LOS PINOS APARTMENTS
3496 SANTA ROSA AVENUE
ENVIRONMENTAL NOISE ASSESSMENT

Santa Rosa, California

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INTRODUCTION

This report summarizes the evaluation of noise and vibration levels attributable to construction activities and project operations due to the proposed Los Pinos Apartments project on a ± 2.49-acre lot at 3496 Santa Rosa Avenue on the east side of the roadway between East Robles and Brooks Avenues in Unincorporated Sonoma County south of the City of Santa Rosa with respect to the regulatory criteria established by the Sonoma County General Plan and the Sonoma County Guidelines for the Preparation of Noise Analysis. The report first describes the project and study area, and the applicable regulatory criteria used in the assessment of project-generated noise and vibration levels. The report then presents the results of an on-site noise measurement survey and an assessment of the existing noise environment on the proposed project along with project-generated noise on area noise sensitive receptors. A brief discussion of the fundamentals of environmental noise and groundborne vibration is presented in Appendix A for those unfamiliar with acoustical terms or concepts.

PROJECT DESCRIPTION

The Los Pinos Apartments project proposes to construct seven residential buildings with a total of 50 apartment units on a ± 2.49-acre lot at 3496 Santa Rosa Avenue on the east side of Santa Rosa Avenue between East Robles and Brooks Avenues in Unincorporated Sonoma County south of the City of Santa Rosa.

NOISE ANALYSIS STUDY AREA

The project site is a flat vacant undeveloped parcel bordered by Santa Rosa Avenue and commercial and residential land uses to the west, a self-storage commercial facility to the south, A channelized creek with largely undeveloped Rural Residentially zoned land to the east, and undeveloped Industrial land the north. The closest noise sensitive residential uses to the project site are two mobile home parks opposite Santa Rosa Avenue, and the Rural Residentially zoned parcels east of the creek. The Figure 1 shows the site plan of the proposed project, adjacent land uses and receptor locations, and noise monitoring locations selected during the noise survey. The closest home or outdoor activity areas of the mobile home parks opposite Santa Rosa Avenue are situated approximately 70 feet (southwestern mobile home park) and 100 feet (northwestern mobile home park) from the centerline of Santa Rosa Avenue. The closest portion of the Rural Residentially zoned parcels east of the site is approximately 860 feet from the centerline of Santa Rosa Avenue.

REGULATORY CRITERIA

The State of California and Sonoma County have established regulatory criteria that are applicable in this assessment. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies. A summary of applicable regulatory criteria is provided below.

2018 State CEQA Guidelines.

The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) 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;

(b) Generation of excessive groundborne vibration or groundborne noise levels;

(c) 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 would expose people residing or working in the project area to excessive noise levels?

Checklist items (a) and (b) are applicable to the proposed project. The project is not located within the vicinity of a private airstrip or a public airport and would not expose people residing or working in the project area to excessive aircraft noise levels; therefore, item (c) is not carried further in this analysis.

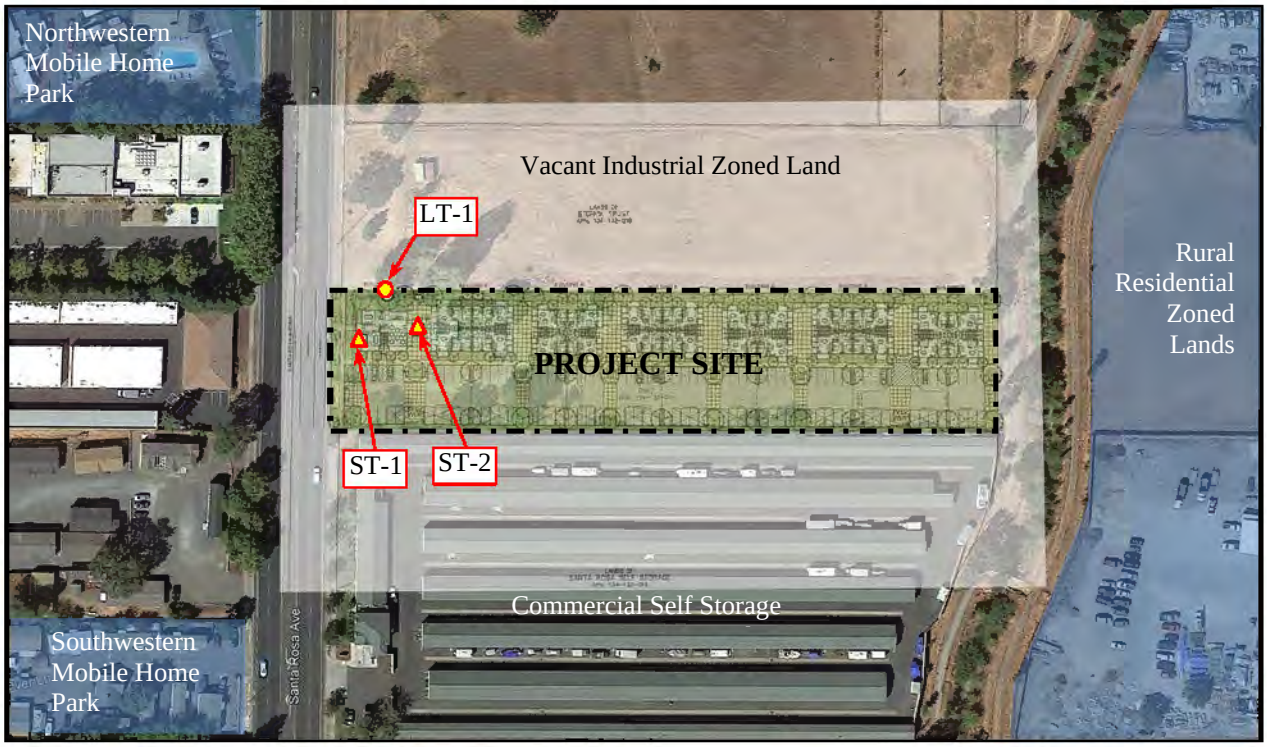


Figure 1: Aerial Photo of Project Site, Noise Monitoring Locations and Surroundings

2016 California Building Code, Title 24, Part 2.

The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn}/CNEL in any habitable room.

Sonoma County 2020 General Plan.

The Noise Element of Sonoma County's 2020 General Plan identifies policies intended to "Protect people from the adverse effects of exposure to excessive noise bad to achieve an environment in which people and land uses function without impairment from noise." Objectives and policies of the Noise Element that are applicable in the assessment of the proposed project are as follows:

Objective NE-1.1: Provide noise exposure information so that noise impacts may be effectively evaluated in land use planning and project review.

Objective NE-1.2: Develop and implement measures to avoid exposure of people to excessive noise levels.

Objective NE-1.3: Protect the present noise environment and prevent intrusion of new noise sources which would substantially alter the noise environment.

Policy NE-1a: Designate areas within Sonoma County as noise impacted if they are exposed to existing or projected exterior noise levels exceeding 60 dB L_{dn}, 60 dB CNEL, or the performance standards of Table NE-2.

Policy NE-1b: Avoid noise sensitive land use development in noise impacted areas unless effective measures are included to reduce noise levels. For noise due to traffic on public roadways, railroads and airports, reduce exterior noise to 60 dBA L_{dn} or less in outdoor activity areas and interior noise levels to 45 dBA L_{dn} or less with windows and doors closed. Where it is not possible to meet this 60 dBA L_{dn} standard using practical application of best available noise reduction technology, a maximum level up to 65 dBA L_{dn} may be allowed but interior noise level shall be maintained so as not to exceed 45 dBA L_{dn}. For uses such as Single Room Occupancy, Work-Live, Mixed Use Projects and Caretaker Units, exterior noise levels above 65 dBA L_{dn} or the Table NE-2 standards may be considered if the interior standards of 45 dBA L_{dn} can be met. For schools, libraries, offices, and other similar uses, the interior noise standard shall be 45 dBA L_{eq} in the worst-case hours when the building is in use.

Policy NE-1c: Control non-transportation related noise from new projects. The total noise level resulting from new sources shall not exceed the standards in Table NE-2 as measured at the exterior property line of any adjacent noise sensitive land use. Limit exceptions to the following:

(1) If the ambient noise level exceeds the standard in Table NE-2, adjust the standard to equal the ambient level, up to a maximum of 5 dBA above the standard, provided that no measurable increase (i.e. +/- 1.5 dBA) shall be allowed.

(2) Reduce the applicable standards in Table NE-2 by five dBA for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises, such as pile drivers and dog barking at kennels.

(3) Reduce the applicable standards in Table NE-2 by 5 decibels if the proposed use exceeds the ambient level by 10 or more decibels

(4) For short term noise sources which are permitted to operate no more than six days per year, such as concerts or race events, the allowable noise exposures shown in Table NE-2 may be increased by 5 dB. These events shall be subject to a noise management plan including provisions for maximum noise level limits, noise monitoring, complaint response and allowable hours of operation. The plan shall address potential cumulative noise impacts from all events in the area.

(5) Noise levels may be measured at the location of the outdoor activity area of the noise sensitive land use, instead of the exterior property line of the adjacent noise sensitive land use where:

(a) the property on which the noise sensitive use is located has already been substantially developed pursuant to its existing zoning, and

(b) there is available open land on those noise sensitive lands for noise attenuation.

This exception may not be used on vacant properties which are zoned to allow noise sensitive uses.

TABLE NE-2: Maximum Allowable Exterior Noise Exposures for Non-Transportation Noise Sources

Hourly Noise Metric[1], dBA	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
L_{50} (30 minutes in any hour)	50	45
L_{25} (15 minutes in any hour)	55	50
L_{08} (5 minutes in any hour)	60	55
L_{02} (1 minute in any hour)	65	60

[1] The sound level exceeded n% of the time in any hour. For example, the L_{50} is the value exceeded 50% of the time or 30 minutes in any hour; this is the median noise level. The L_{02} is the sound level exceeded 1 minute in any hour.

It is clear for the footnote of Table NE-2 that the applicable noise standard is based on the *"sound level exceeded n% of the time in any hour"*, such that the L_{50} is the value exceeded 50% of the time or 30 minutes in any hour or more, the L_{25} is the value exceeded 25% of the time or 15 minutes

in any hour or more, L_{08} is the value exceeded 8% of the time or 5 minutes in any hour or more, and the L_{02} is the value exceeded 2% of the time or 1 minute in any hour or more.

EXISTING NOISE ENVIRONMENT

Ambient noise levels were measured on the project site by *Illingworth & Rodkin, Inc.* between 3pm on Thursday, June 24th and Monday, June 24th, 2019. The monitoring survey included one long-term and two short-term measurements, as shown in Figure 1. Noise measurements were made with Larson Davis Model 820 Integrating Sound Level Meters (SLM) set at "slow" response. The sound level meters were equipped with G.R.A.S. Type 40AQ ½-inch random incidence microphone and fitted with windscreens. The sound level meters were calibrated prior to the noise measurements using a Larson Davis Model CAL200 acoustical calibrator. The response of the systems were checked after each measurement session and was always found to be within 0.1 dBA. No calibration adjustments were made to the measured sound levels. At the completion of the monitoring event, the measured interval noise level data were obtained from the SLM using the Larson Davis SLM utility software program. Weather conditions during the measurement period were generally good for noise monitoring.

The long-term noise measurement (see LT-1 in Figure 1) was made on the northern property line near the west boundary of the project site, in an existing tree approximately 100 feet from the centerline of Santa Rosa Avenue at a height of approximately 10 feet above grade. The primary noise source at this location was traffic along Santa Rosa Avenue. The hourly trend in noise levels at this location, including the energy equivalent noise level (L_{eq}), maximum (L_{max}), minimum (L_{min}), and the noise levels exceeded 2, 8, 25, and 50 percent of the time (indicated as L_2, L_8, L_{25}, and L_{50}) are shown on Chart 1.

A review of Chart 1 shows that the average weekday noise levels at LT-1 ranged from 64 to 71 dBA L_{eq} during the day, and 55 to 65 dBA L_{eq} at night, and average weekend noise levels ranged from 62 to 70 dBA L_{eq} during the day and 55 to 63 dBA L_{eq} at night. The calculated average day/night noise level (L_{dn}) at this location was 69 dBA for weekdays and 68 dBA for weekends. The average, maximum, minimum levels measured for the daytime and nighttime periods for the entire LT-1 measurement along with the corresponding Sonoma County Table NE-2 Noise Standards are shown in Table 1.

Table 1: Comparison of Noise Measurements Results & County Noise Standards at LT-1

Type of Level		Noise Level, dBA			
		L_{50}	**L_{25}**	**L_8**	**L_2**
Daytime Levels	NE-2 Noise Standard	50	55	60	65
	Measured Ambient Level[1]	**62**	**66**	**69**	**71**
	Measured Range (Max/Min)	*57/68*	*63/71*	*67/72*	*69/75*
Nighttime Levels	NE-2 Noise Standard	45	50	55	60
	Measured Ambient Level[1]	**49**	**53**	**62**	**66**
	Measured Range (Max/Min)	*46/62*	*49/66*	*59/69*	*65/72*

[1] Calculated based on an average of the four quietest L_{eq} hours in each measured 24-hour period

The first short-term noise measurement (see ST-1 in Figure 1) was made on Monday, June 24th, 2019 between 1:20 and 1:30 pm at approximately 70 feet from the centerline of Santa Rosa Avenue. This location was selected to quantify the ambient noise levels setback of the closest residential façade to the roadway. The 10-minute average noise level measured at this location was 70 dBA L_{eq}, resulting primarily from vehicular traffic on Santa Rosa Avenue.

The second short-term noise measurement (see ST-2 in Figure 1) was made Monday, June 24th, 2019 between 1:40 and 1:50 pm at approximately 135 feet from the centerline of Santa Rosa

Avenue. This location was selected to quantify the ambient noise levels setback in the center of the closest outdoor plaza to the roadway. The 10-minute average noise level measured at this location was 66 dBA L_{eq}, resulting primarily from vehicular traffic on Santa Rosa Avenue.

The average day-night noise level (L_{dn}) at each short-term measurement location was estimated at by correlating the short-term measurement data to the data gathered during the corresponding time period at the long-term site. The measurement results and estimated L_{dn} level at both short-term measurement locations are shown in Table 2, following.

Table 2: Summary of Short-Term Noise Measurement Data, dBA

Noise Measurement Location	L_{eq}	L_{50}	L_{25}	L_{08}	L_{02}	L_{max}	L_{dn}
ST-1: 70 feet from Santa Rosa Avenue centerline; Closest Proposed Residential Façade to the roadway.	70	69	71	73	76	85	**70**
ST-2: 135 feet from Santa Rosa Avenue centerline; Closest Outdoor Plaza to the roadway.	66	65	67	69	71	73	**67**

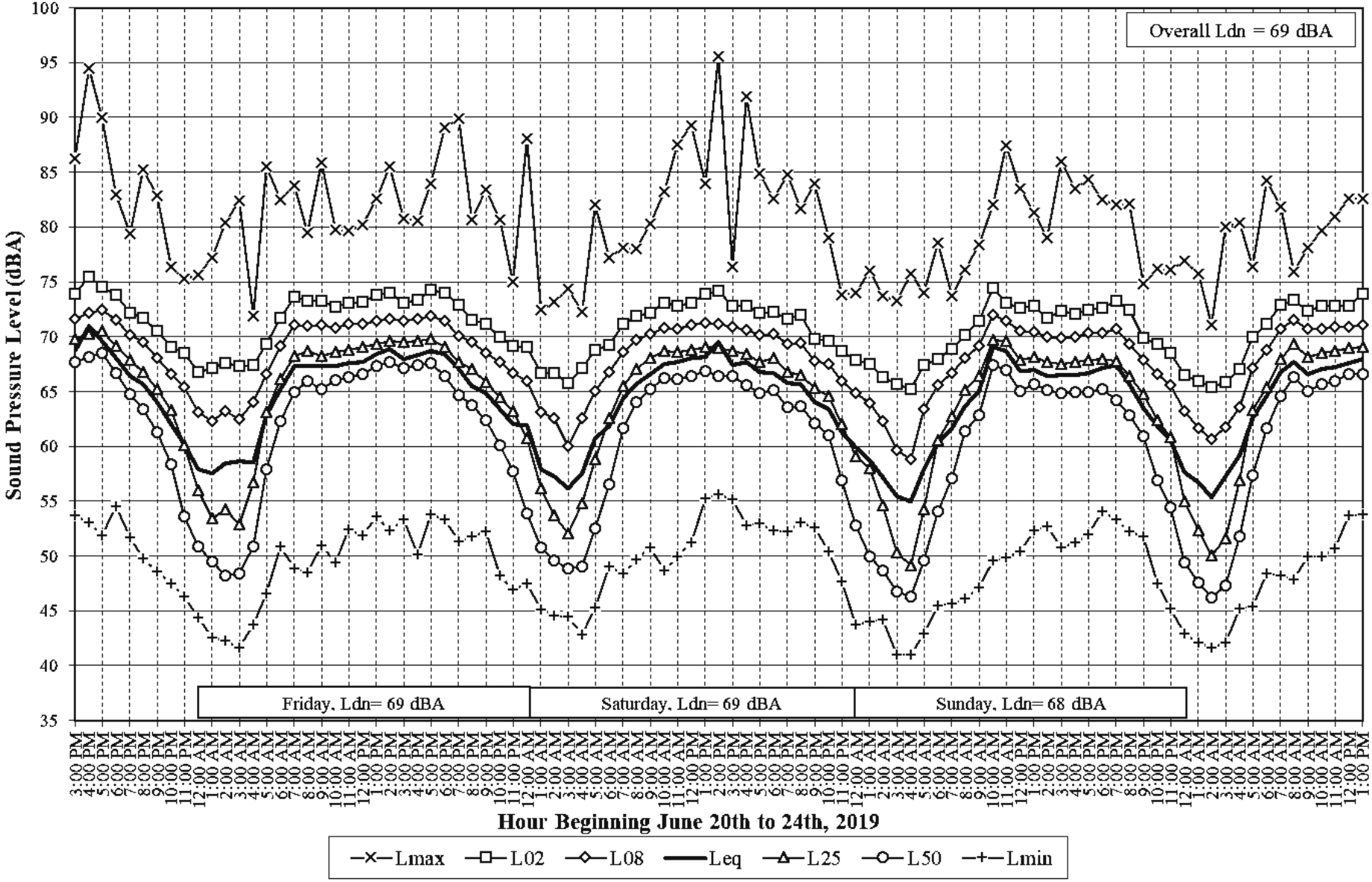
Note: L_{dn} is approximated by correlation to the corresponding measurement period at the long-term sites.

Based on the findings of the noise measurement survey in terms of noise attenuation with increased distance from Santa Rosa Avenue, we have projected the ambient noise levels resulting from Santa Rosa Avenue traffic in terms Average Day/Night levels and those corresponding to the Sonoma County Table NE-2 Noise Standards at the eastern project property line (closest to the Rural residential zoned lands to the east) and at the closest home or outdoor activity areas of the mobile home parks opposite Santa Rosa Avenue. The results of this analysis are shown in Table 3 below.

Table 3: Ambient Noise Levels at adjacent Noise Sensitive Uses

Noise Metric	Calculated Maximum Exterior Ambient Noise Levels, dBA					
	Northwestern Mobile Home Park		Southwestern Mobile Home Park		Eastern Rural Residential Property lines	
	Ave. Daytime Level	Ave. Nighttime Level	Ave. Daytime Level	Ave. Nighttime Level	Ave. Daytime Level	Ave. Nighttime Level
L_{50} (30 Min.)	62	49	64	50	55	41
L_{25} (15 Min.)	66	53	68	55	58	45
L_{08} (5 Min.)	69	62	70	63	61	54
L_{02} (1 Min.)	71	66	73	68	63	59
L_{dn}	**69 dBA**		**70 dBA**		**59 dBA**	

Chart 1: Measured Noise Levels at LT-1



GENERAL PLAN CONSISTENCY ANALYSIS

The impacts of site constraints such as exposure to excessive levels of noise and vibration are not considered under CEQA. This section addresses Noise and Land Use Compatibility for consistency with the policies set forth in the Sonoma County General Plan.

Noise and Land Use Compatibility

The Noise Element of Sonoma County General Plan sets forth policies with a goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below:

- Sonoma County's acceptable exterior noise level objective is 60 dBA L_{dn}.
- Sonoma County's standard for interior noise levels is 45 dBA L_{dn}.

Exterior Noise Environment

Future exterior noise levels at the project site would continue to result primarily from local traffic along Santa Rosa Avenue. The primary common use areas on the site will be the open plazas situated between residential buildings on the site. The closest of these noise sensitive outdoor use areas to Santa Rosa Avenue (Plaza 1) would be located behind the westernmost (Type C) residential building. Based on the noise monitoring survey results, the existing noise level at tin the center of Plaza 1 would be 67 dBA L_{dn} without consideration of the noise shielding supplied by intervening buildings. The two-story residential structure situated between Plaza 1 and Santa Rosa Avenue traffic would however act as an effective barrier to Santa Rosa Avenue traffic and is expected to reduce traffic noise levels by a minimum of 8 to 10 dBA in the center of this westernmost common outdoor use area resulting in existing traffic noise levels in Plaza 1 of 57 to 59 dBA L_{dn} or less.

Though no traffic study was reviewed for this analysis, considering the effect of general growth throughout the City and surrounding region, an increase of 1-2% in traffic volume per year on this roadway has been assumed to establish future traffic volumes. Considering this incremental increase, the future noise environment on the project site is expected to increase by approximately 1 decibel over existing noise levels. Such an increase would result in an L_{dn} level of 60 dBA or less in the center of this closest common outdoor use area. Future exterior noise levels at the project site would, therefore, be expected to meet Sonoma County's acceptable exterior noise level objective of 60 dBA L_{dn}.

Interior Noise Environment

Based on the results of the noise measurement survey, the existing exterior noise level exposure at the closest residential façade to Santa Rosa Avenue will be 70 dBA L_{dn}. Considering the effect of general growth throughout the City and surrounding region discussed above, the future exterior noise level exposure at the closest residential façade to Santa Rosa Avenue is expected to be 71 dBA L_{dn}. Noise levels at other residential facades would be lower due to distance attenuation and building shielding effects.

Interior noise levels within residential uses on the project site would vary depending upon the design of the buildings (relative window/door area to wall area) and the type and finish of the exterior walls. The proposed exterior siding types are not called out in the current drawings, but based on the project elevations, it appears that the exterior walls may be finished with either stucco or fiber cement siding. Though the assemblies of the walls have not yet been determined, they are also expected to be wood stud framed walls and based on typical California construction techniques are also expected to include cavity insulation and a single layer of gypsum board at

the interior face. Based on this and that Hardie brand siding, or equal, will be used for the fiber cement siding, the minimum sound isolation rating of the exterior wall assembly would be STC 40[1].

Taking into consideration this minimum exterior wall assembly and the estimated exterior door and window percentages of between 25% and 35% of the exterior wall area taken from project design drawings, with the use of closed standard thermal insulating windows and weather sealed doors (which, though not sound rated have STC values of between 24 and 26), exterior noise levels will be reduced within the residential interiors by between 26 to 27 dBA. However, when windows or doors are opened the noise attenuation from exterior to interior is typically reduced by 10 to 12 dBA, such that the expected exterior to interior noise reduction would be lowered to between 14 to 17 dBA with open windows and/or doors.

Based on this finding, closed standard thermal insulating windows and weather sealed doors will be sufficient to allow interior noise levels to be an L_{dn} of 45 dBA or less throughout the project. However, considering the reduction in exterior to interior attenuation with open windows discussed above, the interior noise standard of 45 dBA L_{dn} would not be met with open windows in areas where the exterior noise levels exceed an L_{dn} of 59 dBA. In view of the expected future outdoor noise projections, at the adjacent rural residential property line to the east (refer to Table 3) all residences on the project site with a view of Santa Rosa Avenue traffic will be exposed to an L_{dn} of 59 dBA or more and will thus require the inclusion of acoustically effective mechanical ventilation systems to allow occupants to keep windows closed to control noise. To reduce environmental noise intrusion within units and meet the code requirement for acoustically effective mechanical ventilation systems, acoustically rated through wall vents such as Fresh 90-dB[2] units, by Fresh Ventilation, or equal may be used. Alternately, in our experience, a standard central air conditioning system or a central heating system equipped with a 'summer switch' which allows the fan to circulate air without furnace operation will provide a habitable interior environment.

Recommended Conditions of Approval

For consistency with General Plan, the following Condition of Approval is recommended:

- All residential units should be provided with a suitable form of forced-air mechanical ventilation, as determined by the local building official, to allow residents to keep there windows closed for the purpose of noise control.

NOISE IMPACTS AND MITIGATION MEASURES

Noise generated by the proposed project was assessed against the Table NE-2 noise standards presented in the County's Noise Element. The guidelines establish daytime and nighttime noise limits for noise events of varying durations. The primary noise producing activities associated with the Project are vehicular traffic events, parking lot activities, mechanical equipment, and residential outdoor activities.

Permanent Noise Increase Due to Project Generated Traffic

Typically, a significant permanent traffic noise increase would occur if the project would increase noise levels at a noise sensitive receptor by 3 dBA L_{dn} or greater where ambient noise levels exceed

[1] This value is for Hardie brand siding and is based on laboratory test TL365A per James Hardie Building Products Sound Isolation Technical Bulletin 07272007. Where stucco siding is used the sound isolation rating will be 46 STC, based on laboratory test number W-50-71 published by the U.S. National Bureau of Standards.

[2] Go to http://www.fresh.eu/en-gb/3.sound-reducing-wall-vents/fresh-90-db.php for product information.

the "normally acceptable" noise level standard. Where ambient noise levels are at or below the "normally acceptable" noise level standard, noise level increases of 5 dBA L_{dn} or greater would be considered significant. According to the County's General Plan, the "normally acceptable" outdoor noise level standard for noise-sensitive land uses would be 60 dBA L_{dn}.

A traffic report was not reviewed for this analysis, however to cause a 3-dBA increase in noise along Santa Rosa Avenue, the project would have to generate enough traffic to double the current roadway volumes. Given the size of the project and the current amount of traffic on Santa Rosa Avenue this is not considered possible. This is a **less-than-significant** impact.

Permanent Noise Increase Due to Parking Lot Operations

The project proposes 113 parking spaces for the vehicles associated with the 50 proposed apartment units on the southern side of the site which will be accessed from Santa Rosa Avenue. Peak activity within the parking lot would primarily occur during morning and evening peak traffic hours on weekdays. Vehicles accessing the parking areas, engine starts, and door slams would be the primary noise sources. These noises typically range from 50 dBA to 60 dBA L_{max} at 50 feet. The cumulative duration of noise from these intermittent sounds is expected to be more than five minutes, but less than 15 minutes in any hour, therefore, the L_{08} would be the applicable regulatory threshold used in the analysis. The closest residential property line to the west are located about 250 to 300 feet from the edge of the parking lot and the closest rural residentially zoned property line to the east are located about 120 feet from the edge of the parking lot. Table 4 summarizes the assessment of parking lot noise.

Table 4: Parking Lot L_{08} Noise Levels

	L_{08} (Noise Level Exceeded 5 Minutes in any Hour), dBA		
	Northwestern Mobile Homes	Southwestern Mobile Homes	E. Rural Residential Property Lines
Unadjusted Table NE-2 Daytime Limit	60	60	60
Unadjusted Table NE-2 Nighttime Limit	55	55	55
Daytime Ambient Noise Levels	*69*	*70*	*61*
Nighttime Ambient Noise Levels	*62*	*63*	*54*
Parking lot noise level at property line	**37 to 47**	**39 to 49**	**45 to 55**
Operations Exceed Ambient by 10 dBA?	**No**	**No**	**No**
NE-2 Adjustment	**0**	**0**	**0**
Adjusted Table NE-2 Daytime Limit	60	60	60
Adjusted Table NE-2 Nighttime Limit	55	55	55
Parking lot Noise Exceeds NE-2?	**No**	**No**	**No**

Considering the findings shown in Table 4, noise levels associated with automobiles and light vehicles in the project parking lot would not exceed the daytime or nighttime NE-2 noise standards at the property lines of any adjacent noise sensitive residential uses. This is a **less-than-significant** impact.

Permanent Noise Increase Due to Mechanical Equipment Operations

The residential buildings would include various mechanical equipment such as air conditioners and exhaust fans. Information regarding the number, type, and size of the mechanical equipment units to be used in the proposed project was not available at the time of this study. Due to slanted roof design shown in project drawings, mechanical equipment is assumed to be installed outside of and adjacent to the proposed buildings.

Based on measurements I&R has conducted of typical outdoor air conditioning systems for moderate sized residential units, the average A-weighted sound level typically ranges from 66 to 68 dBA at 3 feet (or 42 to 44 dBA at 50 feet) from individual outdoor condensing units. Considering that the residential buildings are 8-plex structures, there may be multiple outdoor condensing units in close proximity to one another. Considering a worst-case situation where all 8 outdoor condensing units are clustered together and all operating at the same time, they could produce noise levels of 51 to 53 dBA at 50 feet.

Mechanical equipment noise levels for similar facilities typically range from 50 to 60 dBA L_{eq} at a distance of 50 feet, assuming direct line-of-site between the receiver and the mechanical equipment. Once operating building mechanical equipment typically runs at a constant noise level for and extended period of time, with the cumulative duration of noise occurring for more than 30 minutes per hour. Therefore, the L_{50} would be the applicable regulatory threshold used in the analysis. The closest residential property line to the west are located about 260 to 320 feet from the proposed buildings and the closest rural residentially zoned property line to the east are located about 120 feet from the proposed buildings. Table 5 summarizes the assessment of project mechanical noise.

Table 5: Mechanical Equipment L_{50} Noise Levels

	L_{50} (Noise Level Exceeded 30 Minutes in any Hour), dBA		
	Northwestern Mobile Homes	Southwestern Mobile Homes	E. Rural Residential Property Lines
Unadjusted Table NE-2 Daytime Limit	50	50	50
Unadjusted Table NE-2 Nighttime Limit	45	45	45
Daytime Ambient Noise Levels	*62*	*64*	*55*
Nighttime Ambient Noise Levels	*49*	*50*	*41*
Equipment noise level at property line	**36 to 38**	**34 to 36**	**43 to 45**
Operations Exceed Ambient by 10 dBA?	**No**	**No**	**No**
NE-2 Adjustment	**0**	**0**	**0**
Adjusted Table NE-2 Daytime Limit	50	50	50
Adjusted Table NE-2 Nighttime Limit	45	45	45
Parking lot Noise Exceeds NE-2?	**No**	**No**	**No**

Considering the findings shown in Table 5, noise levels associated with mechanical equipment at the proposed project would not exceed the daytime or nighttime NE-2 noise standards at the property lines of any adjacent noise sensitive residential uses. This is a **less-than-significant** impact.

Permanent Noise Increase Due to Residential Outdoor Activities

The project proposes open plazas situated between residential buildings on the site and private outdoor patios as the primary outdoor use areas on the site. Base on published[3] voice level data of relaxed, normal and raised conversational voice levels, the sound levels from groups of 5 to 20 residents in raised conversation in these outdoor areas could reach 48 to 54 dBA at 50 feet but would more normally be between 40 to 46 dBA at 50 feet. The closest residential property line to the west are located about 300 to 350 feet from the closest open plaza and the closest rural residentially zoned property line to the east are located about 200 feet from the from the closest open plaza. To conduct a conservative analysis of this potential noise impact I&R considered the possibility of up to 20 residents in open plazas raised conversational voice levels for 30 minutes

3 Harris, Cyril M., "Effects of Noise on Speech", *Handbook of Noise Control*, 2nd Ed., McGraw Hill, 1979, Pg. 14-2

or more per hour. Table 6 summarizes the assessment of noise from these worst-case outdoor residential activities.

Table 5: Outdoor Activity L_{50} Noise Levels

	L_{50} (Noise Level Exceeded 30 Minutes in any Hour), dBA		
	Northwestern Mobile Homes	Southwestern Mobile Homes	E. Rural Residential Property Lines
Unadjusted Table NE-2 Daytime Limit	50	50	50
Unadjusted Table NE-2 Nighttime Limit	45	45	45
Daytime Ambient Noise Levels	*62*	*64*	*55*
Nighttime Ambient Noise Levels	*49*	*50*	*41*
Equipment noise level at property line	**32 to 38**	**31 to 37**	**36 to 42**
Operations Exceed Ambient by 10 dBA?	**No**	**No**	**No**
NE-2 Adjustment	**0**	**0**	**0**
Adjusted Table NE-2 Daytime Limit	50	50	50
Adjusted Table NE-2 Nighttime Limit	45	45	45
Parking lot Noise Exceeds NE-2?	**No**	**No**	**No**

Considering the findings shown in Table 5, noise levels associated with outdoor residential activities at the proposed project would not exceed the daytime or nighttime NE-2 noise standards at the property lines of any adjacent noise sensitive residential uses. This is a **less-than-significant** impact.

Temporary Noise Increase Due to Construction Noise

Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, the distance between construction noise sources and noise-sensitive receptors, any shielding provided by intervening structures or terrain, and ambient noise levels. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), when construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction durations last over extended periods of time.

Each construction phase would include a different mix of equipment operating. The highest noise levels are typically generated when impact tools are used (e.g., jackhammers, hoe rams). Site grading and excavation activities would also generate high noise levels as these phases often require the simultaneous use of multiple pieces of heavy equipment, such as dozers, excavators, scrapers, and loaders. Lower noise levels result from construction activities when less heavy equipment is required to complete the tasks. Pile driving is not anticipated for project construction.

Typical construction noise levels at a distance of 50 feet are shown in Tables 6 and 7. Table 6 illustrates the average noise level range by typical construction phase type and Table 7 shows the maximum noise level range for different construction equipment.

Existing residential uses are located as close as about 240 feet to the west of proposed construction areas. The closest existing rural residential use to the east appears to be over 400 feet from the proposed construction areas. Considering these distances, construction noise levels are anticipated to range from 60 to 70 dBA L_{eq} at the existing residences to the west and from 56 to 66 dBA L_{eq} at the existing residences to the east during periods of heavy construction. Construction noise levels would be anticipated to drop off at a rate of about 6 dBA per doubling of distance as construction moves away from shared property lines.

TABLE 6: Typical Ranges of Noise Levels at 50 Feet from Construction Sites (dBA L_{eq})

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works	
	I	II	I	II
Ground Clearing	83	83	84	84
Excavation	88	75	89	79
Foundations	81	81	78	78
Erection	81	65	87	75
Finishing	88	72	89	75

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.
Source: United States Environmental Protection Agency, 1973, Legal Compilation on Noise, Vol. 1, p. 2-104.

Given the relatively small size of the project, the majority of the site improvements and building construction is expected to be completed during one building season[4]. Extreme noise generating construction methods, such as impact pile driving, are also not expected or proposed. With the implementation of the following standard best management practices to limit construction hours to daytime periods only, reduce construction noise levels emanating from the site, and minimize disruption and annoyance at adjacent noise sensitive uses project construction would be considered a **less-than-significant** impact.

- Limit construction to between the hours of 7am to 7pm on weekdays and 7am to 5pm on weekends.
- Limit work to non-motorized equipment on Sundays and holidays.
- Locate construction staging areas as far as practical from nearby sensitive receptors.
- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as practical from nearby sensitive receptors.
- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment. Air compressors and pneumatic equipment should be equipped with mufflers, and impact tools should be equipped with shrouds or shields.
- Prohibit all unnecessary idling of internal combustion engines.

[4] One building season is typically defined as an approximately 8-month period between the cessation of the rainy season in the Spring and the start of a subsequent rainy season the next Fall.

TABLE 7: Construction Equipment Noise Emission Levels (at 50 feet)

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous*
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:
*Impact activities impact the ground or construction surface, such as pile driving, while continuous activities emit more constant noise, such as construction vehicles.
[1]Measured at 50 feet from the construction equipment, with a “slow” (1 sec.) time constant.
[2]Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.
[3]Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.
Source: FHWA

CEQA INITIAL STUDY CHECKLIST QUESTIONS

The California Environmental Quality Act (CEQA) includes qualitative guidelines for determining the significance of environmental noise impacts. The CEQA Initial Study checklist questions are listed below:

a) 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?
Project traffic would result in traffic noise increases of less than 3 dBA L_{dn} and would not be anticipated to be perceptible or measurable. ***Less-than-Significant Impact.***
Parking spaces would be provided for residents of proposed project building across the southern portion of the project site. Noise due to parking lot activities at nearest residential land would comply with the Sonoma County limits. ***Less-than-Significant Impact.***
Considering worst case conditions with equipment for each building clustered and outdoors the operation of mechanical equipment at the proposed project was found to comply with the Sonoma County limits. ***Less-than-Significant Impact.***
Outdoor activity associated with the project was found to comply with the Sonoma County limits. ***Less-than-Significant Impact.***
Major noise producing construction activities are anticipated to occur over a period of less than one-year. Pile driving is not anticipated as a method of construction. With implementation of standard best management practices this would be a ***Less-than-Significant Impact.***

b) Generation of excessive groundborne vibration or groundborne noise levels?
Construction would be located 50 feet or further from structures and pile driving is not anticipated as a method of construction, based on similar projects' construction in the past. At a distance of 50 feet, groundborne vibration from construction is anticipated to generate vibration levels in the range of 0.001 to 0.098 in/sec PPV. These vibration levels would be well below the conservative 0.3 in/sec PPV vibration limit recommended by the California Department of Transportation for buildings that are found to be structurally sound but where structural damage is a major concern. ***Less-than-Significant Impact.***

c) For a project located within the vicinity of a private airport or airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?
The project site is not located in the vicinity of an existing airport or airport land use zone and would not expose people residing or working in the project area to excessive aircraft noise levels. ***No Impact.***

SUMMARY/CONCLUSIONS

Based on the above findings, permanent noise increase associated with the project is not anticipated to exceed the Sonoma County noise standards Temporary construction noise would be reduced by the implementation of standard best management practices. Additionally, the inclusion of forced-air mechanical ventilation would be required for all residential units with views of Santa Rosa Avenue. Exterior noise levels in the proposed residential outdoor use areas would be below the allowable exterior noise limits set by County of Sonoma.

APPENDIX A: FUNDAMENTALS OF NOISE & VIBRATION

FUNDAMENTALS OF ENVIRONMENTAL NOISE

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table A1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table A2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the *sound level meter*. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level (CNEL)* is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level (L_{dn})* is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn}. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12 to 17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57 to 62 dBA L_{dn} with open windows and 65 to 70 dBA L_{dn} with standard construction if the windows are closed.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn}. At a L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 25 to 30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60 to 70 dBA. Between a L_{dn} of 70 to 80 dBA, each decibel increase, increases by about 3 percent, the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 30 to 35 percent of the population is believed to be highly annoyed.

TABLE A1: Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE A2: Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

FUNDAMENTALS OF GROUNDBORNE VIBRATION

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table A3 displays the reactions of people and the effects on buildings that continuous vibration levels produce. The guidelines in Table A3 represent syntheses of vibration criteria for human response and potential damage to buildings resulting from construction vibration.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table A3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from “Historic and some old buildings” to “Modern industrial/commercial buildings”. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The annoyance levels shown in Table A3 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

TABLE A3: Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.