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March 18, 2020

Mr. Jeff Johnson
McKellar McGowan
Real Estate Land Development
5075 Shoreham Place, Ste. 280
San Diego, CA 92122

VIA E-Mail: jeff@mckellarmcgowan.com

SUBJECT: Petaluma Hill Residential Development, Santa Rosa, CA
Environmental Noise Assessment

Dear Mr. Johnson:

This letter presents the results of Illingworth & Rodkin's (I&R) environmental noise assessment prepared for the proposed Petaluma Hill Residential Project, a 147-unit multifamily residential development at the southwest corner of the Petaluma Hill Road/Colgan Avenue intersection in Santa Rosa, CA (see Figure 1). This analysis evaluates the noise and land use compatibility of the project with respect to the noise environment resulting from vehicular traffic on Petaluma Hill Road and Colgan Avenue and the adjacent gas station and car wash. The noise assessment presents the regulatory criteria used in the assessment, the results of on-site noise monitoring, and our evaluation of the compatibility of the noise environment at the project site in relation to the project site plan. Preliminary noise reduction measures are presented to provide an acceptable interior and exterior noise environment per City of Santa Rosa Guidelines. Persons not familiar with environmental noise analysis are referred to Appendix A for additional discussion.

Figure 1: Project Site and Vicinity

REGULATORY BACKGROUND

The City of Santa Rosa and State of California have established plans and policies designed to limit noise exposure at noise sensitive single residential land uses that are relevant to the proposed project. These plans and policies are contained in (1) the California Building Code, Title 24, Part 2 and (2) the City of Santa Rosa General Plan.

1. 2019 California Building Code, Title 24, Part 2. Section 1206.4 of the current (2019) California Building Code (CBC) states that interior noise levels attributable to exterior sources shall not exceed 45 dB(A) L_{dn} or CNEL (consistent with the noise element of the local general plan) in any habitable room. Though this section does to not explicitly apply this interior limit to multifamily residential buildings, per the scope discussion in Section 1206.1 and in keeping with the requirements of prior editions of the CBC this limit is applied to any habitable room for new attached (e.g. multifamily) dwellings, and not detached single-family dwellings.

2. City of Santa Rosa General Plan. The Noise and Safety Element of the City of Santa Rosa's 2035 General Plan identifies policies that are intended to guide the development of new projects with regard to exposure to or generation of noise. The policies support the City's goal of maintaining an acceptable community noise level. The following policies are applicable to the proposed project:

NS-B Maintain an acceptable community noise level to protect the health and comfort of people living, working and/or visiting in Santa Rosa, while maintaining a visually appealing community.

- Multi-family residential uses are considered to be normally acceptable in areas with a noise environment of L_{dn} of 65 dBA or less, conditionally acceptable in areas exposed to an L_{dn} of 60 to 70 dBA, normally unacceptable in areas exposed to an L_{dn} of 70 to 75 dBA, and unacceptable in areas exposed to an L_{dn} of 75 dBA or more.

NS-B-1 Do not locate noise-sensitive uses in proximity to major noise sources, except residential is allowed near rail to promote future ridership.

NS-B-2 Encourage residential developers to provide buffers other than sound walls, where practical. Allow sound walls only when projected noise levels at a site exceed land use compatibility standards.

NS-B-4 Require new projects in the following categories to submit an acoustical study, prepared by a qualified acoustical consultant:

- All new projects that could generate noise whose impacts on other existing uses would be greater than those normally acceptable.
- All new projects proposed for areas with existing noise above 60 dBA L_{dn}. Mitigation shall be sufficient to reduce noise levels below 45 dBA L_{dn} in habitable rooms and 60 dBA L_{dn} in private and shared recreational facilities. Additions to existing housing units are exempt.

NS-B-5 Pursue measures to reduce noise impacts primarily through site planning. Engineering solutions for noise mitigation, such as sound walls, are the least desirable alternatives.

NS-B-9 Encourage developers to incorporate acoustical site planning into their projects. Recommended measures include:

- Incorporating buffers and/or landscaped earth berms;
- Orienting windows and outdoor living areas away from unacceptable noise exposure;
- Using reduced-noise pavement (rubberized-asphalt);
- Incorporating traffic calming measures, alternative intersection designs, and lower speed limits; and
- Incorporating state-of-the-art structural sound attenuation and setbacks.

NS-B-10 Work with private enterprises to reduce or eliminate nuisance noise from industrial and commercial sources that impact nearby residential areas. If progress is not made within a reasonable time, the City shall issue abatement orders or take other legal measures.

EXISTING NOISE ENVIRONMENT

The Petaluma Hills Residential development is located at the southwest corner of the Petaluma Hill Road/Colgan Avenue Intersection in Santa Rosa, CA. The primary noise source on the project site is vehicular traffic on Petaluma Hill Road and Colgan Avenue. Existing commercial and residential uses in the site vicinity were not found to be significant contributors to the existing noise environment. To evaluate the existing noise environment on the project site two long term and two short term noise measurements were conducted on the site (see Figure 2). All noise measurements where conducted with Larson Davis Laboratories (LDL) Type I Model 820 Sound Level Meter fitted with a ½-inch pre-polarized condenser microphone and windscreen. The meters were calibrated with a Larson Davis Model CA250 precision acoustic calibrator prior to and following the measurement survey.

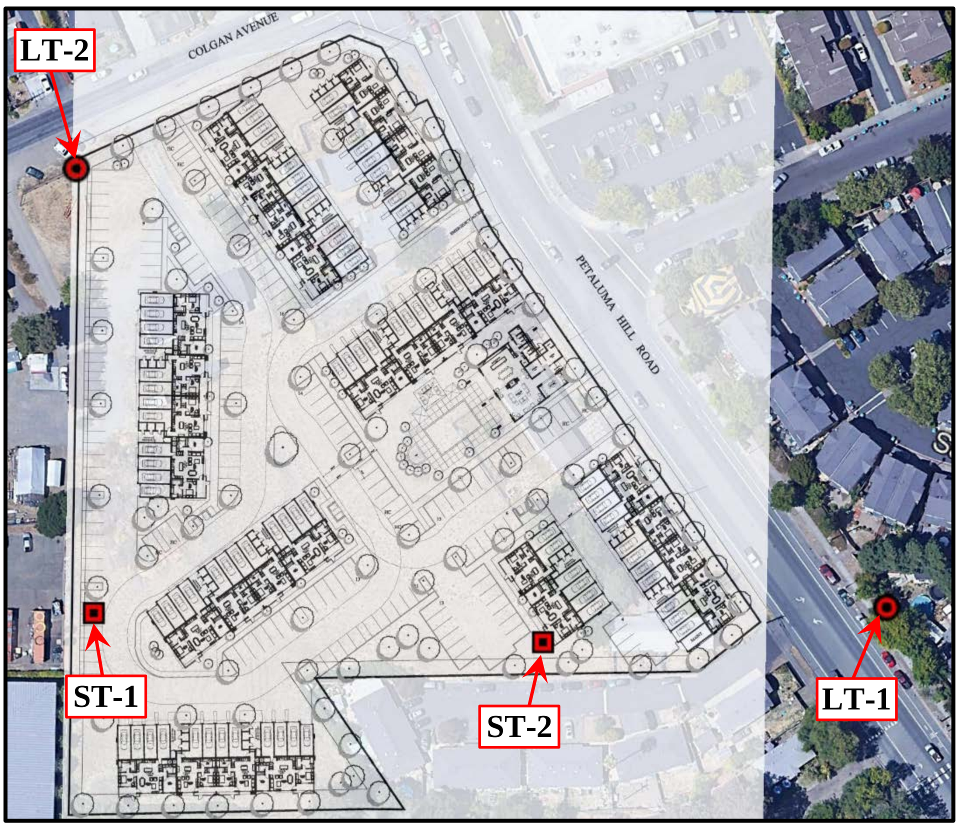
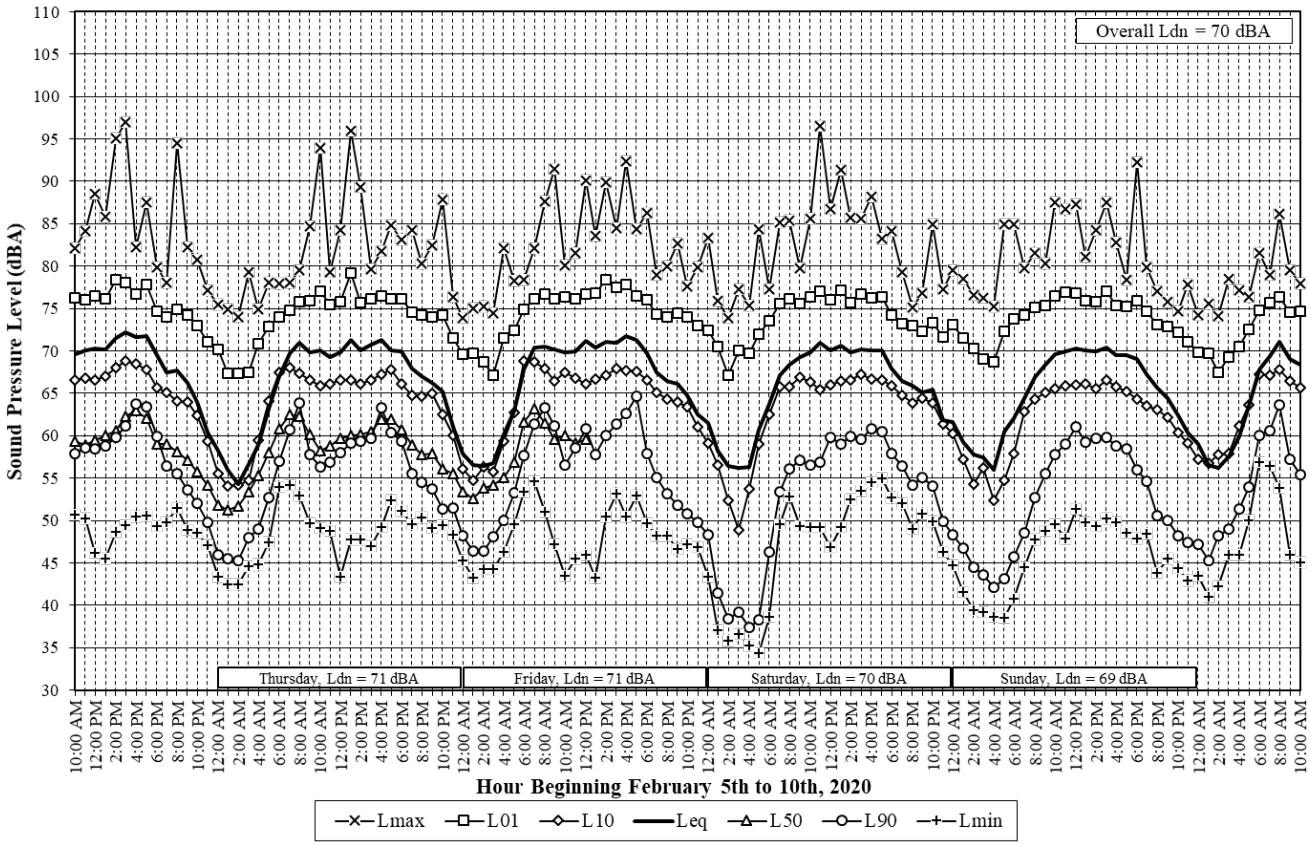


Figure 2: Noise Measurement Locations

The first long-term noise measurement (LT-1) was made in a tree about 10 feet above the existing grade at the approximately 50 feet from the centerline of Petaluma Hill Road. The measurements conducted at this location represent the future setback of the closest residences to Petaluma Hill Road. The measurement was conducted between 10 am on Wednesday, February

5th, 2020 and 11 am on Monday February 10th, 2020 to establish the daily trend in ambient noise levels at the facades of the future homes on the site closest to this roadway. The measured noise levels at site LT-1, including the energy equivalent noise level (L_{eq}), maximum (L_{max}), minimum (L_{min}), and the noise levels exceeded 10, 50 and 90 percent of the time (indicated as L_{10}, L_{50} and L_{90}) are shown on Chart 1. The L_{eq} noise level is typically considered the average noise level, while the L_1 is considered the intrusive level, the L_{50} is considered the median noise level and the L_{90} is considered the background or ambient noise level.

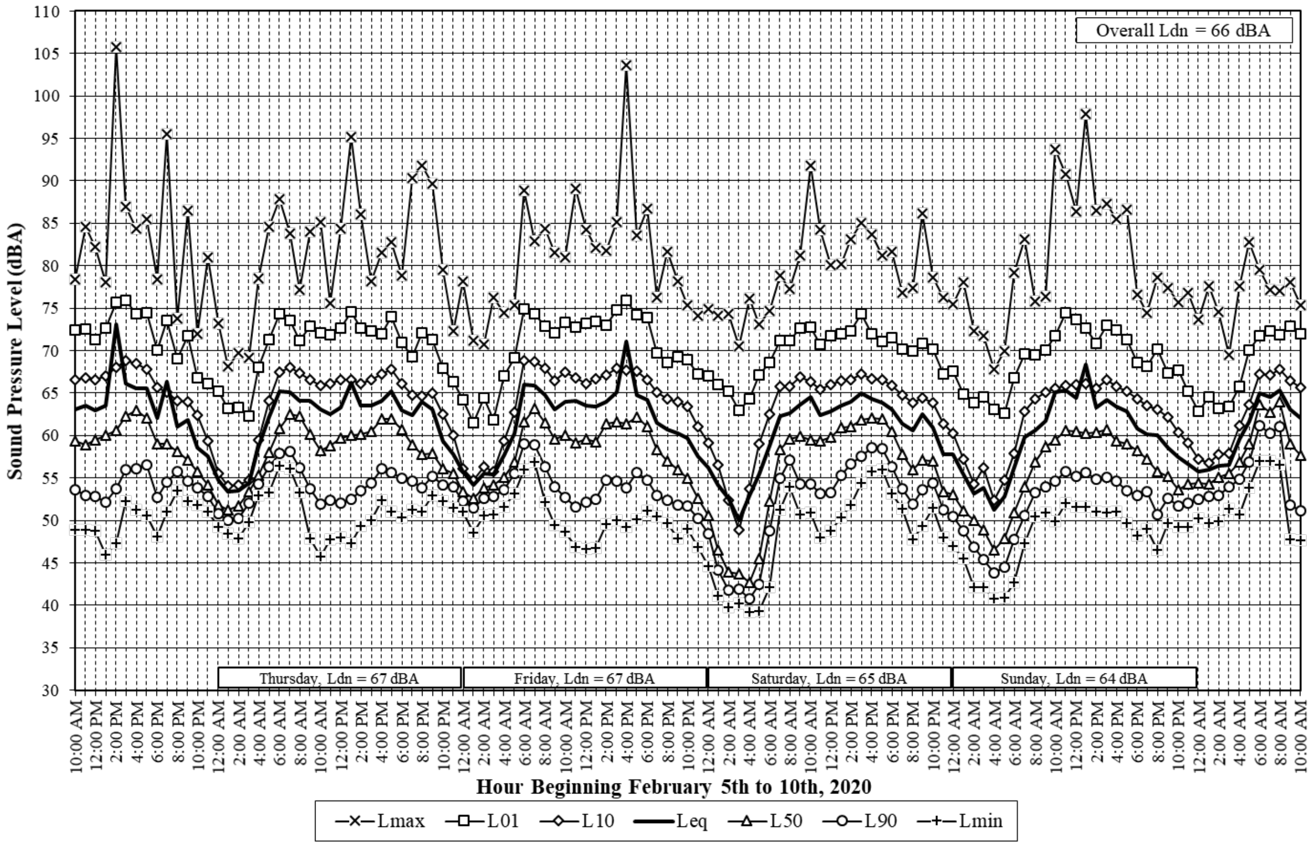
Chart 1: Measured Noise Levels at LT-1



A review of Chart 1 indicates that the noise levels at site LT-1 follow a diurnal pattern characteristic of traffic noise, with the average daytime noise levels ranging from 64 to 72 dBA L_{eq} and the average nighttime noise levels ranging from 54 to 68 dBA L_{eq}. The Day/Night Average Noise Level (L_{dn}) over the entire 121-hour measurement period at LT-1 was calculated to be 70 dBA, while the Day/Night Average Noise Levels over the 24 hour periods of February 6th, 7th, 8th and 9th were, respectively, 71 dBA, 71 dBA, 70 dBA, and 69 dBA.

The second long-term noise measurement (LT-2) was made near the northwestern edge of the site on a utility pole about 12 feet above the existing grade at the approximately 40 feet from the centerline of Colgan Avenue Road. Measurements conducted at this location represent the future setback of the future residences closest to Colgan Avenue. This measurement was made simultaneously with LT-1, between 10 am on Wednesday, February 5th, 2020 and 11 am on Monday February 10th, 2020 to establish the daily trend in ambient noise levels on the Colgan Avenue site frontage. The measured noise levels at site LT-2, including the energy equivalent noise level (L_{eq}), maximum (L_{max}), minimum (L_{min}), and the noise levels exceeded 10, 50 and 90 percent of the time (indicated as L_{10}, L_{50} and L_{90}) are shown on Chart 2.

Chart 2: Measured Noise Levels at LT-2



A review of Chart 2 indicates that the noise levels at site LT-2 follow a diurnal pattern characteristic of traffic noise, with the average daytime noise levels ranging from 59 to 73 dBA L_{eq} and the average nighttime noise levels ranging from 50 to 66 dBA L_{eq}. The Day/Night Average Noise Level (L_{dn}) over the entire 121-hour measurement period at LT-2 was calculated to be 66dBA, while the Day/Night Average Noise Levels over the 24 hour periods of February 6th, 7th, 8th and 9th were, respectively, 67 dBA, 67 dBA, 65 dBA, and 64 dBA.

The short-term noise measurements were made simultaneously with the long-term measurements on a 10-minute basis at two locations at elevations of 5 feet above the current site grade to determine the change in noise levels at various setbacks of the project buildings from area roadways. The measurement locations are described as follows:

- Measurement location ST-1 was positioned on the southwestern side of the site at approximately 370 feet and 465 feet from the respective centerlines of Colgan Avenue and Petaluma Hill Road to evaluate site interior noise levels between 10:10 & 10:20 am on February 5th, 2020.
- Measurement location ST-2 was positioned on the southern property line approximately 190 feet from the centerline of Petaluma Hill Road to evaluate how noise from Petaluma Hill Road traffic attenuates with distance between 10:30 & 10:40 am on February 5th, 2020.

The average day-night noise level (L_{dn}) at each short-term measurement location was estimated at this site 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} levels at these locations are shown in Table 1, following.

TABLE 1: Summary of Short-Term Noise Measurement Data, dBA

Noise Measurement Location	L_{max}	$L_{(01)}$	$L_{(10)}$	$L_{(eq)}$	$L_{(50)}$	$L_{(90}$	L_{dn}
ST-1: 370 feet from the Colgan Avenue centerline & 465 feet from the Petaluma Hill Road centerline.	59	56	52	51	50	49	**53**
ST-2: 190 feet from the centerline of Petaluma Hill Road.	65	60	56	54	53	50	**54**

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

NOISE AND LAND USE COMPATIBILITY ASSESSMENT

Future Exterior Noise Environment

The predominant noise source affecting the project site is traffic on Colgan Avenue and Petaluma Hill Road. For the purposes of this assessment, we have assumed a conservative 1-2% increase in traffic volumes along the roadway over the next 15 to 20 years. These projections assume a standard rate of growth in the City. As a result, future noise levels are predicted to increase by approximately 1 decibel. Exterior noise levels would be as high as 72 dBA L_{dn} at residential facades closest to Petaluma Hill Road and as high as 68 dBA at the residential property lines closest to Colgan Avenue.

A review of the project’s site plan indicates that the common use area for the development will be located between 110 and 190 feet from the centerline of Petaluma Hill and will be partially shielded from roadway traffic noise by a project amenity building. Based on the results or existing noise measurements/future noise projects and the effect of the noise shielding from the amenity building, we expect that the sound levels in the project common use area will be less than 65 dBA L_{dn}. Such exterior noise levels are considered “normally acceptable” for Multi-family residential uses by the City of Santa Rosa General Plan Noise Element.

Future Interior Noise Environment

The City of Santa Rosa requires interior noise levels to be maintained at or below 45 dBA L_{dn} to be considered acceptable for residential development. As discussed above, unshielded façades of residential units proposed nearest Petaluma Hill Road and Colgan Avenue would be exposed to respective future noise levels of up to 72 dBA and 68 dBA L_{dn}. Future noise levels at all other facades further removed from these roadways would be lower.

The proposed exterior siding types or the relative percentage of exterior door & window area to exterior wall area are shown in the current drawings, however based on a review of architectural design of McKellar McGowan’s West College Avenue (WCA) project (which we understand will be similar to this project) and based on experience with similar multifamily projects we would expect the exterior finishes to either fiber cement siding, stucco, or a mix of these finishes. Additionally, though the assemblies of the walls have not yet been determined, they are also expected to be wood stud framed walls and based on the WCA project and typical California construction techniques we expect that they will also 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, and any stucco finish would be full 7/8” thick stucco, the sound isolation rating of these exterior wall assemblies would be STC 40 for walls with fiber cement siding[1] and STC 46 for walls with 7/8" thick stucco[2].

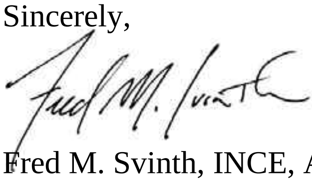
Considering these exterior wall assemblies and exterior door and window percentages of between 20% and 40% of the exterior wall area, with closed standard thermal insulating windows and weather sealed doors, the exterior noise levels will be reduced within the residential interiors by between 25 to 27 dBA with fiber cement siding, and by between 26 to 29 dBA with stucco siding. When these windows or doors are open the noise attenuation from exterior to interior is typically reduced by 10 to 12 dBA, such that for this project we would expect exterior to interior noise reduction to be between 13 to 19 dBA with open windows and/or doors.

Based on this consideration 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 where exterior noise levels are less than 70 dBA L_{dn}. Based on calculations of the expected noise reduction with distance this would mean that project residences within 65 feet of the Petaluma Hill Road centerline as indicated in Figure 3 would require sound rated windows and doors, while standard thermal insulating windows and weather sealed doors would be acceptable at all other residential facades at the project.

However, considering the exterior to interior attenuation with open windows, the interior noise standard of 45 dBA L_{dn} of may not be met with open windows in areas where the exterior noise levels exceed an L_{dn} of 58 dBA. In view of our future noise projections residences within 300 feet of Petaluma Hill Road with a clear view of this roadway and projections residences within 130 feet of Colgan Avenue with a clear view of this roadway may be exposed to such exterior noise levels. Therefore, we recommend that these residences, as indicated in Figure 3, be equipped with a mechanical ventilation system capable of providing adequate fresh air to the residence while allowing the windows to remain closed to control noise. 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.

This concludes the Illingworth & Rodkin's environmental noise assessment for the proposed Petaluma Hill Residential Project at the southwest corner of the Petaluma Hill Road/Colgan Avenue intersection in Santa Rosa, California. If you have any questions, or if we can be of further assistance, please do not hesitate to call.

Sincerely,



Fred M. Svinth, INCE, Assoc, AIA
Senior Consultant, Principal
Illingworth & Rodkin, Inc.
Attachments:

Figure 3: Residences requiring Sound Rated Windows and/or Mechanical Ventilation
Appendix A: Fundamental Concepts of Environmental Acoustics

[1] Based on laboratory test TL365A as published in James Hardie Building Products Sound Isolation Technical Bulletin 07272007

[2] Based on laboratory test number W-50-71 published by the U.S. National Bureau of Standards.

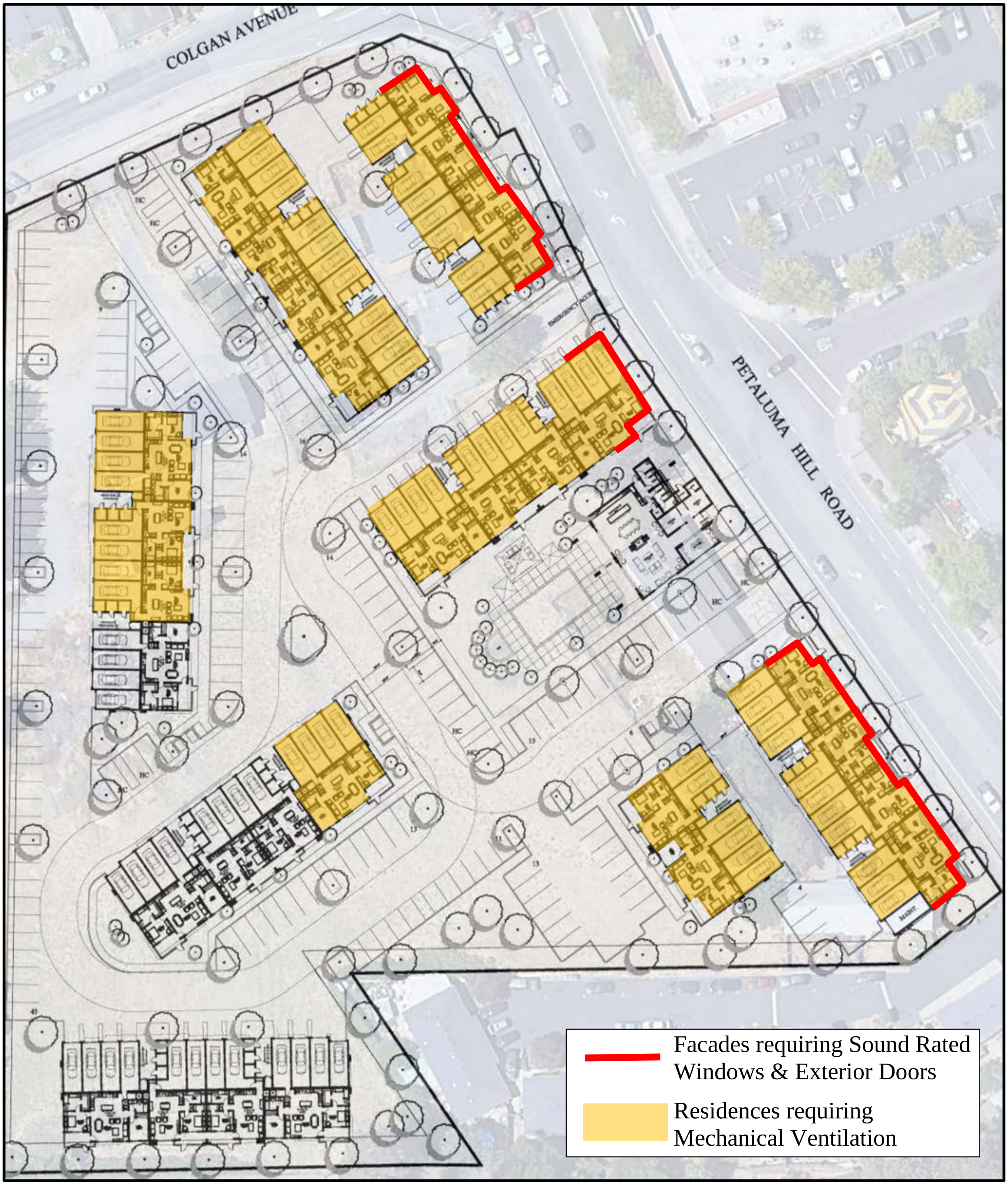


Figure 3: Residences requiring Sound Rated Windows and/or Mechanical Ventilation

APPENDIX A:
FUNDAMENTAL CONCEPTS OF ENVIRONMENTAL ACOUSTICS

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound may be caused by either 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 that are used to describe noise in a particular location. *A decibel (dB)* is a unit of measurement that 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 1. There are several methods of characterizing sound. The most common in California is the *A-weighted sound level or 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 2.

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, Ldn,* 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.

TERM	DEFINITIONS
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, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
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. All sound levels in this report are A-weighted, unless reported otherwise.
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.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Day/Night Noise Level, L_{dn}	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.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
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.

Definitions of Acoustical Terms **Table 1**

ILLINGWORTH & RODKIN, INC./*Acoustical Engineers*

At a Given Distance From Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
	140		
Civil Defense Siren (100')	130		Pain Threshold
Jet Takeoff (200')	120	Rock Music Concert	
	110		Very Loud
Diesel Pile Driver (100')	100	Boiler Room Printing Press Plant	
	90		
Freight Cars (50') Pneumatic Drill (50') Freeway (100')	80	In Kitchen With Garbage Disposal Running	Moderately Loud
Vacuum Cleaner (10')	70	Data Processing Center	
	60	Department Store	
Light Traffic (100') Large Transformer (200')	50	Private Business Office	Quiet
	40	Quiet Bedroom	
Soft Whisper (5')	30	Recording Studio	
	20		Threshold of Hearing
	10		
	0		

Typical Sound Levels Measured In The Environment And Industry — **Table 2**

ILLINGWORTH & RODKIN, INC./Acoustical Engineer

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 noise 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 Ldn. Typically, the highest steady traffic noise level during the daytime is about equal to the Ldn 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 12-17 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 57-62 dBA Ldn with open windows and 65-70 dBA Ldn if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

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 Ldn 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 55 dBA Ldn. At an Ldn of about 60 dBA, approximately 2 percent of the population is highly annoyed. When the Ldn increases to 70 dBA, the percentage of the population highly annoyed increases to about 12 percent of the population. There is, therefore, an increase of about 1 percent per dBA between an Ldn of 60-70 dBA. Between an Ldn of 70-80 dBA, each decibel increase increases by about 2 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the Ldn is 60 dBA, approximately 10 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 2 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 3 percent increase in the percentage of the population highly annoyed.