NOISE AND VIBRATION TECHNICAL STUDY
KIA DEALERSHIP PROJECT

Prepared for:

CITY OF CALABASAS
100 Civic Center Way
Calabasas, CA 91302
Attn: Mr. Glenn Michitsch

Prepared by:

ENVICOM CORPORATION
4165 E. Thousand Oaks Boulevard, Suite 290
Westlake Village, CA 91362
Contact: Alejandro Garcia INCE-USA
Noise Services Manager
(818) 879-4700

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APPENDIX

1.0 INTRODUCTION

This Noise and Vibration Technical Analysis discusses the fundamentals of sound and vibration, characterizes existing conditions in the project area, and evaluates the potential for the proposed project to result in noise and vibration impacts at nearby noise and vibration sensitive receptors. This analysis also discusses applicable federal, state, and local noise guidelines, policies, and standards. All noise and vibration modeling worksheets are attached as **Appendix A**.

1.1 Noise and Vibration Fundamentals

1.1.1 Noise Glossary

Sound: Sound is a vibratory disturbance created by a moving or vibrating source in the pressure and density of a gaseous or liquid medium or in the elastic strain of a solid that is capable of being detected by the hearing organs.

Noise: Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and that causes a disturbance to humans.

Decibel (dB): The decibel is a unit used to measure the intensity of a sound or the power level of an electrical signal by comparing it with a given level on a logarithmic scale.

A-weighting (dBA): A-weighted sound levels represent the overall noise at a receiver that is adjusted in frequency to approximate typical human hearing sensitivity.

Equivalent continuous sound level (L_{eq}): L_{eq} is the equivalent continuous sound level and represents the total sound energy average over a period of interest.

Maximum sound level (L_{max}): The maximum level describes the maximum noise level reached during a single noise event.

Minimum sound level (L_{min}): The minimum sound level measured with 'A' frequency weighting and fast time weighting during the measurement period.

Statistical noise descriptors (L_n): Statistical analysis of noise levels. The 'n' denotes the percentage exceedance, for example the value of L90 shows the noise level that was exceeded for 90% of the measurement duration.

Root mean square (rms): The square root of the arithmetic average of the squared amplitude of a vibration signal.

Sound pressure level (SPL): A logarithmic measurement of the rms sound pressure of a sound relative to a reference value. It is measured in decibels (dB).

Day-night level (L_{dn}): L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10 dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10:00 p.m. and 7:00 a.m.

Community noise equivalent level (CNEL): Similar to L_{dn}, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10 dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10:00 p.m. and 7:00 a.m., and a 5 dB penalty applied to the A-weighted sound levels occurring during evening hours between 7:00 p.m. and 10:00 p.m.

Peak particle velocity (PPV): The peak signal value of an oscillating vibration velocity waveform. Usually expressed in inches/second in the United States.

Vibration decibel (VdB): The root mean square vibration velocity in a decibel scale used to convey the magnitude of the vibration signal felt by the human body, in inches per second.

Sensitive receptor: Noise and vibration sensitive receptors include land uses where quiet environments are necessary for enjoyment and public health and safety. Residences, schools, motels and hotels, libraries, religious institutions, hospitals, and nursing homes are examples.

1.2 Noise Fundamentals

Noise is defined as any unwanted or undesirable sound that disrupts or interferes with the normal auditory environment. It is often characterized by its loudness, pitch, frequency, and duration. Noise can be subjective, as what one person considers noise may not be perceived the same way by another. In various contexts, noise can refer to any sound that is considered disturbing, irritating, or harmful to human health and well-being. Noise pollution, for example, is the presence of excessive or intrusive noise in the environment that can have negative effects on individuals, communities, and ecosystems.

Sound perceived by humans is a vibration that propagates longitudinally through an elastic medium such as air, which is also known as an acoustic wave or pressure wave. This longitudinal wave is comprised of an amplitude, frequency, and wavelength. The amplitude of a sound wave can be defined as the loudness or the amount of maximum displacement of vibrating particles of the medium from their mean position when the sound is produced. Sound pressure level is the most common descriptor used to describe the perceived “loudness” of an ambient sound level. The standard measurement unit of sound pressure is called a decibel (dB). The frequency of sound is the number of oscillations per second and is measured in hertz (Hz). Frequency and pitch are often used synonymously – the higher the frequency, the higher the pitch. Lastly, the wavelength is simply the size of a wave measured from one peak to the next. The wavelength of a sound is inversely proportional to its frequency, and therefore, the higher the frequency, the shorter the wavelength.

A healthy and typical audible range for adult humans is between 20 Hz and 20,000 Hz. However, the human response to frequencies within the audible range are not all the same and tends to drop below 20,000 Hz with aging. To address this, the A- weighted scale is applied (dBA). The scale assigns a weight to the decibel value of sound based on the sensitivity of the ear at a particular frequency. Generally, the human ear naturally deemphasizes frequencies below 1,000 Hz and emphasizes frequencies between 1,000 Hz and 5,000 Hz. The human ear therefore has a natural “pick-up” in the frequencies that make consonant sounds in human speech.

Because the decibel is based on a logarithmic scale, a doubling of a sound source is perceived as a 3 dBA increase which is often referred to as the just noticeable difference threshold in an outdoor or uncontrolled environment. A change in 1 to 3 dBA is detectable under quiet, controlled, laboratory conditions. A change of 5 dBA is readily perceptible to most people and a change in 10 dBA is perceived as a doubling (or halving) of the sound. Another example is to consider that a 10 dBA increase is 10 times more intense than 1 dBA, a 20 dBA increase is 100 times more intense, a 30 dBA increase is 1,000 times more intense, and so on. **Table 1**, **Common Noise Levels**, show a range of urban noise sources, their noise levels, and subjective human impression.

Table 1
Common Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	70	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60	
		Large business office
Quiet urban daytime	50	Dishwasher in next room
Quiet urban daytime	40	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
Threshold of hearing	0	Threshold of hearing
Source: California Department of Transportation (Caltrans). 2013, September. Technical Noise Supplement ("TeNS").		

1.3 Health Effects of Noise to Humans

Loud noise can create physical and psychological stress, reduce productivity, and interfere with communication and concentration. Short term exposure to loud noise can also cause a temporary change in hearing (your ears may feel stuffed up) or a ringing in your ears (tinnitus). These short-term problems may go away within a few minutes or hours after leaving the noise. However, repeated exposures to loud noise can lead to permanent tinnitus and/or hearing loss. The effects of noise induced hearing loss can be profound, limiting your ability to hear high frequency sounds, understand speech, and seriously impairing your ability to communicate (OSHA).

1.4 Sound Propagation

In an exterior environment when a noise event occurs, the noise level diminishes with distance to the inverse square law which states that for every doubling of distance from the noise source to receiver, sound attenuates 6 dBA for point sources (most stationary noise sources such as mechanical equipment, loudspeakers, and people talking) and 3 dBA for line sources (e.g., roadways and rail lines). This is the minimum attenuation achieved and does not account for additional ground absorption and acoustical shielding from other buildings, walls, trees, or other physical barriers.

1.5 Vibration Fundamentals

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. Because the motion is oscillatory, there is no net movement of the vibration element and the average of any of the motion metrics is zero. Displacement is the most intuitive metric. For a vibrating floor, the displacement is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the floor movement and acceleration is the rate of change of the speed. Although displacement is easier to understand than velocity or acceleration, it is rarely used for describing ground-borne vibration. Most transducers used for measuring ground-borne vibration use either velocity or acceleration. Furthermore, the response of humans, buildings, and equipment to vibration is more accurately described using velocity or acceleration.

The typical frequency range of most ground-borne vibrations that can be felt by humans is less than 1 Hz to a high of 200 Hz. Common vibration metrics used to assess vibration are the root mean square (vibration decibel, VdB) and peak particle velocity (PPV). PPV is often used in monitoring of construction vibration (such as blasting) and to assess potential architectural damage since it is related to the stresses that are experienced by buildings. The units for PPV in the United States are normally inches per second (in/sec). VdB is commonly used when assessing the human response (also referred to human annoyance) to vibration as it uses the arithmetic average of the squared amplitude of the signal. Like noise, groundborne vibration attenuates with distance. Vibration attenuation varies depending on the soil type, compaction, and vibration frequency.

Traffic, including heavy trucks traveling on a highway, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage. However, there have been cases in which heavy trucks traveling over potholes or other discontinuities in the pavement have caused vibration high enough to result in complaints from nearby residents. These types of issues typically can be resolved by smoothing the roadway surface. In describing vibration in the ground and in structures, the motion of a particle (i.e., a point in or on the ground or structure) is used.

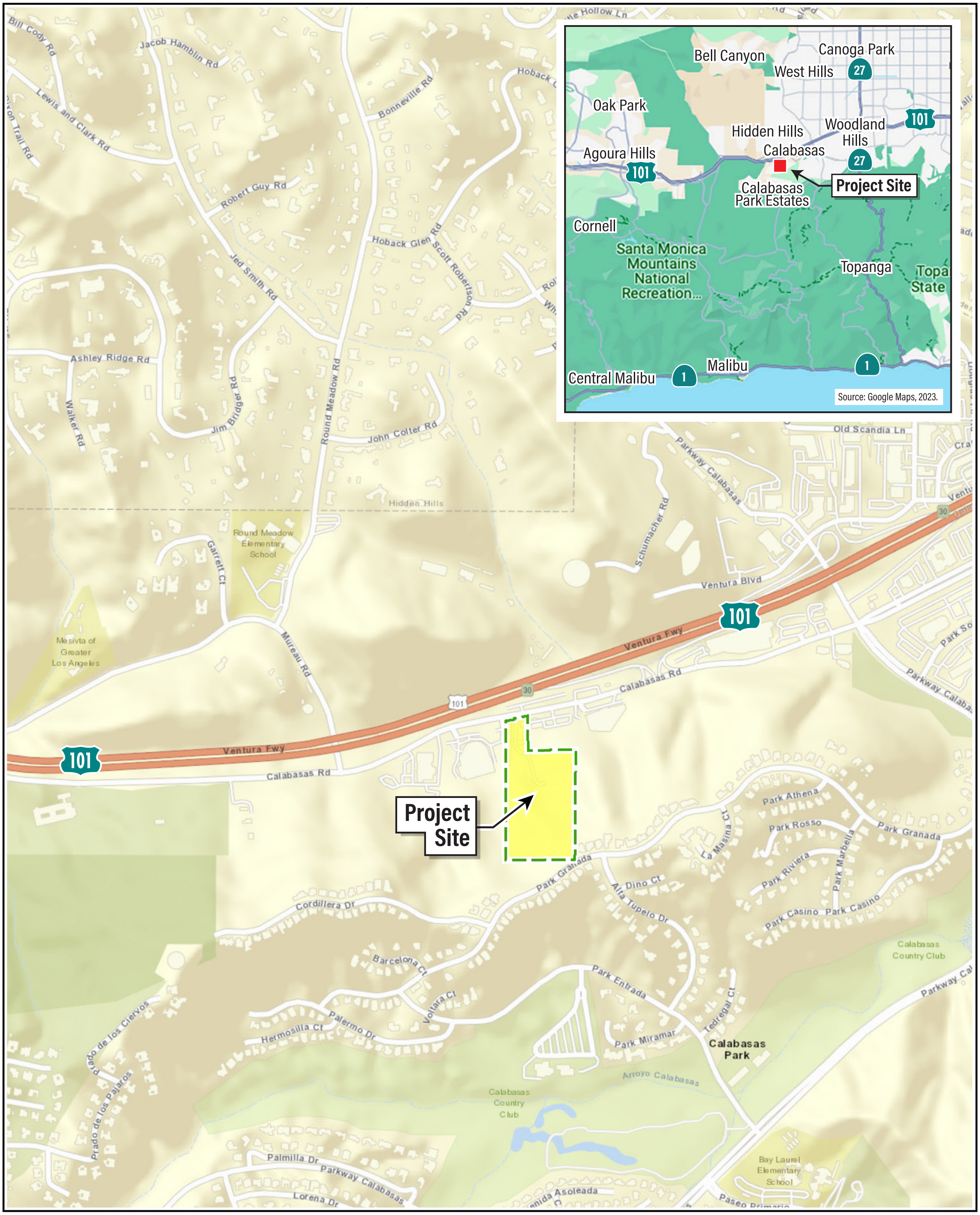
2.0 PROJECT LOCATION AND DESCRIPTION

2.1 Project Location

The project site address is located at 24460 Calabasas Road in Calabasas, California and is comprised of two parcels: APN 2069-009-020 and APN 2069-009-008 totaling 10.94 acres. The site is approximately 160 feet south of United States Route 101 (US 101) and next to Cadillac of Calabasas Dealership (east) and Bob Smith BMW dealership (west). According to the Calabasas General Plan Zoning Map, the project site is situated within the Commercial Retail/Commercial Auto Retailer zone. The project site boundary and site plan are shown in **Figure 1, Regional Location Map** and **Figure 2, Project Site Plan** on the following pages, respectively.

2.2 Project Description

The project site was historically used as a plant nursery, with retail operations shutting down in 2015. While the commercial structures that were part of that business have since been demolished, the site still contains many remnants of this previous development including paved areas, foundations, retaining walls, and graded pads. The proposed development includes construction and operation of a 2-story, 35-foot-tall auto dealership building and the construction of a separate car wash/detail building. The gross footprint for the primary 2-story dealership building is 23,972 SF and the gross footprint for the car wash building is 2,117 SF.



Source: ESRI World Street Maps, 2023.

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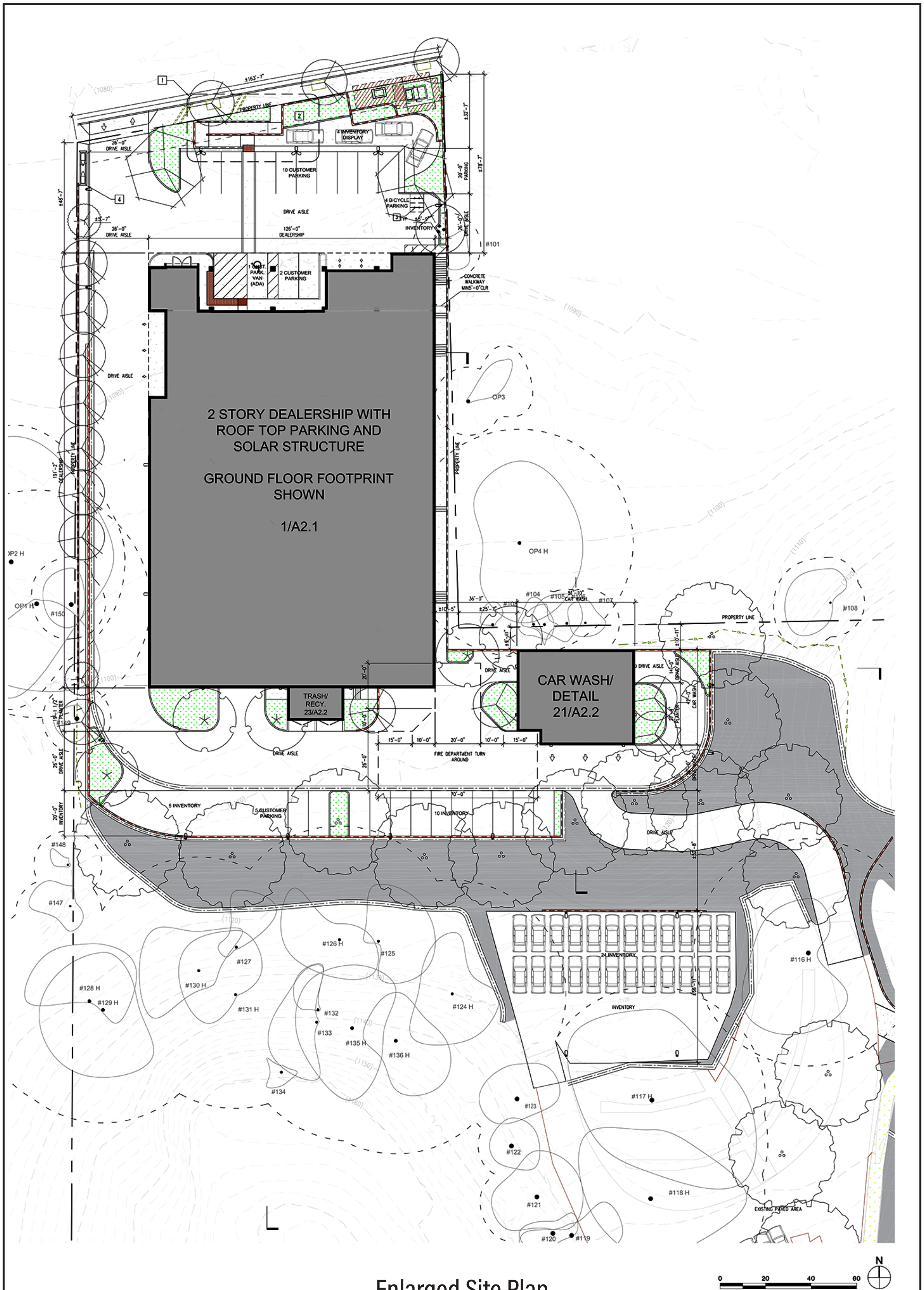
envicom

Regional Location Map

FEET 0 500 1,000

FIGURE 1



Enlarged Site Plan

Source: AHT Architects Inc., June 20, 2023.

3.0 REGULATORY SETTING

3.1 Federal

3.1.1 Federal Transit Administration

The US Department of Transportation Federal Transit Administration (FTA) published its latest Transit Noise and Vibration Impact Assessment Manual in 2018. This comprehensive manual covers procedures for predicting and evaluating noise and vibration impacts associated with proposed transit projects. The manual provides guidelines for assessing construction noise and vibration impacts including a comprehensive list of reference noise and vibration levels for construction equipment and construction noise and vibration impact criteria for various building and land use categories. It is important to note that this manual serves as guidance rather than a federal regulatory requirement. However, in the absence of quantitative construction noise and vibration standards, the criteria outlined in this FTA guidance manual are adopted for impact assessments for receptors in the City of Calabasas.

3.2 State

3.2.1 California Green Building Standards

The State of California's noise insulation standards for non-residential uses are codified in the California Code of Regulations, Title 24, Building Standards Administrative Code, Part 11, California Green Building Standards Code (CALGreen). CALGreen noise standards are applied to new or renovation construction projects in California to control interior noise levels resulting from exterior noise sources. Proposed projects may use either the prescriptive method (Section 5.507.4.1) or the performance method (5.507.4.2) to show compliance.

- **Section 5.507.4.1 Prescriptive Method**: Wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of noise less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 in the following locations:
    - Within the 65 CNEL or L_{dn} noise contour of an airport
    - Within the 65 CNEL or L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed guideway sources as determined by the Noise Element of the General Plan.
- **Section 5.507.4.2 Performance method:** For buildings located as defined in Section 5.07.4.1 or 5.507.4.1.1 of the CCR, wall and roof ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level 50 dBA $L_{eqc1hr)}$ in occupied areas during any hour of operation.

3.3 Local

3.3.1 City of Calabasas Municipal Code

The Calabasas Municipal Code (CMC) provides performance noise standards and exterior noise standards under Chapter Section 17.20.161(A) and Section 17.20.161(D), respectively. The performance noise standards are applicable to all development, except for the construction of one single-family home on an existing lot, the expansion of existing commercial, office and business park projects, and the addition of housing units to an existing multi-family residential project.

Performance Noise Standards

The proposed project is subject to the following mitigation measures outlined in the CMC performance noise standards:

Project Site Planning

- Orient buildings to buffer or attenuate noise.
- Locate the highest noise sources as far away from adjacent sensitive uses as is feasible.
- Provide sound attenuation walls (open space buffers and berms are preferred).
- Utilize landscape materials and "softscape" design to break up hard surfaces for the purpose of minimizing reverberation (mandatory for noise, as well as aesthetic purposes).

Landscape Treatment

- Utilize open space and landscape buffers between uses to naturally attenuate noise with distance. Project applicants shall be responsible for providing open space buffers in the form of easements to eliminate noise encroachment from having an adverse effect. The distance shall be sufficient to meet the exterior noise standards established in Sections 17.20.160 (C) and (D).
- For commercial retail and business park uses place fixed equipment, such as air conditioning units, inside an enclosed space, or in shielded locations.

Architectural Design

- For commercial, office, and business park uses, place rooftop equipment at an appropriate setback from property lines, or in acoustically treated mechanical rooms or in shielded equipment wells, to meet noise standards and minimize disturbance potential.
- Provide one or more of the following: sound rated windows, additional exterior wall or roof insulation, vent or mail slot modifications or relocation, or forced air ventilation.

The exterior noise standards are intended to protect persons from excessive noise levels, which are detrimental to the public health, welfare and safety since they have the potential to:

- interfere with sleep, communication, relaxation and the full enjoyment of property.
- contribute to hearing impairment and a wide range of adverse physiological stress conditions.
- adversely affects the value of real property.

Exterior Noise Standards

Exemptions

Section 17.20.160(C) of the CMC provides exemptions to the exterior noise standards. Applicable exemptions to the project are:

- Noise sources associated with construction, including the idling of construction vehicles, provided such activities do not take place before 7:00 a.m. or after 6:00 p.m. on any day except Saturday in which no construction is allowed before 8:00 a.m. or after 5:00 p.m. No construction is allowed on Sunday's or federal holidays. These requirements may be modified by a conditional use permit.
- Noise sources associated with the collection of waste or garbage from property devoted to other than residential uses.

Table 2, Calabasas Exterior Noise Standards summarizes the CMC exterior noise standards for residential receptors.

Table 2
Calabasas Exterior Noise Standards

Day of Week		Time of Day	dBA L_{eq} Residential
Monday – Friday	Nighttime	10:00 p.m. to 7:00 a.m.	50
	Daytime	7:00 a.m. to 10:00 p.m.	65
Saturday and Sunday	Nighttime	10:00 p.m. to 8:00 a.m.	50
	Daytime	8:00 a.m. to 10:00 p.m.	60
Source: City of Calabasas Municipal Code §17.20.160(D).			

3.3.2 County of Los Angeles

North of the project site across US 101 lies a section of unincorporated Los Angeles (LA) County designated as single-family that is approximately 400 feet from the project site boundary. Because the property line of this receptor is within 500 feet of the project property line, applicable LA County standards are discussed and applied to this receptor.

- Section 12.08.390 of the Los Angeles County Code (LACC) establishes exterior noise standards (for stationary sources) for residential uses. The daytime (7:00 a.m. to 10:00 p.m.) exterior noise standard for residential uses is 50 dB, and during nighttime (10:00 p.m. to 7:00 a.m.), it is set at 45 dB.
- Section 12.08.440 of the LACC sets forth long-term construction noise standards of 60 dBA during the hours of 7:00 a.m. to 8:00 p.m. All mobile or stationary internal-combustion-engine powered equipment or machinery shall be equipped with suitable exhaust and air-intake silencers in proper working order.
- Section 12.08.450 of the LACC limits the operation or of any forced-air blower in a tunnel car wash between the hours of 7:00 a.m. and 8:00 p.m. in such a manner as to exceed 60 dBA at a residential property.

4.0 EXISTING CONDITIONS

The primary noise source in the project vicinity is traffic noise from US 101, located approximately 160 feet south of the project site. To establish existing conditions, a version of the Federal Highway Traffic Noise Prediction Model (FHWA RD77-108) was used to model the existing US 101 traffic noise contours. Traffic model inputs, including average daily traffic (ADT) volumes and fleet mix, were sourced from Caltrans (Caltrans, 2021). **Table 3, Existing Freeway Traffic Noise Contours** summarizes the modeled CNEL (dBA) noise level at 50 feet and the distances to the 60, 65, and 70+ CNEL noise contours. The traffic noise model indicates the project site is within the 70 dBA CNEL noise contour.

Table 3
Existing Freeway Traffic Noise Contours

US 101	ADT Volumes	dBA CNEL at 50 Feet	Distance in feet to CNEL Contours		
			70+ dBA	65 dBA	60 dBA
US 101 west JCT. RTE. 27, Topanga Canyon Boulevard Interchange	213,000	86.4	621	1,339	2,884

Source: Caltrans Traffic Census, 2021
Notes: See Appendix A for traffic noise calculation worksheets.

4.1 Sensitive Receptors

Certain land uses, such as residences, schools, and hospitals, are particularly sensitive to noise and vibration. Sensitive receptors include residences, senior housing, schools, places of worship, libraries, and recreational areas. These uses are regarded as sensitive because they are where citizens most frequently engage in tranquil activities which are likely to be disturbed by noise, such as reading, studying, sleeping, resting, or prayer. Commercial and industrial uses are not particularly sensitive to noise but are evaluated for potential vibration impacts.

The nearest sensitive receptors to the project site are located within two different jurisdictions: unincorporated LA County and the City of Calabasas. The nearest receptor is a single-family home situated north of US 101 in unincorporated LA County, approximately 400 feet from the nearest project site boundary. The second closest sensitive receptors are single-family homes located approximately 580 feet to the south of the nearest project site boundary, within the City of Calabasas. It's important to note that the distances in this section (4.1 Sensitive Receptors) are measured from the project site boundary to the receptor property lines. In the impact analysis, distances may vary as noise impacts depend on the specific location of the sound source (e.g., car wash, HVAC) relative to the receptor

5.0 PROJECT-RELATED NOISE AND VIBRATION IMPACT ANALYSIS

5.1 Construction Noise

Project-related construction noise is generated from off-site mobile sources used to transport workers and materials and from on-site noise sources from construction equipment. Construction would occur during the permissible outlined in the CMC, permitting work from Monday through Friday between 7:00 a.m. to 6:00 p.m., and on Saturdays from 8:00 a.m. to 5:00 p.m. Construction is prohibited on Sundays and federal holidays. Construction is estimated to begin April of 2024 and be completed by May of 2025.

5.2 Construction Vehicles

The transport of workers and materials to and from the construction site would incrementally increase noise levels along access roadways in the project vicinity. Individual construction vehicle pass-bys and haul trucks may create momentary noise levels of up to 85 dBA (L_{max}) at 50 feet from the vehicle, but these occurrences would be temporary and generally short lived as trucks pass by.

Caltrans reports an existing ADT volume of 213,000 vehicles along US 101 near the project site. Additionally, the traffic study conducted by Associated Traffic Engineers reports an existing ADT of 7,160 vehicles along Calabasas Road next to the project site. [1] Based on the California Emissions Estimator Model (CalEEMod) defaults, the project would generate up to 34 daily worker/vendor trips during the 200 work-day building construction phase and up to 44 daily haul truck trips over a 40 work-day grading phase . The generation of these construction trips would result in a less than 0.5 dBA CNEL increase. Increases less than 3 dB are indiscernible in an exterior environment. In addition, all construction trips would cease upon completion of the proposed project.

5.3 Construction Equipment

Construction occurs in discrete activity phases and construction noise generated from project activities varies based on the type of equipment used, the location of the equipment relative to sensitive receptors, and acoustical usage factor.[2] Each construction activity (e.g., demolition, grading, building construction) can involve the use of different construction equipment (equipment mix), and therefore each activity can emit distinct noise characteristics. Construction noise is often dominated by the loudest piece of construction equipment, and the dominant noise source for non-impact equipment is typically the engine. Impact noise sources such as hammering work-piece noise can also be noticeable.

The CalEEMod default construction equipment mix provided by Air Quality report was used to model construction noise by activity phase. The equipment mix was modeled using the Roadway Construction Noise Model (RCNM). Average construction noise levels for each activity phase were modeled using the top three loudest pieces of equipment. To calculate the noise level at sensitive receptors, the distance from the construction activity to the nearest receptor was measured from the acoustical center of the activity (e.g., paving, grading, building construction). **Table 4**, **Construction Equipment Noise Level at Sensitive Receptors** shows the construction noise levels per activity phase at a distance of 50 feet and at the nearest sensitive receptors. Modeling details and spreadsheets are in Appendix A.

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1 Existing peak PM traffic volumes provided by Associated Transportation Engineers (ATE) and a standard peak hour to daily multiplier of 10 was applied to estimate ADT.

2 Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.

Table 4
Construction Equipment Noise Level at Sensitive Receptors

Modeled Equipment per Construction Activity	Construction Noise Levels in dBA L_{eq}[1]		
	RCNM reference Noise Levels [1]	Residential Receptors to the South (Calabasas)	Residential Receptors to the North (unincorporated LA)
Distance	***50 feet***	***900 feet***	***600 feet***
Demolition	85	60	64
Site Preparation	85	59	63
Grading	85	59	63
Building Construction	82	57	60
Architectural Coating	74	49	52
Distance in feet	***50 feet***	***650 feet***	***460 feet***
Paving/Parking Lot	83	60	63
Maximum Construction Noise	**85**	**60**	**64**

Source: RCNM and CalEEMod construction defaults.
Notes: See Appendix A for distances and calculations.
[1] dBA L_{eq} is rounded to the nearest whole number.

LA County Receptor

The closest single-family residence located in unincorporated LA County would be exposed to construction noise levels of up to 64 dBA L_{eq}. While this exceeds the LA County construction noise standard of 60 dBA, this receptor is situated approximately 75 feet from US 101 and within the 70+ dBA CNEL freeway noise contour (see Table 3). For instance, a single passenger vehicle traveling at 60 miles per hour typically registers at approximately 80 dBA L_{eq} when measured at a distance of 50 feet. Trucks, trailers, and other heavy-duty vehicles would produce even higher noise levels. When these levels are adjusted for the receptor's distance of 75 feet, they would experience traffic noise levels of at least 78 dBA L_{eq}. Construction noise levels would be approximately 11 decibels below ambient conditions and would not result in a substantial noise increase.

Furthermore, Section 12.08.440 of the LACC mandates that all mobile or stationary internal-combustion-engine powered equipment or machinery must be equipped with suitable exhaust mufflers and air-intake silencers in proper working order. A study conducted for the US Department of Transportation reported that applying a good muffler to equipment without one or with a poor muffler can reduce overall noise by 6 to 12 dBA (Toth 1979). This requirement would further reduce noise levels to 58 dBA or less. Therefore, construction noise would not result in a substantial noise increase at this noise sensitive receptor.

Calabasas Receptors

The City of Calabasas does not have construction noise standards; therefore, the FTA daytime construction noise criteria of 80 dBA L_{eq} is used. As indicated in Table 4, the nearest single-family homes in the City of Calabasas would experience construction noise levels of up to 60 dBA. Therefore, construction noise would not exceed the FTA construction noise threshold for residential uses, and it would not result in a substantial noise increase at these noise-sensitive receptors. Additionally, as mentioned above, noise levels would be further reduced by at least 6 dBA with the use of proper exhaust mufflers.

5.4 Operational Noise

The proposed project would generate on-site and off-site operational noise. Off-site operational noise would arise from project trip generation, contributing to incremental increases in traffic noise along nearby roadway segments. On-site operational noise sources encompass noise generated by heating, ventilation, and cooling mechanical equipment (HVAC) and the blow dryers in the car wash tunnel. The proposed car wash would not be open to the public and does not include outdoor vacuum stalls. Therefore, the primary noise source from the car wash would be from the blow dryers.

5.4.1 Off-Site Operational Traffic Noise

PM peak-hour trips for the *existing no project*, *existing plus project*, and *cumulative no project* and *cumulative plus project* were provided by ATE. The PM peak-hour trips were converted to ADT volumes using a standard peak-hour daily multiplier of 10. To estimate the traffic noise, increase due to the project, the *existing plus project* traffic volumes are logarithmically compared to the *existing no project* traffic volumes. The same method is used in determining the project's traffic noise increase contribution for *cumulative* (*cumulative plus project* traffic volumes are compared to *cumulative no project*).

A change of 5 dBA is readily discernible to most people in an exterior environment. People with normal or healthy hearing can typically detect a 3 dBA change in noise under normal conditions. Changes between 1 to 2 dBA are typically only perceptible under quiet, controlled conditions such as an audiometric booth, and changes less than 1 dBA are typically imperceptible. Considering these perceptibility thresholds, the Federal Aviation Administration's (FAA) and Federal Interagency Committee on Noise (FICON) criterion for impact significance is applied and a significant traffic noise increase would occur if the project results in a:

- 1.5 dBA CNEL increase in ambient noise environments greater than 65 dBA CNEL.
- 3.0 dBA CNEL increase in ambient noise environments between 60 -65 dBA CNEL.
- 5 dBA CNEL increase in ambient noise environments less than 60 dBA CNEL.

Table 5, Project-Related Traffic Noise Increase displays project and cumulative traffic noise increase along study roadway segments. The traffic noise increase attributed to the project is anticipated to be 1.1 dBA CNEL or less, and the project's contribution to cumulative traffic noise is 0.9 dBA CNEL or less. Consequently, all study roadway segments are projected to experience an increase of less than 1.5 dBA CNEL. Therefore, the project would not result in a substantial traffic noise increase.

5.4.2 On-Site Operational Stationary Noise

Outdoor Mechanical Equipment

The proposed project is anticipated to have heating, ventilation, and cooling (HVAC) equipment on rooftops. HVAC equipment would be installed near the center of the building's rooftop. HVAC equipment typically ranges between 60 dBA to 72 dBA at a distance of 3 feet. The nearest sensitive receptors to the rooftop mechanical equipment would be the single-family homes to the north (LA County) and south (City of Calabasas) situated approximately 600 feet and 900 feet away, respectively. At these distances, noise levels would attenuate to 26 dBA or less. Therefore, HVAC noise levels comply with the LACC exterior noise standards of 45 dBA (nighttime) and 50 dBA (daytime), as well as comply with the CMC noise standards for weekday daytime/nighttime of 65/50 dBA and weekend daytime/nighttime standards of 60/50 dBA.

Table 5
Project-Related Traffic Noise Increase

Roadway Segment	ADT Volumes				dBA CNEL		
	Existing No Project	Existing Plus Project	Cumulative No Project	Cumulative Plus Project	Project Noise Increase	Cumulative Plus Project Increase	Project's Contribution to Cumulative
Mureau Road north of Calabasas Road	6,970	7,090	8,030	8,150	0.1	0.7	0.1
Calabasas Road east of Mureau Road	7,160	7,280	8,820	8,940	0.1	1.0	0.1
Calabasas Road east of US 101 on/off ramps	13,610	14,230	14,750	15,370	0.2	0.5	0.2
Calabasas Road west of US 101 on/off ramps	9,540	10,580	11,110	12,150	0.4	1.1	0.4
Parkway Calabasas north of Calabasas Road	18,230	18,730	19,770	20,270	0.1	0.5	0.1
Parkway Calabasas south of Calabasas Road	13,200	13,250	11,220	13,810	0.0	0.2	0.9
Calabasas Road east of Parkway Calabasas	12,110	12,180	13,090	13,160	0.0	0.4	0.0
Calabasas Road west of Parkway Calabasas	12,960	13,580	12,160	15,320	0.2	0.7	0.2

Notes: See Noise Appendix A for traffic noise calculation worksheets.
Source: ATE, November 2023

Car Wash Blow Dryers

The proposed project involves the construction of a car wash intended exclusively for servicing the dealership's vehicles. Site plans show the car wash to function as a drive-through car wash with blow dryers near the exist. However, the car wash would not install outdoor vacuum stalls. Consequently, this noise analysis focuses on noise impacts from the tunnel blow dryers.

Additionally, the car wash will not be accessible to the general public and will operate in accordance with the allowable hours of operation stipulated in both the LACC and CMC. During weekdays (Monday to Friday), the car wash would operate from 7:00 a.m. to 8:00 p.m., ensuring compliance with the LACC car wash operational hours, which allow operation from 7:00 a.m. to 8:00 p.m. On weekends (Saturday and Sunday), the car wash would operate from 8:00 a.m. to 8:00 p.m. This schedule ensures compliance with the City of Calabasas daytime hours of operation, which extend from 8:00 a.m. to 10:00 p.m. on weekends, while also adhering to the LACC car wash operational hours during this timeframe. Thus, the project's proposed car wash hours effectively accommodate both sets of standards, with minor adjustments for weekend operations to meet the requirements of both jurisdictions.

LA County Receptor

The nearest sensitive receptor in unincorporated LA County and is subject to different noise standards outlined in Section 12.08.450 of the LACC which restricts the operation of forced-air blowers in car wash tunnels between 7:00 a.m. and 8:00 p.m. Noise levels during the allowable hours are to not exceed 60 dBA at a residential property. The car wash is approximately 660 feet from the residential property line. As indicated in Table 6, noise levels at this distance would attenuate to 49 dBA or less. Therefore, blow dryer noise from the car wash would be compliant with the LACC noise limit for forced-air blow dryers.

City of Calabasas Receptors

The nearest residential property line within the City of Calabasas is approximately 730 feet from the car wash. As indicated in **Table 6**, **Car Wash Dryer Noise Levels at Receptors** noise levels at this distance would attenuate to 50 dBA or less. Therefore, blow dryer noise levels would comply with the CMC noise standards for weekday daytime/nighttime of 65/50 dBA and weekend daytime/nighttime standards of 60/50 dBA.

Table 6
Car Wash Dryer Noise Levels at Receptors

Receptor	Jurisdiction	Distance to Car Wash	Dryer Noise Levels at Receptors	
Single-family homes to the north	City of Calabasas	730 feet	10HP without PowerLock[1]	45 dB
			15HP without PowerLock[2]	49 dB
Single-family home to the south	LA County	660 feet	10HP without PowerLock[1]	46 dB
			15HP without PowerLock[2]	50 dB

Source: MacNiel Wash Systems
Notes: HP = Horsepower
[1] Maximum level displayed from Table 6 associated with 10 HP Model
[2] Maximum level displayed from Table 6 associated with 15 HP Model
See Appendix A for reference data and calculation worksheets.

5.5 Vibration

Groundborne vibration from construction activities generates vibration levels of varying intensity depending on the equipment. As construction equipment operates, it generates vibrations that travel through the ground, creating a spectrum of effects ranging from imperceptible to humans to potentially physically impactful to nearby structures. Groundborne vibration propagates through the ground, and the attenuation of vibration can depend on various factors such as distance from the source, soil characteristics, vibration-specific frequencies, the building structure itself, and depth of the vibration sources.

5.5.1 Vibration Damage

To assess potential vibration impacts, the FTA criterion of 0.2 inches per second (in/sec), peak particle velocity (PPV), is employed for non-engineered timber and masonry buildings, which are representative of typical residential construction. This criterion is conservatively applied to the surrounding commercial buildings as well.

To estimate vibration levels at the nearest structures, reference vibration levels at a distance of 25 feet for various equipment, as provided by the FTA, are utilized. Attenuated vibration levels are determined by measuring from the vibration source (construction equipment) to the nearest off-site structure. The closest structure to the project site boundary is the neighboring BMW dealership building to the west, situated approximately 80 feet from the project site boundary. As shown in **Table 7, Vibration Damage Levels at Nearby Sensitive Receptors** vibration levels would attenuate to 0.037 in/sec PPV at 80 feet. Construction related vibration would not exceed the FTA criterion of 0.20 in/sec PPV at the nearest off-site structure. In addition, the nearest residential building is over 600 feet away from the project boundary, and therefore, would also experience vibration levels less than 0.20 in/sec PPV.

Table 7
Vibration Damage Levels at Nearby Sensitive Receptors

Equipment	Vibration Levels, PPV (in/sec)	
	FTA Reference Level at 25 feet	BMW Dealership Building - 80 feet west
Vibratory Roller	0.210	0.037
Large Bulldozer	0.089	0.016
Caisson Drilling	0.089	0.016
Loaded Trucks	0.079	0.013
Jackhammer	0.035	0.006
Small Bulldozer	0.003	0.001
Source: FTA 2018 Notes: in/sec = inches per second; PPV = peak particle velocity		

5.5.2 Operational Vibration

The proposed project would not have significant sources of operational vibration, such as rail systems or railroad tracks. Therefore, the project would not generate substantial long-term vibration levels.

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APPENDIX A

Noise and Modeling Worksheets

Construction Noise Modeling

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/13/2023
Case Description: Kia Dealership 2023-105-01

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Demolition	Residential	70.0	65.0	60.0

Equipment

Description	Impact Device	Spec Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	50.0	0.0
Tractor	No	40	84.0		50.0	0.0
Dozer	No	40		81.7	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Saw	89.6	82.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	89.6	85.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 06/04/2024
Case Description: Kia Dealership 2023-105-01

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site Preparation	Residential	70.0	65.0	60.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Grader	No	40	85.0		50.0	0.0
Tractor	No	40	84.0		50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	85.0	81.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	85.0	84.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 06/04/2024
Case Description: Kia Dealership 2023-105-01

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Grading	Residential	70.0	65.0	60.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50.0	0.0
Grader	No	40	85.0		50.0	0.0
Tractor	No	40	84.0		50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	85.0	81.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	85.0	84.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 06/04/2024
Case Description: Kia Dealership 2023-105-01

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Building Construction	Residential	70.0	65.0	60.0

Equipment

Description	Impact Device	Spec Usage (%)	Actual Lmax (dBA)	Receptor Lmax (dBA)	Estimated Distance (feet)	Shielding (dBA)
Crane	No	16		80.6	50.0	0.0
Tractor	No	40	84.0		50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Calculated (dBA) Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Crane	80.6	72.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	79.1	75.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	84.0	81.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/13/2023
Case Description: Kia Dealership 2023-105-01

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Paving	Residential	70.0	65.0	60.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	50.0	0.0
Drum Mixer	No	50		80.0	50.0	0.0
Tractor	No	40	84.0		50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	77.2	74.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Drum Mixer	80.0	77.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	84.0	82.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/13/2023
Case Description: Kia Dealership 2023-105-01

**** Receptor #1 ****

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Paving	Residential	70.0	65.0	60.0

Equipment

Description	Impact Device	Spec Usage (%)	Actual Lmax (dBA)	Receptor Lmax (dBA)	Estimated Distance (feet)	Shielding (dBA)
Compressor (air)	No	40		77.7	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	77.7	73.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	77.7	73.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Kia Dealership Project #2023.105.01

Construction Noise Modeling Attenuation Calculations

Levels in dBA Leq

Phase	RCNM Reference Noise Level	Calabasas SF Homes - South	LA unincorporated SF Home - North
Distance in feet	*50*	*900*	*600*
Demolition	85	60	64
Site Preparation	85	59	63
Grading	85	59	63
Building Construction	82	57	60
Architectural Coating	74	49	52
Distance in feet	*50*	*650*	*460*
Paving	83	60	63

Attenuation calculated through Inverse Square Law: Lp(R2) = Lp(R1) - 20Log(R2/R1)

Kia Dealership Project #2023.105.01
Vibration Damage Attenuation Calculations

		Levels, PPV (in/sec)			
	Vibration Reference	BMW Building to west			
Distance in feet		80			
Vibratory Roller	0.21	0.037			
Large Bulldozer	0.089	0.016			
Caisson Drilling	0.089	0.016			
Loaded Trucks	0.076	0.013			
Jackhammer	0.035	0.006			
Small Bulldozer	0.003	0.001			

Kia Dealership Project #2023.105.01

CalEEMod Construction Trips Worksheet

Phase Name	Trip Type	One-Way Trips per Day	Total Trips Per Phase: Non Haul	Total Trips Per Phase: Haul Tucks
Demolition				
	Worker	10	10	
	Vendor			
	Hauling	11		11
	Onsite truck			
Site Preparation				
	Worker	5	5	
	Vendor			
	Hauling	0		0
	Onsite truck			
Grading				
	Worker	7.5	8	
	Vendor			
	Hauling	44		**44**
	Onsite truck			
Building Construction				
	Worker	24	**34**	
	Vendor	11		
	Hauling	0		0
	Onsite truck			
Paving				
	Worker	18	18	0
	Vendor			
	Hauling	0		0
	Onsite truck			
Architectural Coating				
	Worker	5	5	0
	Vendor			
	Hauling	0		0
	Onsite truck			

Stationary Noise Modeling

Kia Dealership Project #2023.105.01

HVAC Noise Modeling Attenuation Calculations

Levels in dBA			
Rooftop Equipment	Reference HVAC Level	Calabasas SF Homes - South	LA unincorporated SF Home - North
Distance in feet	*3*	*900*	*600*
HVAC	72	22	26
HVAC	59	10	13

Reference Car Wash Dryer Noise Levels

Carwash Tunnel	Reference Noise Level at 1 Meter	Reference Noise Level Conveted to Feet	Reference Noise Level Normalized to 5 Feet
Distances	*1*	*3.28*	*5*
10HP Tech 21 Dryer Max	92	96	88
15HP Tech 21 Dryer Reference Level Max	96	85	92

Carwash Dryer Noise Levels At Receptors

Carwash Tunnel	Dryer Reference Level	Calabasas SF Homes - South	LA unincorporated SF Home - North
Distance in feet	*5*	*730*	*660*
10HP Tech 21 Dryer Max	88	45	46
15HP Tech 21 Dryer Reference Level Max	92	49	50

Attenuation calculated through Inverse Square Law: Lp(R2) = Lp(R1) - 20Log(R2/R1)

HVAC Source: Carrier Product Data for FJ4 Base Series Fan Coil Sizes 18-60
Carrier Product Data for GH5S Single-Stage Heat Pump

OCT / 07

POWERLOCK SOUND PRESSURE LEVELS
Individual Fan Study

10HP Tech 21 Dryer

10HP at 1 meter **without** PowerLock	=	92DB
10HP at 1 meter with PowerLock **open**	=	88DB
10HP at 1 meter with PowerLock **closed**	=	85DB

15HP Tech 21 Dryer

15HP at 1 meter **without** PowerLock	=	96DB
15HP at 1 meter with PowerLock **open**	=	92DB
15HP at 1 meter with PowerLock **closed**	=	87DB

On average, a site will appreciate a 30-50% sound reduction, depending on its dryer package, valve cycling, and wash area.

Bob MacNeil
R&D

Traffic Noise Modeling

Traffic Noise Calculator: FHWA 77-108

Kia Dealership Project

Inputs														Outputs					
														dBA at 50 feet			distance to CNEL Contour		
Roadway	Segment	ADT	Posted Speed Limit	Grade	% Autos	% Med Trucks	% Heavy Trucks	% Daytime	% Evening	% Night	Number of Lanes	Site Condition	Distance to Reciever	$L_{eq-24hr}$	L_{dn}	CNEL	70 dBA	65 dBA	60 dBA
State Route 101	West of JCT. RTE. 27, Topanga Canyon Boulevard Interchange	213,000	65	0.0%	94.5%	3.4%	2.1%	75.0%	15.0%	10.0%	6	Soft	50	82.9	85.7	86.4	621	1339	2884

Kia Dealership Project #2023.105.01
Traffic Noise Calculations

	ADT Volumes					dBA CNEL Increae		
Roadway Segment	Existing No Project	Project Trip Distribution	Existing Plus Project	Cumulative No Project	Cumulative Plus Project	Project Noise Increase	Cumulative Increase	Project Cumulative Contribution
Mureau Road north of Calabasas Road	6,970	120	7,090	8,030	8,150	0.1	0.7	0.1
Calabasas Road east of Mureau Road	7,160	120	7,280	8,820	8,940	0.1	1.0	0.1
Calabasas Road east of SR-101 on/off ramps	13,610	620	14,230	14,750	15,370	0.2	0.5	0.2
Calabasas Road west of SR-101 on/off ramps	9,540	1,040	10,580	11,110	12,150	0.4	1.1	0.4
Parkway Calabasas north of Calabasas Road	18,230	500	18,730	19,770	20,270	0.1	0.5	0.1
Parkway Calabasas south of Calabasas Road	13,200	50	13,250	11,220	13,810	0.0	0.2	0.9
Calabasas Road east of Parkway Calabasas	12,110	70	12,180	13,090	13,160	0.0	0.4	0.0
Calabasas Road west of Parkway Calabasas	12,960	620	13,580	12,160	15,320	0.2	0.7	1.0