Appendix I:

Environmental Noise and Vibration Assessment

CAMBRIA HOTEL ENVIRONMENTAL NOISE AND VIBRATION ASSESSMENT

Pleasant Hill, California

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INTRODUCTION

The project plans to demolish existing restaurant building and construct a 4-story, 155-room hotel on a 2.5-acre plot located along North Main Street in Pleasant Hill. Parking will be located on-site in lots to the south and west of the building. This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency Section discusses noise and land use compatibility utilizing policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to provide a compatible project in relation to adjacent noise sources and land uses.

SETTING

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 1.

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 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* (*DNL* or 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 12-17 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 L_{dn} with open windows and 65-70 dBA L_{dn} 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, and 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 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 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60-70 dBA. Between a L_{dn} of 70-80 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 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

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 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much 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.

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. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. 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.

Damage caused by vibration can be classified as cosmetic or structural. Cosmetic damage includes minor cracking of building elements (exterior pavement, room surfaces, etc.). Structural damage includes threatening the integrity of the building. Damage resulting from construction related vibration is typically classified as cosmetic damage. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. 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.

TABLE 1 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 2 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.

TABLE 3 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	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

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

Regulatory Background – Noise

The State of California and the City of Pleasant Hill have established regulatory criteria that are applicable in this assessment. The City of Pleasant Hill is the lead agency for this project and, therefore, the guidelines they established are relevant to this analysis. However, the thresholds used in this analysis are not inconsistent with Walnut Creek regulations. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

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) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within 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, if the project would expose people residing or working in the project area to excessive noise levels; or

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

The impacts of site constraints such as exposure of the proposed project to excessive levels of noise are not assessed under CEQA, but rather are described within the General Plan Consistency Analysis Section of the report. The significant effects of the project on the environment are addressed within the Impacts and Mitigation Section of the report, which follows CEQA EIR criteria.

Checklist items (a), (b), (c), and (d) are applicable to the proposed project. Guidelines (e) and (f) are not applicable because the project is not located in the vicinity of a public airport or private airstrip and would not expose persons in the project area to excessive airport-related noise. Therefore, items (e) and (f) are not carried further in this analysis.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA L_{dn} or greater would be considered significant where exterior noise levels would exceed the normally acceptable noise level standard (60 dBA L_{dn} for residential land uses). Where noise levels would remain at or below the normally acceptable noise level standard with the project, noise level increases of 5 dBA L_{dn} or greater would be considered significant.

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.

2016 California Building Cal Green Code. The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2016 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). The sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.
>
> **5.507.4.2 Performance method.** For buildings located as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

The performance method, which establishes the acceptable interior noise level, is the method typically used when applying these standards.

City of Pleasant Hill General Plan. The Safety and Noise Element of the City of Pleasant Hill's 2003 General Plan identifies noise and land use compatibility standards for various land uses. The City's "conditionally acceptable" noise level objective for hotel land uses is 70 dBA L_{dn} and the City's "normally acceptable" noise level objective for hotel land use category is 65 dBA L_{dn}. The plan also identifies policies to "protect persons from noise that interferes with human activity or causes health problems".

Safety and Noise Policy 7A. Require new development projects to be designed and constructed to meet acceptable noise level standards adopted by the City.

Safety and Noise Policy 7B. Evaluate the noise impacts of development based on the potential for significant increases in noise levels, in addition to acceptability standards.

The City of Pleasant Hill Zoning Ordinance. Ordinance No. 18.50.060 states that "The following performance standards shall apply to all use classifications in all zoning districts: A. Noise. All uses and activities shall comply with the Pleasant Hill noise regulations, and no use shall create ambient noise levels measured at the property line which exceed the standards in Schedule 18.50.060. Where noise is measured at the property line of abutting districts, the noise standard for the more restrictive district applies." (Pleasant Hill 2003). Table 3 presents the City's ambient base noise levels.

TABLE 3 City of Pleasant Hill Zoning Ordinance

SCHEDULE 18.50.060 MAXIMUM NOISE STANDARDS BY ZONING DISTRICT		
Zone of Property Receiving Noise		**Maximum Noise Level Ldn or CNEL, dB**
R, NB	Residential and Neighborhood Business Districts	50
RB, C	Commercial and Retail Business Districts	60
PAO	Office District	65
LI	Industrial District	70
PUD, PPD	Planned Development/Precise Plan District	Study Required

1. Duration and timing. The noise standards above shall be modified as follows to account of the effects of time and duration on the impact of noise levels:
    a. In residential zones, the noise standard shall be five dB lower between 10:00 p.m. and 7:00 a.m.
    b. Noise that is produced for more than a cumulative period of five minutes in any hour may exceed the standards above by five dB.
    c. Noise that is produced for more than a cumulative period of one minute in any hour may exceed the standards above by 10 dB.

Based on a review of the applicable City of Pleasant Hill regulatory criteria, it was determined that the acoustical descriptors (CNEL or L_{dn}) cited in Section 18.50.060 of the Pleasant Hill Zoning Ordinance are incorrect. In our estimation, it is nearly impossible for residential zones to adhere to a 50 dBA L_{dn} noise limit at the property line when, in reality, very few areas of the City experience such a low L_{dn} noise level. In our experience with other communities, a reasonable interpretation of the noise ordinance would indicate that the intended residential noise limit at the property line would be 50 dBA L_{eq}. It is also assumed that in noisier areas of the community, such as this particular site, that the noise standards are adjusted higher to reflect the ambient noise levels.

The City of Pleasant Hill Municipal Code. In section 9.15.040 Special noise sources, the Municipal Code states the following regarding noise:

H. Machinery, equipment, fans, and air-conditioning. It is unlawful for a person to operate machinery, equipment, a pump, fan, air-conditioning apparatus or similar mechanical device in a manner which creates noise, unless the noise is muffled and the device is equipped with a muffler sufficient to deaden the noise.

L. Construction of buildings and projects.

1. It is unlawful for a person within a residential land use district to operate or perform construction or repair work on a building, structure or project, or to operate a pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist, or other construction-type device on city-recognized holidays as designated by city council resolution, and on Monday through Friday, prior to 7:30 a.m. and after 7:00 p.m. on each day and on Saturdays and Sundays, prior to 9:00 a.m. and after 6:00 p.m. The above prohibition does not apply to emergency work.

Existing Noise Environment

The project site is located adjacent to Interstate Highway I-680, south of the intersection of North Main Street and Oak Park Boulevard. Single family residences surround the project site on the north, west and south sides. A noise monitoring survey was performed in the vicinity of the project site beginning Wednesday, September 5, 2018 and concluding on Friday, September 7, 2018. The monitoring survey included two long-term (24+ hours) noise measurements and three short-term (10-minute) measurements, as shown in Figure 1. The results of the long-term noise measurements at LT-1 and LT-2 are shown in Figure 2 and Figure 3, respectively. The noise environment at the site and in the surrounding areas results primarily from vehicular traffic along I-680, local traffic on North Main Street and Oak Park Boulevard, and some secondary noise from nearby businesses.

Long-term noise measurement LT-1 was made near the eastern boundary of project site, approximately 170 feet from the center of I-680 and 35 feet from the center of North Main Street. Hourly average noise levels at this location were primarily the result of traffic along I-680 and typically ranged from 72 to 76 dBA L_{eq} during the day and from 66 to 77 dBA L_{eq} at night. The day-night average noise level on Wednesday, September 5, 2018 was 79 dBA L_{dn}.

Long-term noise measurement LT-2 was made near the western boundary of the project site, approximately 380 feet from the center of I-680. The primary noise source at this location was traffic noise from I-680. Hourly average noise levels ranged from 61 to 66 dBA L_{eq} during the day and from 57 to 68 dBA L_{eq} at night. The day-night average noise level on Wednesday, September 5, 2018 was 70 dBA L_{dn}.

Three short-term noise measurements were made on Wednesday September 5, 2018 to document ambient noise levels at the project site. The primary noise source in the project vicinity was vehicle traffic along I-680. Some air traffic noise was audible at the time of measurement as well as operational noise from a nearby lawn mower repair shop. These noises were acoustically indistinguishable above traffic noise from I-680. Highway noise noticeably decreased towards

the southern portion of the project site. Table 4 summarizes the results of the short-term measurements.

TABLE 4 Summary of Short-Term Noise Measurement Data, September 5th, 2018

ID	Location (Start Time)	Measured Noise Levels, dBA				Primary noise source
		L_{10}	L_{50}	L_{90}	L_{eq}	
ST-1	Oak Park Boulevard, 300 feet west of I-680 (9/5/18, 12:40 pm to 12:50 pm)	71	69	67	69	I-680 traffic noise
ST-2	End of Pleasant Court (9/5/18, 1:20 p.m. to 1:30 p.m.)	58	57	55	57	Distant traffic noise, aircraft noise
ST-3	Vacant lot on site, 270 feet from I-680 (9/5/18, 1:00 p.m. to 1:10 p.m.)	64	63	61	63	I-680 traffic noise (highway elevated from measurement site)

FIGURE 1 Noise Measurement Locations

Source: Google Earth, 2018.

FIGURE 2 Daily Trend in Noise Levels at LT-1

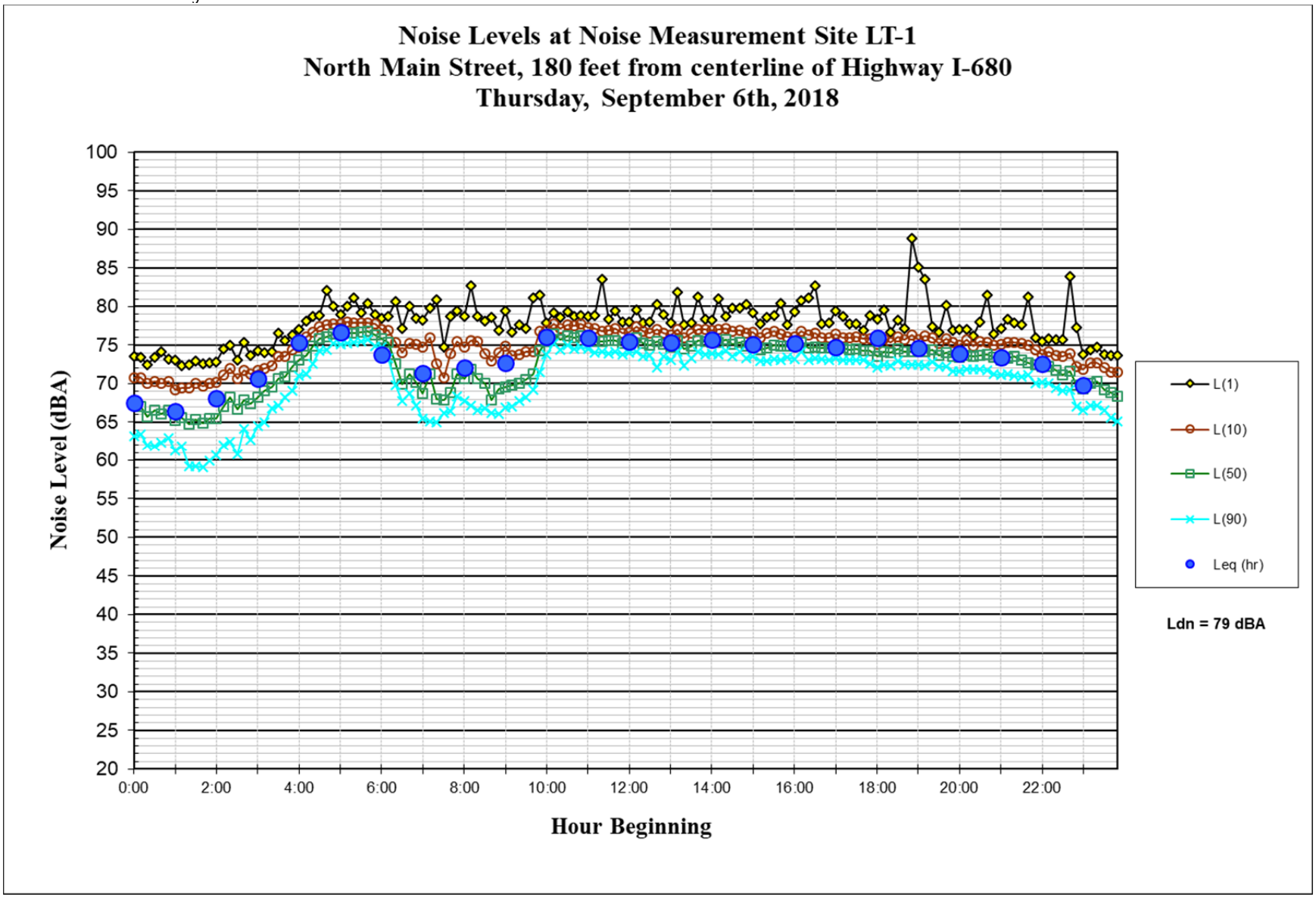
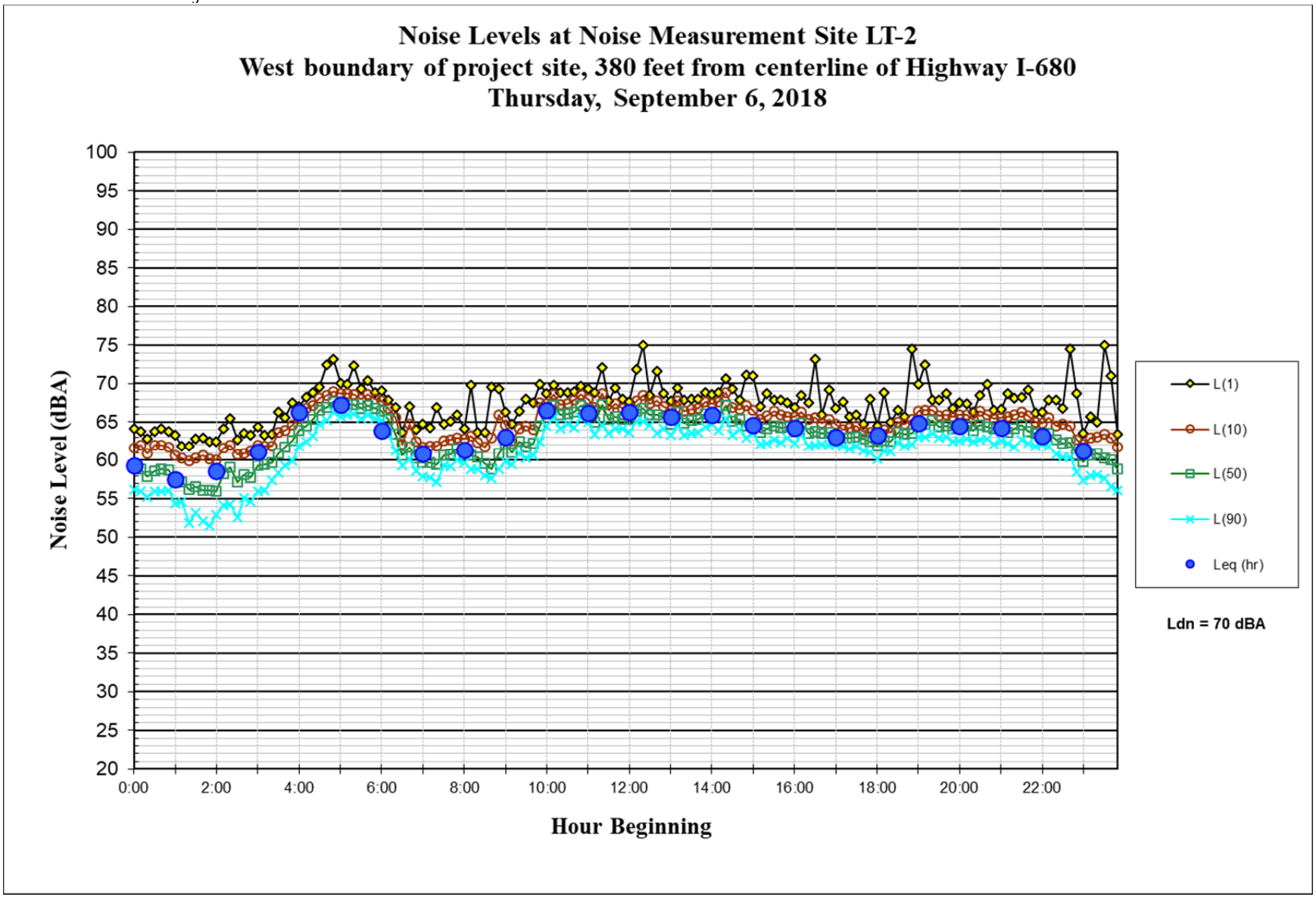


FIGURE 3 Daily Trend in Noise Levels at LT-2



GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The Noise Element of City of Pleasant Hill's General Plan sets forth policies with the 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 for the proposed project:

- The City's normally acceptable exterior noise level objective is 65 dBA L_{dn} or less for transient lodging/hotel land uses.

- The State of California's Building Code requires interior noise levels in residences and hotels to be less than 45 dBA L_{dn}.

- The California Green Building Code limits interior noise levels within new non-residential land uses to an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

Noise and Land Use Compatibility

The project proposes to demolish an existing restaurant building and construct a 4-story, 155-room hotel. Grade level parking will be provided for 135 vehicles. The proposed building will be located to the southwest corner of intersection of North Main Street and Oak Park Boulevard, to the west of Interstate Highway 680. Exterior use areas would include a pool and terrace on the first floor. The primary noise source for proposed building would continue to be traffic on Highway I-680.

Future Exterior Noise Environment

Based on traffic volumes provided in the Traffic Impact Assessment (TIA)[1], future traffic noise levels on are anticipated to increase by 2 dB from existing levels. Future traffic noise levels at the site were calculated based on the results of the noise monitoring survey and accounting for the increase in traffic noise due to higher traffic volumes.

Exterior use areas of the proposed hotel building would include a pool and terrace area on the first floor. According to the site plans[2], the pool and terrace would be shielded from North Main Street and Highway I-680 by the hotel building. The primary noise source for the outdoor use area is the traffic on Highway I-680. The terrace and pool area would be exposed to a noise level of 63 dBA L_{dn}. Exterior noise levels would meet the acceptable exterior noise level criteria of 65 dBA L_{dn} for hotel land use as per the standards set by City of Pleasant Hill.

[1] Administrative Draft – Traffic Impact Assessment, Cambria Hotel Project; Fehr & Peers, October, 2018.

[2] Cambria Hotel and Suites Site Plans; Hannouche Architects, Newport Beach, CA, September 26, 2018.

Future Interior Noise Environment

The California Building Code requires that interior noise levels be maintained at 45 dBA L_{dn} or less for residences and hotels. The Cal Green code requires interior noise attributable to exterior sources to not exceed 50 dBA $L_{eq\text{-}1hr}$ in non-residential spaces.

The space on the first floor of the hotel building would be used for office, meeting rooms, fitness center etc. Rooms would be located on second through fourth floors. The western façade of hotel building would be exposed to a future noise level of 80 dBA $L_{dn,}$ based on the noise measurements and the calculated future increase in traffic noise. The eastern façade would be exposed to 67 dBA L_{dn}.

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn}, the inclusion of adequate forced-air mechanical ventilation can reduce interior noise levels to acceptable levels by allowing occupants the option of closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn}, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Interior noise levels in rooms with standard construction and windows open would be up to 65 dBA L_{dn} for rooms facing west and 52 dBA for rooms facing east. These levels exceed the City's threshold for interior noise (45 dBA L_{dn}). The inclusion of forced air mechanical ventilation and windows would be sufficient for rooms facing east. Rooms facing west, with windows overlooking Highway I-680, would require windows with STC[3] 36 rating or higher to reduce the interior noise exposure in these units to 45 dBA L_{dn} or less, assuming a window to wall ratio[4] of 22% or less.

Non-residential spaces on the first floor of the hotel would be exposed to interior noise levels up to 64 dBA L_{eq} with standard construction and open windows. Inclusion of forced air mechanical ventilation with STC 33 rating[5] of higher would be required to limit interior noise levels to 49

[3] **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

[4] Window and wall dimensions were approximated from project site plan. Walls are assumed to be STC46 – Stucco walls.

[5] The office and meeting rooms will have larger windows. A Window to wall ratio of 75 % was assumed for calculation of interior noise in non-dwelling spaces on first floor of the proposed hotel building.

dBA $L_{eq\ (1\text{-}hr)}$. These levels would comply with the acceptable interior limit of 50 dBA $L_{eq\ (1\text{-}hr)}$ specified by the Cal Green Code.

Recommended Conditions of Approval

For consistency with the General Plan, the following Conditions of Approval are recommended for consideration by the City:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, so that windows can be kept closed to control noise.

- Provide sound rated windows to proposed building façades facing West to maintain interior noise levels at acceptable levels. Preliminary calculations show that sound-rated windows with minimum STC Ratings of 36 or higher would be necessary for hotel rooms to achieve acceptable interior noise levels, assuming stucco wall construction and a window to wall ratio of 22% or less. STC Ratings of 33 or higher would be necessary for ground floor non-residential spaces to achieve acceptable interior noise levels, assuming stucco wall construction and a window to wall ratio of 75% or less. The specific determination of what noise insulation treatments are necessary shall be conducted on a room-by-room basis during final design of the project.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Conflict with Established Standards:** A significant impact would be identified if project construction were to conflict with local noise standards contained in the City of Pleasant Hill's General Plans or Municipal Code.

- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- **Permanent Noise Increases:** A significant permanent noise impact would occur if the project resulted in an increase of 3 dBA L_{dn} or greater at noise-sensitive land uses where existing or projected noise levels would equal or exceed the noise level considered satisfactory for the affected land use (60 dBA L_{dn} for residential areas) and/or an increase

of 5 dBA L_{dn} or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use.

- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses. Hourly average noise levels exceeding 70 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent commercial land uses.

Impact: 1 **Operational Noise.** The operation of the project could produce nose levels in excess of local noise standards at nearby noise-sensitive land uses. **This is a potentially significant noise impact.**

Operational noise sources associated with the project include rooftop mechanical equipment and parking lot activities. The City of Pleasant Hill Zoning Ordinance states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 50 dBA L_{eq} at any property line shared with land zoned for residential use or 60 dBA at any property line shared with land zoned for commercial/industrial uses. Maintenance equipment or tools are to be used between the hours of 8:00 a.m. and 7:00 p.m. on weekdays and 9:00 a.m. and 7:00 p.m. on weekends and holidays.

Mechanical Equipment Noise

The project proposes 12 self-contained heat pumps located on the rooftop. Pool and elevator equipment would be located indoors and would not be anticipated to be audible outside the building structure. The rooftop units are Goodman GPH1460H41 heat pumps, which are specified to produce a noise level of 80 decibels. Although no distance or weighting is given for this noise level by the manufacturer, it is assumed that this refers to a noise level of 80 dBA at a distance of 5 feet based on our experience with similar units.

The rooftop equipment, based on the plans dated June 18, 2018, would be located as close as 100 feet from the nearest residential property line and 130 feet from the nearest commercial property line. Not taking into account any noise reduction due to shielding from the rooftop or an parapet walls, the cumulative noise level generated by all 12 units operating simultaneously would be 64 dBA at the residential property line and 62 dBA at the commercial property line. These levels would exceed the 50 dBA L_{eq} limit at the residential property line and the 60 dBA L_{eq} limit at the commercial property line. This is a **potentially significant** impact.

Use of 42-inch solid parapet wall or mechanical screen to shield the mechanical equipment form the surrounding uses would reduce noise levels to be in compliance with the City's Ordinance limits.

Parking Lot

The proposed surface parking lot and outdoor dining patio will be located on the northern portion of the project site bordered by residential land uses to the west. The major noise sources attributed to parking lot activities is the sound of vehicles as they drive by, noise generated when vehicles start their engines, door slams and the occasional sound of car alarms. Sounds of voices generally produce less noise. Based on data contained in I&R files, typical parking lot activities generate maximum noise levels of 50 to 60 dBA L_{max} when measured at 50 feet from the source. Car alarms generate maximum noise levels of 63 to 70 dBA L_{max} at 50 feet. The hourly average noise level resulting from noise-generating activities in a small parking lot would be anticipated to reach 40 dBA L_{eq} at a distance of 50 feet from the parking area. Residential units at the end of Pleasant Court (approximately 15 feet from active parking areas, at their nearest point) would experience hourly average noise levels of 50 dBA L_{eq}. Parking lot activities would not exceed the ambient noise levels currently experienced at these residences. Parking lot activities could result in intermittent maximum noise levels at adjoining residential properties, but these maximum levels would typically be below maximum noise levels generated by existing traffic along North Main Street and I-680. This is a **less-than-significant** impact.

Outdoor Activity Noise

Outdoor activities associated with the pool will be located on the southwestern portion of the hotel building. The major noise sources attributed to outdoor pool activities is the sound of voices while people congregate. Noise generated during pool activities would be similar in character to typical residential activity noise and below noise levels generated by existing traffic along North Main Street and I-680. This is a **less-than-significant** impact.

Overall Project Noise Contribution

Based on the results of the noise monitoring survey, residences to the west of the project site are currently exposed to an ambient noise level of about 62 dBA L_{dn} at ground level and 70 dBA L_{dn} at upper stories, primarily generated by vehicular traffic on I-680. These residences are shielded by an existing 6-foot high sound wall and by the existing on-site 2-story structure. Construction of the proposed 4-story hotel would provide substantially more shielding from vehicular traffic noise on I-680 and Main Street to residences located to the west. It is anticipated that up to 5 dBA of additional noise reduction would be provided to the ground level of these residences and 5 to 15 dBA of noise reduction would be provided to upper stories. As a result, future traffic noise levels at well shielded residences would be approximately 57 dBA L_{dn} at ground and upper levels taking into account the shielding provided by the project structure. These noise levels would be considered “normally acceptable” under the City of Pleasant Hill’s General Plan criteria.

With the development of the project, assuming the construction of the 42-inch parapet wall as specified in Mitigation Measure 1, the project would generate a combined noise level of 50 dBA L_{eq} at the closest residences to the west. Assuming 24-hour operations of mechanical equipment, this would be equivalent to a day-night average noise level of 56 dBA L_{dn}. The resulting future ambient noise level at residences to the west, taking into account noise generating project

operations and the shielding provided by the project building from traffic on I-680 and Main Street, would be 60 dBA L_{dn}. This noise level would be about 2 dBA lower than existing noise levels at ground levels of residences and about 10 dBA lower than existing noise levels at upper stories. This is a **less-than-significant** impact.

Mitigation Measure 1: The following mitigation measures shall be included in the project to reduce the impact to a less-than-significant level:

- All rooftop equipment shall be shielded by a 42-inch high parapet wall or mechanical screen wall, relative to the base elevation of the equipment. To be effective as a noise barrier, the parapet wall or screen wall must be constructed with a solid material with no gaps at the base or the face of the barrier. Openings or gaps between sound wall materials substantially decrease the effectiveness of the sound wall. Suitable materials for sound wall construction should have a minimum surface weight of 3 pounds per square foot, such as 1-inch-thick wood, 5/8-inch Cement Board, ½-inch laminated glass, masonry block, concrete, or metal one-inch.

Impact 2: **Groundborne Vibration from Construction.** Commercial buildings near the project site would not be exposed to excessive construction-related vibration. **This is a less-than-significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Pile driving, a typically high vibration generating activity, is not anticipated during the project. Construction activities would include site demolition work, preparation work, excavation of below-grade levels, foundation work, and new building framing and finishing. Table 5 presents typical vibration levels that could be expected from construction equipment at 25 feet.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		**PPV at 25 ft. (in/sec)**
Pile Driver (Impact)	upper range	1.158
	typical	0.644
Pile Driver (Sonic)	upper range	0.734
	typical	0.170
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

The City of Pleasant Hill does not establish a vibration limit for construction. For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern. For historic and old buildings, the limit is 0.08 in/sec PPV (see Table 3). There are no known historical or structurally weakened buildings within 300 feet of the proposed building. Therefore, the 0.3 in/sec PPV threshold would apply.

Construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. At 25 feet, jackhammers typically generate vibration levels of 0.035 in/sec PPV and drilling typically generates vibration levels of 0.089 in/sec PPV. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. At a distance of 25 feet and greater, vibration levels from construction activities would be expected to be below the 0.3 in/sec threshold for normal structurally sound buildings.

The nearest land uses to possible heavy construction activities exist to the west, approximately 80 feet from the future building footprint. At this distance, vibration levels may be perceptible to occupants, but would be below the 0.3 in/sec PPV vibration limit and would not be anticipated to cause architectural or structural damage. As construction moves away from the shared property lines, vibration levels would be even lower. This is a **less-than-significant** impact.

Mitigation Measure 2: None required.

Impact: 3 Project-Generated Street Traffic Noise. The proposed project will not substantially increase traffic noise levels along roadways in the project vicinity. **This is a less-than-significant impact.**

A significant permanent noise impact would occur if the project resulted in an increase of 3 dBA L_{dn} or greater at noise-sensitive land uses where existing or projected noise levels would equal or exceed the noise level considered satisfactory for the affected land use (60 dBA L_{dn} for residential areas) and/or an increase of 5 dBA L_{dn} or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use.

Project traffic data was reviewed to calculate the relative change in noise levels expected with the operation of the project. The project would result in an additional 188 peak hour vehicle trips. The majority of trips would be along North Main Street, which has an existing traffic volume of 1100 to 1200 vehicles during peak hour. Very few vehicles would access the site from Oak Park Boulevard. A doubling in traffic volume would result in a 3 dBA increase in traffic noise levels along a roadway. Vehicular traffic generated by the project would not increase noise levels substantially because the project traffic makes up a small percentage of the total traffic along area roadways. Vehicular traffic noise levels are not expected to increase measurably above existing levels as a result of the project (increase would be less than 1 dBA L_{dn}). This is a **less-than-significant** impact.

Mitigation Measure 3: **None Required.**

Impact 4: **Substantial Temporary Noise Increase due to Construction.** Existing noise-sensitive land uses would be exposed to construction noise levels in excess of the significance thresholds for a period of one year. **This is a less-than-significant impact**.

The construction of the project would generate noise and would temporarily increase noise levels at adjacent residential receivers. Noise impacts resulting from construction depend on the noise generated by various pieces of construction equipment operating on site, the timing and duration of noise generating activities, the presence of intervening terrain or noise barriers, and the distance between construction noise sources and noise sensitive receptors. Neither the City of Pleasant Hill nor the State of California specify quantitative thresholds for the impact of temporary increases in noise due to construction. The threshold for speech interference indoors is 45 dBA (see Setting Section, Effects of Noise). Assuming a 15 dB exterior-to-interior reduction for standard residential construction with windows open and a 25 dB exterior-to-interior reduction for standard commercial construction, assuming windows closed, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Therefore, the project would be considered to generate a significant temporary construction noise impact if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

Construction activities generate considerable amounts of noise, especially during demolition activities and when project infrastructure improvements are made with the use of heavy construction equipment. Table 6 depicts the range of A-weighted noise levels generated by specific pieces of construction equipment at a distance of 50 feet. Table 7 presents typical ranges in hourly average noise levels at a distance of 50 feet generated different phases of construction. The highest maximum noise levels generated by project construction would typically range from about 90 to 95 dBA at a distance of 50 feet from the noise source. Typical hourly average construction generated noise levels are about 78 dBA to 89 dBA measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). Construction generated noise levels drop off at a rate of about 6 dBA per doubling of distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

TABLE 6 Noise Level Range of Typical Construction Equipment

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

TABLE 7 Noise Levels by Construction Phase

	Domestic Housing		Office Building, Hotel, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses, or when construction durations last over extended periods of time. Limiting the hours when construction can occur to daytime hours is often a simple method to reduce the potential for noise impacts. In areas immediately adjacent to construction, controls such as constructing temporary noise barriers and utilizing "quiet" construction equipment can also reduce the potential for noise impacts.

It is anticipated that the project would be constructed over a period of 12 months. Construction phases would include, demolition of the current buildings on site, site preparation, grading, trenching and foundation work, building construction, and paving. Pile driving would not be used as a method of construction.

The nearest noise sensitive receptors to future construction are the adjacent residences located 100 feet to the west of the project site center. Project construction would be expected to generate worst-case hourly average noise levels of 71 to 82 dBA L_{eq} at these nearest noise-sensitive receivers. A six-foot sound barrier currently exists between the project site and the nearest residences. This wall provides sound attenuation from traffic noise and would also provide shielding from ground level project construction noise. Daytime ambient noise levels behind the wall, representing the ambient noise environment of the closest noise sensitive receptors, were measured to be 57 dBA L_{eq}. This ambient level dictates an impact threshold of 62 dBA at the nearest noise sensitive receptors. Given the proximity of the single-family residences, construction noise levels would generally exceed 60 dBA L_{eq} and the ambient noise environment by at least 5 dBA L_{eq} when activities are occurring outside during noisy construction phases. However, noise generating construction activities would occur over a period of less than one year.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. The following best management practices should be included in the project to reduce construction noise levels as low as feasible:

- Noise-generating activities at the construction site or in areas adjacent to the construction site associated with the project in any way should be restricted to the hours of 8:00 a.m. to 7:00 p.m. on weekdays and 9:00 a.m. to 7:00 p.m. on weekends.

- Equip all internal combustion engine driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Locate stationary noise generating equipment as far as possible from sensitive receptors when sensitive receptors adjoin or are near a construction project area. Construct temporary noise barriers to screen stationary noise generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction levels by 5 dBA.

- Utilize "quiet" air compressors and other stationery noise sources where technology exists.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction, as feasible.

- Temporary noise control blankets could be erected, if necessary, along upper story building facades facing residential areas. This mitigation would only be necessary if conflicts occurred which were irresolvable by proper scheduling. Noise control blankets can be rented and quickly erected.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with the adjacent noise sensitive facilities so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem be implemented. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.

With the incorporation of these standard construction noise control best management practices and with the understanding that noise generating construction would occur over a period of less than one year, the noise impact resulting from project construction would be considered **less-than-significant**.

Mitigation Measure 4: None Required.