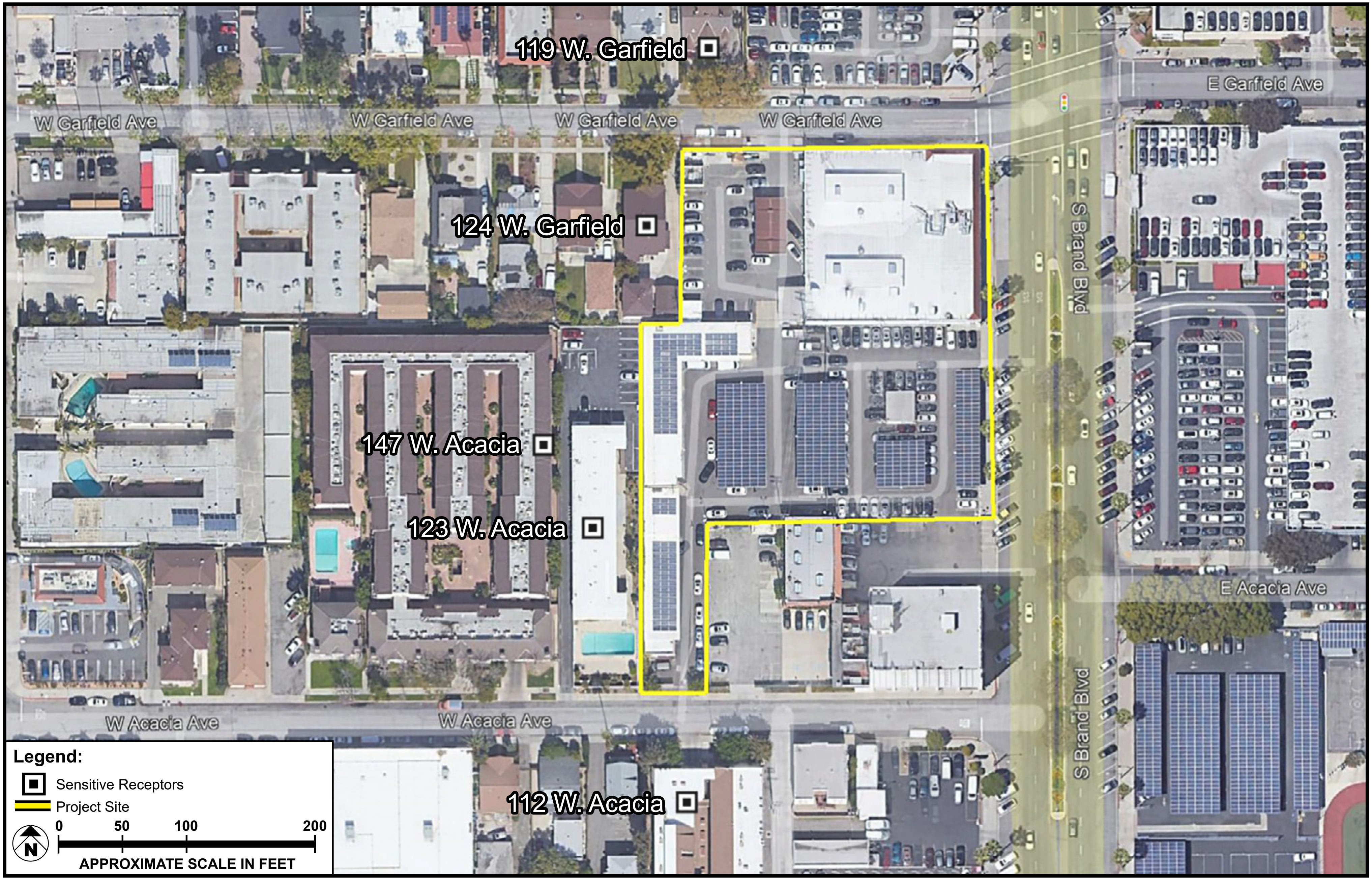

SOURCE: Google Earth - 2022

FIGURE **4**

Meridian Consultants

Sensitive Receptor Map

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METHODOLOGY

Ambient Noise Measurements

To determine existing noise levels in the area (ambient), Meridian Consultants monitored two (2) locations between June 8 – June 9, 2022 on the Project site, as shown in **Figure 5**. Noise-level monitoring was conducted for a 24-hour period at each location using a Larson Davis Model 831 sound-level meter. This meter satisfies Section 8.36.030 of the City's Municipal Code related to decibel measurement criteria and the American National Standards Institute standard for general environmental noise measurement instrumentation. Random incidence microphones with windscreens were used, given the outdoor (i.e., free field) conditions of monitoring. The sound level averages were measured as A-weighted, slow-time-weighted (1-minute period) sound pressure level variables, commonly used for measuring environmental sounds. Sound levels presented in this report are in terms of dBA.

The Larson Davis Model 831 is a Type 1 precision sound-level meter. This meter meets all requirements of ANSI S1.4-1983 and ANSI1.43-1997 Type 1 standards, as well as International Electrotechnical Commission (IEC) IEC61672-1 Ed. 1.0, IEC60651 Ed 1.2, and IEC60804 Type 1, Group X standards. The sound-level meter was located approximately 5 feet above ground and was covered with a Larson Davis windscreen. The sound-level meter was field calibrated with an external calibrator prior to operation.

Construction Scenario

Future dates represent approximations based on the general Project timeline and are subject to change pending unpredictable circumstances that may arise. As such, for purposes of this analysis, project construction is assumed to begin in December 2022 and is expected to last until November 2023. Construction would occur over six phases: (1) demolition; (2) site preparation; (3) grading; (4) building construction; (5) paving; and (6) architectural coating.

On-Site Construction Equipment

Construction activities typically generate noise from the operation of equipment within the Project site that is required for construction of various facilities. Noise impacts from on-site construction and staging of construction trucks were evaluated by determining the noise levels generated by different types of construction activity, calculating the construction-related noise level at nearby noise-sensitive receptor locations, and comparing these construction-related noise levels to existing ambient noise levels (i.e., noise levels without project-related construction noise). The actual noise level would vary, depending upon the equipment type, model, the type of work activity being performed, and the condition of the equipment.

In order to calculate a construction noise levels, hourly activity or utilization factors (i.e., the percentage of normal construction activity that would occur, or construction equipment that would be active, during each hour of the day) are estimated based on the temporal characteristics of other previous and current construction projects. The hourly activity factors express the percentage of time that construction activities would emit average noise levels. Typical noise levels for each type of construction equipment were obtained from the FHWA Roadway Construction Noise Model. Calculated noise levels associated with construction at noise-sensitive receptor locations were then compared to estimated existing noise levels and the construction noise significance thresholds identified below.

An inventory of construction equipment, including the number and types of equipment, which would be operating simultaneously within the Project Site was identified for each phase/component of construction and shown in **Table 5: Construction Equipment by Phase**. It is highly unlikely that all pieces of construction equipment identified in **Table 5** would operate simultaneously in any specific location during construction because equipment is generally operated only when needed and space constraints limit the equipment that can be used at any one time in a specific location. Therefore, this modeling is considered a conservative approach to calculate the maximum noise levels that would be generated.

TABLE 5
CONSTRUCTION EQUIPMENT BY PHASE

Construction Phase	Equipment Type	Quantity	Usage Hours (per day)	Noise Level at 50 feet (dBA Leq-1hour)	Calculated Average Noise Level (dBA Leq-1hour)
Demolition	Concrete/Industrial Saws	1	8	82.6	87.3
	Rubber Tired Dozers	1	8	77.7	
	Tractors/Loaders/Backhoes	3	8	84.8	
Site Preparation	Graders	1	8	81.0	84.6
	Rubber Tired Dozers	1	7	77.7	
	Tractors/Loaders/Backhoes	1	8	80.0	
Grading	Graders	1	8	81.0	85.9
	Rubber Tired Dozers	1	8	77.7	
	Tractors/Loaders/Backhoes	2	7	83.0	
Building Construction	Cranes	1	6	72.6	85.2
	Forklifts	1	6	81.0	
	Generator Sets	1	8	77.6	
	Tractors/Loaders/Backhoes	1	6	80.0	
	Welders	3	8	74.8	
Paving	Cement and Mortar Mixers	1	6	74.8	83.1
	Pavers	1	6	74.2	
	Paving Equipment	1	8	74.2	
	Rollers	1	7	73.0	
	Tractors/Loaders/Backhoes	1	8	80.0	
Architectural Coating	Air Compressors	1	6	73.7	73.7

Source: FHWA Roadway Construction Noise Model (RCNM) version 1.1
Note: N/A = not available.
[a] *Lmax sound levels are measured 50 feet from the source of the equipment.*

The calculated average noise levels provided in **Table 5** were inputted into the noise model SoundPLAN,[4] which generates computer simulations of noise propagation from sources such as construction noise. SoundPLAN forecasts noise levels at specific receptors using sound power data and three-dimensional topographical data.

Construction noise levels have been calculated at each of the analyzed sensitive receptors as follows: (1) construction noise levels generated during each of the three construction phases; and (2) construction noise levels during those periods when the three construction phases could potentially occur concurrently.

Noise levels generated by on-site construction equipment can be reduced via specific noise control measures including the following: (1) muffler requirements; (2) equipment modifications that reduce noise levels; and (3) maintenance and operational requirements. These noise control measures can be used separately or in combination in order to reduce the noise levels generated by on-site construction equipment.

Most on-site construction-related noise originates from equipment powered by either gasoline or diesel engines. A large part of the noise emitted is due to the intake and exhaust portions of the engine cycle. Reducing noise from this source can be achieved via muffler systems. This noise control strategy would include the replacement of worn mufflers and retrofitting on-site construction equipment where mufflers are not in use. Using muffler systems on on-site construction equipment reduces construction noise levels by 10 dBA or more.[5]

Another effective method of diminishing noise levels associated with individual pieces of construction equipment is by modifying the equipment. Modifications such as the dampening of metal surfaces is effective in reducing on-site construction equipment noise levels. These modifications are typically done by the manufacturer or with factory assistance. Noise reductions of up to 5 dBA are achieved using dampening materials.[6]

Additionally, faulty or damaged mufflers, loose engine parts, rattling screws, bolts, or metal plates all contribute to increasing the noise level of on-site construction equipment. By regularly inspecting on-site construction equipment for these conditions and making adjustments to the equipment as necessary can also reduce noise levels generated by on-site construction equipment.

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4 SoundPLAN model is in compliance with ISO 9613-2 standards for assessing attenuation of sound propagating outdoors and general calculation method.

5 FHWA, Special Report—Measurement, Prediction, and Mitigation, updated June 2017, https://www.fhwa.dot.gov/Environment/noise/construction_noise/special_report/hcn04.cfm, Accessed June 2022.

6 FHWA, Special Report—Measurement, Prediction, and Mitigation, updated June 2017, accessed June 2022, https://www.fhwa.dot.gov/Environment/noise/construction_noise/special_report/hcn04.cfm.

Construction Traffic Noise

The analysis of off-site construction traffic noise impacts focuses on: (1) identifying major roadways that may be used for construction worker commute routes or truck haul routes; (2) identifying the nature and location of noise-sensitive receptors along those routes; and (3) evaluating the traffic characteristics along those routes, specifically as related to existing traffic volumes.

Each phase of construction would result in varying levels of intensity and a number of construction personnel. The construction workforce would consist of approximately 13 worker trips per day and 158 total hauling trips during demolition; 8 worker trips per day during site preparation; 10 worker trips per day and 219 total hauling trips during grading; 86 worker trips per day and 35 vendor trip per day during building construction; 13 worker trip per day during paving; and 17 worker trips per day during architectural coating.

Construction Equipment Vibration

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. While ground vibrations from construction activities do not often reach the levels that can damage structures, fragile buildings must receive special consideration.

Impacts due to construction activities were evaluated by identifying vibration sources (i.e., construction equipment), measuring the distance between vibration sources and surrounding structure locations, and making a significance determination.

For quantitative construction vibration assessments related to human annoyance, vibration source levels for construction equipment are taken from the FTA *Transit Noise and Vibration Impact Assessment Manual.*[7] Ground-borne vibration related to human annoyance is assessed in terms of rms velocity levels.

The vibration source levels for various types of equipment are based on data provided by the FTA.

THRESHOLDS OF SIGNIFICANCE

In accordance with Appendix G of the State CEQA Guidelines, a project would have a potentially significant impact related to noise and groundborne vibration if it would result in:

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

7 FTA, Transit Noise and Vibration Impact Assessment Manual, September 2018, accessed March 2022, https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf

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

The Project site is not located within an airport land use plan and is not located within two miles of public airport or public use airport or within the vicinity of a private airstrips. The nearest public or private airport/airstrip to the Project site is Hollywood Burbank Airport located approximately over 8 miles northwest of the Project site. As such, the Project would result in no impacts to these screening criteria and no further analyses of these topics are necessary.

Construction Noise

The City's General Plan and Municipal Code do not establish numeric acceptable source noise levels or noise level increases at potentially affected receivers. Section 8.36.080 of the City's Municipal Code regulates construction noise and specifies restrictions from work occurring within certain time periods. To evaluate whether the Project will generate a substantial periodic increase in short-term noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the Criteria for Recommended Standard: Occupational Noise Exposure prepared by the National Institute for Occupational Safety and Health (NIOSH). A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. For the purposes of this analysis, the lowest, more conservative construction noise level threshold of 85 dBA Leq-8hour is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time period, they are expressed as Leq noise levels. Therefore, the noise level threshold of 85 dBA Leq-8hour over a period of eight hours or more is used to evaluate the potential Project-related construction noise level impacts at the nearby sensitive receiver locations.

Ground-Borne Vibration

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings founded on the soil near the construction site respond to these vibrations with varying results, ranging from no perceptible effects at the lowest levels, low rumbling sounds and perceptible vibrations at moderate levels, and slight damage at the highest levels.

There are no adopted City standards or thresholds of significance for vibration. As mentioned previously, Section 8.36.210 of the City's Municipal Code prohibits vibration to exceed the perception threshold at or beyond the property boundary of the source or at 150 feet from the source if on a public space or public right of way, however does not define the level of vibration that is deemed perceptible by an individual and does not establish maximum allowable vibration levels.

The FTA has also adopted standards associated with human annoyance for groundborne vibration impacts for the following three-land use categories: (1) Category 1, High Sensitivity; (2) Category 2, Residential; and (3) Category 3, Institutional.

- **Category 1** refers to buildings where vibration would interfere with operations within the building, including vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and university research operations. Vibration-sensitive equipment includes, but is not limited to, electron microscopes, high-resolution lithographic equipment, and normal optical microscopes.
- **Category 2** refers to all residential land uses and any buildings where people sleep, such as hotels and hospitals.
- **Category 3** refers to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

For purposes of this analysis, the human annoyance threshold for infrequent construction vibration events is 80 VdB for residences and buildings where people normally sleep and 83 VdB for institutional land uses with primarily daytime use.

IMPACT ANALYSIS

On-Site Construction Equipment

Noise from Project construction activities would be affected by the amount of construction equipment, the location of this equipment, the timing and duration of construction activities, and the relative distance to noise-sensitive receptors. Construction activities that would occur during the construction phases would generate both steady-state and episodic noise that would be heard both on and off the Project site. Each phase involves the use of different types of construction equipment and, therefore, has its own distinct noise characteristics. The Project would be constructed using typical construction techniques; no blasting or impact pile driving would be required.

The construction equipment reference noise levels provided in **Table 5** above, are based on measured noise data compiled by the FHWA and would occur when equipment is operating under full power conditions. However, equipment used on construction sites typically operate at less than full power. The acoustical usage factor is the percentage of time that each type of construction equipment is anticipated to be in full power operation during a typical construction day. These values are estimates and will vary based on the actual construction process and schedule.

Construction equipment operates at its noisiest levels for certain percentages of time during operation. As such, equipment would operate at different percentages over the course of an hour.[8] During a construction day, the highest noise levels would be generated when multiple pieces of construction equipment are operated concurrently.

To characterize construction-period noise levels, the average noise level associated with each construction stage was calculated based on the quantity, type, and usage factors for each type of equipment that would be used during each construction stage. These noise levels are typically associated with multiple pieces of equipment operating simultaneously.

The estimated construction noise levels were calculated for each of the analyzed receptors (refer to **Figure 4**) during each of the construction phases in which construction equipment was assumed to be operating simultaneously. Given the physical size of the Project site and logistical limitations, and with the noise equipment located at the construction area nearest to the affected receptors collectively serve to result in a conservative impact analysis, this is considered a conservative evaluation because construction of the Project would typically use fewer pieces of equipment simultaneously at any given time as well as operating throughout the construction site (i.e., most of the time construction equipment would be operating at distances further away from the off-site receptors than that assumed in the forecasting of Project construction noise levels). Additionally, construction noise levels presented below do not take into account adherence to regulatory compliance measures that further reduce noise levels, such as adherence to Section 8.36.290(K) of the GMC. As such, Project construction would often generate lower noise levels than reported herein.

Table 6: Maximum Noise Impacts Associated With On-Site Construction Activities presents the maximum noise impacts that are forecasted to occur at each of the receptor sites. As shown, construction noise levels would range between 54.9 dBA (Leq-8hour) at the single-family residential use located at 119 W. Garfield Avenue during the architectural coating phase to a high of 74.8 dBA (Leq-8hour) at multi-family residential uses adjacent to the west of the Project site located at 124 W. Garfield Avenue during the demolition of the accessory building. Noise levels due to construction would not exceed 85 dBA (Leq-8hour) threshold at the nearby sensitive uses.

8 Federal Highway Administration, Traffic Noise Model (2006).

TABLE 6 MAXIMUM NOISE IMPACTS ASSOCIATED WITH ON-SITE CONSTRUCTION ACTIVITIES								
Location	Calculated Noise Level (Leq-8hour) by Construction Phase						Significance Threshold (Leq-8hour)	Exceeds Threshold?
	Demolition	Site Preparation	Grading	Building Construction	Paving	Architectural Coating		
112 W. Acacia Avenue	70.5	67.8	69.1	68.4	66.3	56.6	85	**No**
123 W. Acacia Avenue	66.8	64.0	65.3	64.6	62.5	58.7	85	**No**
147 W. Acacia Avenue	64.9	61.9	63.2	62.5	60.4	56.3	85	No
119 W. Garfield Avenue	69.2	63.1	64.4	63.7	61.6	54.9	85	**No**
124 W. Garfield Avenue	74.8	68.7	70.0	69.3	67.2	60.2	85	**No**

Source: Refer to ***Appendix B*** *for construction noise worksheets*

Additionally, the Project would be required to adhere to Section 8.36.290(K) of the GMC, which requires noise limitations to be implemented during construction to the extent feasible. Noise limitations that are commonly used include the use of mufflers, shields, sound barriers and/or any other noise reduction device or techniques during the operation of the equipment. More specifically, using optimal muffler systems on all equipment would reduce construction noise levels by 10 dBA or more.[9] Temporary abatement techniques such as the use of a noise barrier can achieve a 5-dBA noise level reduction when it is tall enough to break the line-of-sight to the receiver. Modifications such as dampening of metal surfaces or the redesign of a particular piece of equipment can achieve noise reduction of up to 5 dBA.[10] Moving stationary equipment away from sensitive receptors will reduce noise levels at the receptor as every doubling of distance will reduce noise by 4 to 6 dBA. As such, adherence to the GMC would further reduce construction noise levels at all nearby sensitive uses. Moreover, the Project would comply with the GMC as it relates to construction equipment by ensuring that the operation of noise generating construction equipment would not occur between the hours of 7:00 PM on one day and 7:00 AM of the next day, or from 7:00 PM on Saturday to 7:00 AM on Monday, or from 7:00 PM preceding a holiday. Compliance with the above practices would ensure construction noise levels are reduced to the maximum extent feasible; thus, construction noise levels would not be considered significant.

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9 FHWA, *Special Report—Measurement, Prediction, and Mitigation*, updated June 2017, https://www.fhwa.dot.gov/Environment/noise/construction_noise/special_report/hcn04.cfm, Accessed January 2021.

10 FHWA, *Special Report—Measurement, Prediction, and Mitigation*, updated June 2017, accessed July 2019, https://www.fhwa.dot.gov/Environment/noise/construction_noise/special_report/hcn04.cfm.

Off-Site Construction Noise

Construction of the Project would require worker, haul, and vendor truck trips to and from the site to work on the site, export demolition debris, and deliver supplies to the site. Trucks traveling to and from the Project site would be required to travel along a haul route approved by the City. At the maximum approximately 219 total hauling trips would take place during the grading phase, totaling to approximately 37 haul truck trips per workday. Haul truck traffic would take the most direct route to the freeway along Brand Boulevard. There are no noise-sensitive receptors along Brand Boulevard. However, for a conservative assessment, this analysis assumes the haul route would be located within 25 feet of the nearest sensitive use.

Noise associated with construction trips were estimated using the Caltrans FHWA Traffic Noise Model based on the maximum number of worker and hauling trips in a day. Project haul truck trips which includes medium- and heavy-duty trucks would generate noise levels of approximately 52.9 dBA and 57.8 dBA, respectively, measured at 25 feet to the nearest sensitive receptors along the haul route. As shown in **Table 4**, existing hourly noise levels ranged from 59.5 dBA to 63.8 dBA (Leq-1hour). The noise level from truck trips would be below ambient noise levels. As such, off-site construction noise impacts would not be considered significant.

Construction Vibration

Table 7: On-Site Construction Vibration Impacts presents the construction vibration impacts associated with on-site construction in terms of human annoyance. It is important to note pile driving or heavy intensive vibration equipment are not required during construction of this Project due to the minimal amount of excavation expected to occur. As shown in **Table 7**, the forecasted vibration levels due to on-site construction activities would not exceed the human annoyance threshold for infrequent events of 80 VdB for the nearby residential receptors surrounding the Project area during construction. As such, impacts related to human annoyance from on-site construction vibration would not be considered significant.

TABLE 7 ON-SITE CONSTRUCTION VIBRATION IMPACTS								
Location	Description	Estimated Vibration Velocity Levels at the Nearest Off-Site Structures from the Project Construction Equipment					Significance Threshold (VdB)	Exceeds Threshold?
		Large Bulldozer	Caisson Drilling	Loaded Trucks	Jackhammer	Small bulldozer		
112 W. Acacia Avenue	Multi-family residential to the south across Acacia Avenue	60	60	59	52	31	80	**No**
123 W. Acacia Avenue	Multi-family residential adjacent to the west	74	74	73	66	45	80	**No**
147 W. Acacia Avenue	Multi-family residential to the west	67	67	66	59	38	80	**No**
119 W. Garfield Avenue	Single-family residential to the north across Garfield Avenue	59	59	58	51	30	80	**No**
124 W. Garfield Avenue	Single-family residential adjacent to the northwest	70	70	69	62	41	80	**No**

*Source: Refer to **Appendix C** for construction vibration worksheets.*

CUMULATIVE NOISE

For purposes of this analysis, development of any related projects will be considered to contribute to cumulative noise impacts. Noise, by definition, is a localized phenomenon and drastically reduces as distance from the source increases. As a result, only related projects, and growth in the general area of the Project site (within 500 feet) would contribute to cumulative noise impacts. Cumulative construction-noise impacts have the potential to occur when multiple construction projects in the local area generate noise within the same time frame and contribute to the local ambient noise environment. It is expected that, as with the Project, any related projects would adhere to Section 8.36.290(K) of the GMC and implement noise reduction techniques such as mufflers, shields, sound barriers, which would minimize any noise-related nuisances during construction. In addition, distance attenuation and intervening structures would further reduce construction noise levels and not result in noticeable increases. Therefore, the combined construction-noise impacts of related projects within a 0.5-mile radius and the Project's contribution would not cause a significant cumulative impact.

CERTIFICATION

The contents of this noise study represent an accurate depiction of the noise environment and impacts associated with the proposed Pacific BMW Dealership Expansion Project. The information contained in this noise study is based on the best available information at the time of preparation. If you have any questions, please contact me directly at (805) 413-4187.

Christ Kirikian, INCE Associate
Principal | Director of Air Quality & Acoustics
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APPENDIX A

Noise Measurements

Appendix A.1

Noise Measurements

Monitoring Location: Site 1
Date: June 8 - June 9, 2022

	Monitoring Period		Monitored Leq	Logarithmic Equivalent	Evening/Night Adjustments 10 dB	5 dB
	Midnight	0 / 24	47.1	51114	511138	161636
am	1:00	100	46.5	44454	444543	140577
	2:00	200	46.4	43538	435378	137678
	3:00	300	45.5	35368	353684	111845
	4:00	400	45.0	31926	319255	100957
	5:00	500	47.0	49944	499437	157936
	6:00	600	54.1	257588	2575876	814564
	7:00	700	53.9	243124	2431241	768826
	8:00	800	57.7	587473	5874731	1857753
	9:00	900	56.6	454692	4546917	1437861
	10:00	1000	55.5	355204	3552041	1123254
	11:00	1100	55.5	356798	3567985	1128296
	12:00	1200	59.5	889256	8892564	2812076
pm	1:00	1300	56.4	436020	4360196	1378815
	2:00	1400	57.7	594667	5946672	1880503
	3:00	1500	57.1	514935	5149345	1628366
	4:00	1600	54.9	311024	3110241	983544
	5:00	1700	55.4	346703	3467025	1096370
	6:00	1800	55.7	371420	3714198	1174532
	7:00	1900	55.0	318496	3184960	1007173
	8:00	2000	53.8	241911	2419112	764990
	9:00	2100	54.7	296726	2967256	938329
	10:00	2200	50.0	99278	992785	313946
pm	11:00	2300	52.3	169667	1696672	536535

Leq Morning Peak Hour 7:00-10:00 a.m.
56 dBA

Leq Evening Peak Hour 7:00-10:00 p.m.
54.6 dBA

Leq Nighttime 10:00 pm-7:00 a.m. (not adjusted)
49.4 dBA

Leq Daytime 7:00 am-7:00 p.m.
56.3 dBA

Leq 8-Hour
52.4 dBA

Ldn: 10 dB adjustment between 10:00 p.m. & 7:00 a.m.
57.7 dBA

CNEL: 5 dB adjustment between 7:00p.m. & 10:00 p.m., & 10 dB adjustment between 10:00 p.m. & 7:00 a.m.
58.2 dBA

Difference between CNEL and Ldn
CNEL - Ldn 0.53464605

Monitoring Location: Site 2
Date: June 8 - June 9, 2022

	Monitoring Period		Monitored Leq	Logarithmic Equivalent	Evening/Night Adjustments 10 dB	5 dB
	Midnight	0 / 24	43.5	22487	224871	71110
am	1:00	100	48.3	67715	677147	214133
	2:00	200	47.1	51092	510915	161566
	3:00	300	41.3	13384	133844	42325
	4:00	400	46.5	44778	447779	141600
	5:00	500	44.5	27994	279936	88524
	6:00	600	47.9	61759	617592	195300
	7:00	700	52.2	165409	1654089	523069
	8:00	800	63.2	2067493	20674928	6537986
	9:00	900	63.8	2393795	23937952	7569845
	10:00	1000	56.6	458627	4586274	1450307
	11:00	1100	53.1	202674	2026744	640913
	12:00	1200	52.7	188002	1880018	594514
pm	1:00	1300	55.6	364603	3646028	1152975
	2:00	1400	54.1	257502	2575016	814292
	3:00	1500	54.8	302858	3028580	957721
	4:00	1600	52.6	183828	1838281	581316
	5:00	1700	49.2	82660	826597	261393
	6:00	1800	51.2	131334	1313343	415315
	7:00	1900	48.4	69875	698754	220965
	8:00	2000	51.8	151752	1517522	479883
	9:00	2100	49.2	82882	828820	262096
	10:00	2200	48.1	63947	639474	202219
pm	11:00	2300	50.5	111652	1116516	353073

Leq Morning Peak Hour 7:00-10:00 a.m.
62 dBA

Leq Evening Peak Hour 7:00-10:00 p.m.
50.1 dBA

Leq Nighttime 10:00 pm-7:00 a.m. (not adjusted)
47.1 dBA

Leq Daytime 7:00 am-7:00 p.m.
57.4 dBA

Leq 8-Hour
54.1 dBA

Ldn: 10 dB adjustment between 10:00 p.m. & 7:00 a.m.
57 dBA

CNEL: 5 dB adjustment between 7:00p.m. & 10:00 p.m., & 10 dB adjustment between 10:00 p.m. & 7:00 a.m.
57.1 dBA

Difference between CNEL and Ldn
CNEL - Ldn 0.23676425

APPENDIX B

Construction Noise Worksheets

Demolition

Receiver	Leq-8hour/dB(A)	Source	Source ty	Time slice	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
112 W. Acacia Avenue	70.5	Demolition	Area	Leq-8hour			87.3	122.2	3120.8	0	0	3	90.16	-50.1	-3.7	-2.5	-0.2		0	1.7	70.5	0	0	0	70.5
		Demolition of Building	Area	Leq-8hour			87.3	107.5	105.7	0	0	3	133.18	-53.5	-4.1	-3	-0.3		0	0.6	50.4	0	0	0	50.4
119 W. Garfield Avenue	69.2	Demolition	Area	Leq-8hour			87.3	122.2	3120.8	0	0	3	93.61	-50.4	-4	-6.2	-0.2		0	1.3	65.8	0	0	0	65.8
		Demolition of Building	Area	Leq-8hour			87.3	107.5	105.7	0	0	3	43.08	-43.7	-2.3	0	-0.1		0	2	66.5	0	0	0	66.5
123 W. Acacia Avenue	66.8	Demolition	Area	Leq-8hour			87.3	122.2	3120.8	0	0	3	50.93	-45.1	-2.1	-15.1	-0.1		0	3.9	66.7	0	0	0	66.7
		Demolition of Building	Area	Leq-8hour			87.3	107.5	105.7	0	0	3	80.85	-49.1	-3.7	-12	-0.2		0	4.2	49.8	0	0	0	49.8
124 W. Garfield Avenue	74.8	Demolition	Area	Leq-8hour			87.3	122.2	3120.8	0	0	3	57.79	-46.2	-3	-5.3	-0.1		0	0.8	71.4	0	0	0	71.4
		Demolition of Building	Area	Leq-8hour			87.3	107.5	105.7	0	0	3	25.17	-39	-0.5	0	0		0	1.2	72.2	0	0	0	72.2
147 W. Acacia Avenue	64.9	Demolition	Area	Leq-8hour			87.3	122.2	3120.8	0	0	3	63.52	-47	-3.2	-14.2	-0.1		0	3.9	64.6	0	0	0	64.6
		Demolition of Building	Area	Leq-8hour			87.3	107.5	105.7	0	0	3	73.76	-48.3	-3.5	-8.1	-0.1		0	2.6	53.1	0	0	0	53.1

Site Preparation

Receiver	Leq-8hour/dB(A)	Source	Source type	Time slice	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
112 W. Acacia Avenue	67.8	Site Preparation	Area	Leq-8hour			84.6	119.5	3120.8	0	0	3	90.16	-50.1	-3.7	-2.5	-0.2		0	1.7	67.8	0	0	0	67.8
119 W. Garfield Avenue	63.1	Site Preparation	Area	Leq-8hour			84.6	119.5	3120.8	0	0	3	93.61	-50.4	-4	-6.2	-0.2		0	1.3	63.1	0	0	0	63.1
123 W. Acacia Avenue	64	Site Preparation	Area	Leq-8hour			84.6	119.5	3120.8	0	0	3	50.93	-45.1	-2.1	-15.1	-0.1		0	3.9	64	0	0	0	64
124 W. Garfield Avenue	68.7	Site Preparation	Area	Leq-8hour			84.6	119.5	3120.8	0	0	3	57.79	-46.2	-3	-5.3	-0.1		0	0.8	68.7	0	0	0	68.7
147 W. Acacia Avenue	61.9	Site Preparation	Area	Leq-8hour			84.6	119.5	3120.8	0	0	3	63.52	-47	-3.2	-14.2	-0.1		0	3.9	61.9	0	0	0	61.9

Grading

Receiver	Leq-8hour/dB(A)	Source	Source type	Time slice	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
112 W. Acacia Avenue	69.1	Grading	Area	Leq-8hour			85.9	120.8	3120.8	0	0	3	90.16	-50.1	-3.7	-2.5	-0.2		0	1.7	69.1	0	0	0	69.1
119 W. Garfield Avenue	64.4	Grading	Area	Leq-8hour			85.9	120.8	3120.8	0	0	3	93.61	-50.4	-4	-6.2	-0.2		0	1.3	64.4	0	0	0	64.4
123 W. Acacia Avenue	65.3	Grading	Area	Leq-8hour			85.9	120.8	3120.8	0	0	3	50.93	-45.1	-2.1	-15.1	-0.1		0	3.9	65.3	0	0	0	65.3
124 W. Garfield Avenue	70	Grading	Area	Leq-8hour			85.9	120.8	3120.8	0	0	3	57.79	-46.2	-3	-5.3	-0.1		0	0.8	70	0	0	0	70
147 W. Acacia Avenue	63.2	Grading	Area	Leq-8hour			85.9	120.8	3120.8	0	0	3	63.52	-47	-3.2	-14.2	-0.1		0	3.9	63.2	0	0	0	63.2

Building Construction

Receiver	Leq-8hour/dB(A)	Source	Source type	Time slice	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dE	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
112 W. Acacia Avenue	68.4	Building Construction	Area	Leq-8hour			85.2	120.1	3120.8	0	0	3	90.16	-50.1	-3.7	-2.5	-0.2		0	1.7	68.4	0	0	0	68.4
119 W. Garfield Avenue	63.7	Building Construction	Area	Leq-8hour			85.2	120.1	3120.8	0	0	3	93.61	-50.4	-4	-6.2	-0.2		0	1.3	63.7	0	0	0	63.7
123 W. Acacia Avenue	64.6	Building Construction	Area	Leq-8hour			85.2	120.1	3120.8	0	0	3	50.93	-45.1	-2.1	-15.1	-0.1		0	3.9	64.6	0	0	0	64.6
124 W. Garfield Avenue	69.3	Building Construction	Area	Leq-8hour			85.2	120.1	3120.8	0	0	3	57.79	-46.2	-3	-5.3	-0.1		0	0.8	69.3	0	0	0	69.3
147 W. Acacia Avenue	62.5	Building Construction	Area	Leq-8hour			85.2	120.1	3120.8	0	0	3	63.52	-47	-3.2	-14.2	-0.1		0	3.9	62.5	0	0	0	62.5

Paving

Receiver	Leq-8hour/dB(A)	Source	Source type	Time slice	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
112 W. Acacia Avenue	66.3	Paving	Area	Leq-8hour			83.1	118	3120.8	0	0	3	90.16	-50.1	-3.7	-2.5	-0.2		0	1.7	66.3	0	0	0	66.3
119 W. Garfield Avenue	61.6	Paving	Area	Leq-8hour			83.1	118	3120.8	0	0	3	93.61	-50.4	-4	-6.2	-0.2		0	1.3	61.6	0	0	0	61.6
123 W. Acacia Avenue	62.5	Paving	Area	Leq-8hour			83.1	118	3120.8	0	0	3	50.93	-45.1	-2.1	-15.1	-0.1		0	3.9	62.5	0	0	0	62.5
124 W. Garfield Avenue	67.2	Paving	Area	Leq-8hour			83.1	118	3120.8	0	0	3	57.79	-46.2	-3	-5.3	-0.1		0	0.8	67.2	0	0	0	67.2
147 W. Acacia Avenue	60.4	Paving	Area	Leq-8hour			83.1	118	3120.8	0	0	3	63.52	-47	-3.2	-14.2	-0.1		0	3.9	60.4	0	0	0	60.4

Architectural Coating

Receiver	Leq-8hour/dB(A)	Source	Source type	Time slice	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
112 W. Acacia Avenue	56.6	Architectural Coating	Area	Leq-8hour			73.7	108.6	3120.8	0	0	3	90.16	-50.1	-3.7	-1.3	0		0	0	56.6	0	0	0	56.6
119 W. Garfield Avenue	54.9	Architectural Coating	Area	Leq-8hour			73.7	108.6	3120.8	0	0	3	93.61	-50.4	-4	-2.4	0		0	0.2	54.9	0	0	0	54.9
123 W. Acacia Avenue	58.7	Architectural Coating	Area	Leq-8hour			73.7	108.6	3120.8	0	0	3	50.93	-45.1	-2.1	-5.7	0		0	0	58.7	0	0	0	58.7
124 W. Garfield Avenue	60.1	Architectural Coating	Area	Leq-8hour			73.7	108.6	3120.8	0	0	3	57.79	-46.2	-3	-2.4	0		0	0	60.1	0	0	0	60.1
147 W. Acacia Avenue	56.3	Architectural Coating	Area	Leq-8hour			73.7	108.6	3120.8	0	0	3	63.52	-47	-3.2	-5.2	0		0	0	56.3	0	0	0	56.3

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/8/2022
Case Description: Demolition

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	55	55	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	50	0
Dozer	No	40		81.7	50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0

Calculated (dBA)

Equipment		*Lmax	Leq
Concrete Saw		89.6	82.6
Dozer		81.7	77.7
Tractor		84	80
Tractor		84	80
Tractor		84	80
	Total	89.6	87.3

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/8/2022
Case Description: Site Preparation

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	55	55	55

			Equipment			
Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	0
Dozer	No	40		81.7	50	0
Tractor	No	40	84		50	0

Calculated (dBA)

Equipment		*Lmax	Leq
Grader		85	81
Dozer		81.7	77.7
Tractor		84	80
	Total	85	84.6

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/8/2022
Case Description: Grading

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	55	55	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	0
Dozer	No	40		81.7	50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0

Calculated (dBA)

Equipment		*Lmax	Leq
Grader		85	81
Dozer		81.7	77.7
Tractor		84	80
Tractor		84	80
	Total	85	85.9

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/8/2022
Case Description: Building Construction

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	55	55	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50	0
Forklift	Yes	40	85		50	0
Generator	No	50		80.6	50	0
Tractor	No	40	84		50	0
Welder / Torch	No	40		74	50	0
Welder / Torch	No	40		74	50	0
Welder / Torch	No	40		74	50	0

Calculated (dBA)

Equipment		*Lmax	Leq
Crane		80.6	72.6
Forklift		85	81
Generator		80.6	77.6
Tractor		84	80
Welder / Torch		74	70
Welder / Torch		74	70
Welder / Torch		74	70
	Total	85	85.2

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/8/2022
Case Description: Paving

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	55	55	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	50	0
Paver	No	50		77.2	50	0
Paver	No	50		77.2	50	0
Roller	No	20		80	50	0
Tractor	No	40	84		50	0

Calculated (dBA)

Equipment	*Lmax	Leq
Concrete Mixer Truck	78.8	74.8
Paver	77.2	74.2
Paver	77.2	74.2
Roller	80	73
Tractor	84	80
Total	84	83.1

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 6/8/2022
Case Description: Architectural Coating

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	55	55	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50	0

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		77.7	73.7
	Total	77.7	73.7

*Calculated Lmax is the Loudest value.

APPENDIX C

Construction Vibration Worksheets

Meridian Consultants LLC

112 W. Acacia
Construction Vibration Model
(195 feet)

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	195	0.004	0.001	60
Jackhammer		1	0.035	195	0.002	0.000	52
Large bulldozer		1	0.089	195	0.004	0.001	60
Loaded trucks		1	0.076	195	0.003	0.001	59
Pile Drive (impact)		1	0.644	195	0.030	0.007	77
Vibratory Roller		1	0.210	195	0.010	0.002	68
Small bulldozer		1	0.003	195	0.000	0.000	31

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment**

Meridian Consultants LLC

123 W. Acacia
Construction Vibration Model
(65 feet)

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	65	0.021	0.005	74
Jackhammer		1	0.035	65	0.008	0.002	66
Large bulldozer		1	0.089	65	0.021	0.005	74
Loaded trucks		1	0.076	65	0.018	0.005	73
Pile Drive (impact)		1	0.644	65	0.154	0.038	92
Vibratory Roller		1	0.210	65	0.050	0.013	82
Small bulldozer		1	0.003	65	0.001	0.000	45

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment**

147 W. Acacia
Construction Vibration Model
(115 feet)

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	115	0.009	0.002	67
Jackhammer		1	0.035	115	0.004	0.001	59
Large bulldozer		1	0.089	115	0.009	0.002	67
Loaded trucks		1	0.076	115	0.008	0.002	66
Pile Drive (impact)		1	0.644	115	0.065	0.016	84
Vibratory Roller		1	0.210	115	0.021	0.005	75
Small bulldozer		1	0.003	115	0.000	0.000	38

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment**

119 W. Garfield
Construction Vibration Model
(210 feet)

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	210	0.004	0.001	59
Jackhammer		1	0.035	210	0.001	0.000	51
Large bulldozer		1	0.089	210	0.004	0.001	59
Loaded trucks		1	0.076	210	0.003	0.001	58
Pile Drive (impact)		1	0.644	210	0.026	0.007	76
Vibratory Roller		1	0.210	210	0.009	0.002	67
Small bulldozer		1	0.003	210	0.000	0.000	30

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment**

124 W. Garfield
Construction Vibration Model
(90 feet)

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	90	0.013	0.003	70
Jackhammer		1	0.035	90	0.005	0.001	62
Large bulldozer		1	0.089	90	0.013	0.003	70
Loaded trucks		1	0.076	90	0.011	0.003	69
Pile Drive (impact)		1	0.644	90	0.094	0.024	87
Vibratory Roller		1	0.210	90	0.031	0.008	78
Small bulldozer		1	0.003	90	0.000	0.000	41

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment**