HERITAGE HOUSE ENVIRONMENTAL NOISE AND VIBRATION ASSESSMENT

Napa, California

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Prepared for:

Natalie Noyes
David J. Powers & Associates, Inc.
1611 Telegraph Avenue, Suite 1002
Oakland, CA 94612

Prepared by:

Manasi Biwalkar
Dana M. Lodico, PE, INCE Bd. Cert.

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
429 E. Cotati Ave
Cotati, CA 94931
(707) 794-0400

Project: 18-109

INTRODUCTION

The Heritage House project proposes to modify the interior of the existing Sunrise Assisted Living Facility at 3700 Valle Verde Drive in City of Napa, California. This building will house 24 one-bedroom units and 66 single-room occupancy (SRO) units with on-site supportive services. A new three-story multi-family apartment building will be constructed to the north of the existing building and will house 16 two-bedroom and 8 three-bedroom affordable housing units.

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 CNEL. Typically, the highest steady traffic noise level during the daytime is about equal to the CNEL 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 CNEL with open windows and 65-70 dBA CNEL 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 CNEL 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 CNEL. At a CNEL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the CNEL 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 CNEL of 60-70 dBA. Between a CNEL 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 CNEL 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, November 2009.

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 Napa 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, 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.

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

The impacts of the project on the surrounding land uses are addressed in the Noise Impacts and Mitigation Measures Section of the report. The impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not considered under CEQA and are discussed in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA CNEL or greater would be considered significant

where exterior noise levels would exceed the compatible noise level standard (60 dBA CNEL for residential land uses and 70 dBA CNEL for industrial land uses). Where noise levels would remain at or below the compatible noise level standard with the project, noise level increases of 5 dBA CNEL 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 DNL/CNEL in any habitable room.

Supplemental Annoyance and Sleep Disturbance Criteria. Though the City noise criteria are typically sufficient to achieve an acceptable interior noise environment with common environmental noise source, when dealing with loud intermittent noise sources, such as the sounding of train horns near railroad tracks or emergency vehicle sirens, the achievement of an CNEL of 45 dBA within homes may still result in maximum noise levels within interiors great enough to result in significant sleep disturbance and resident annoyance. Studies have been undertaken to determine the effect of short-term maximum noise levels on these issues. The conclusions of the studies related to the sleep disturbance typically give a probability of sleep disturbance related to the maximum noise level of the event at the sleep location and the duration of the event. A review of these data shows that limiting maximum noise levels to 55 dBA within bedrooms will limit the probability of waking the future residents of the homes at the subject project when trains pass the site to less than five percent per occurrence[1]. Therefore, though this is not a City or State requirement, I&R recommends the adoption of additional interior sound level criteria limiting maximum noise levels from emergency vehicle sirens to 55 dBA within bedrooms and other living spaces within the proposed residences.

City of Napa General Plan. The Health and Safety Chapter in the *Envision Napa 2020, Policy Document* 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 in the City of Napa. The following policies are applicable to the proposed project:

HS-9.1 The City shall require new development to meet the exterior noise level standards set out in Table 8-1. For residential areas, these exterior noise guidelines apply to backyards; exceptions may be allowed for front yards where overriding design concerns are identified.

HS-9.2 The City shall use CEQA and the development review process to ensure that the new development does not exceed City standards.

HS-9.6 The City shall use the development and building permit review process to site new construction in ways that reduce noise levels.

HS-9.9 When feasible and appropriate, the City shall limit construction activities to that portion of the day when the number of persons occupying a potential noise impact area is lowest.

HS-9.10 The City shall encourage new development to maintain the ambient sound environment as much as possible. The City shall require new transportation-related noise sources that cause the ambient sound levels to exceed the compatibility

[1] Kryter Karl D., The effects of Noise on Man, Second Edition, Academic Press, Inc. London, 1985, p.444-446.

standards in Table 8-1 to incorporate conditions or design modifications to reduce the potential increase in noise environment.

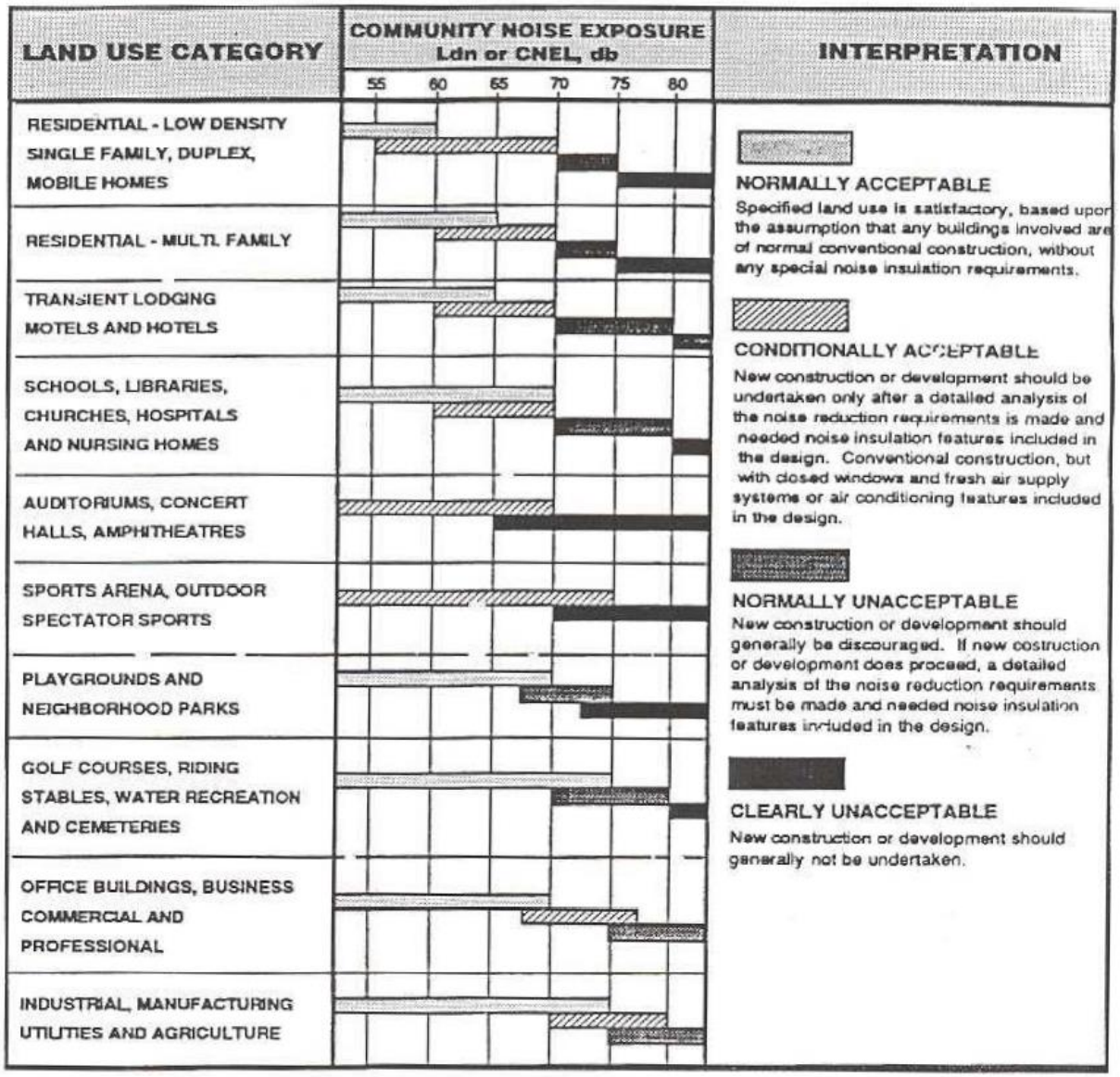
HS-9.11 The City shall regulate construction in a manner that allows efficient construction mobilization and activities, while also protecting noise sensitive land uses.

HS9.13 The City shall require all new residential projects to provide for an interior CNEL of 45 dB or less due to exterior noise sources. To accomplish this, the City shall review all residential and other noise sensitive land uses within the 60 dB contours defined in the Table 8.-2 (not shown) and Figure 8-11 (not shown) to ensure that adequate noise attenuation has been incorporated into the design of the project, or other measures are implemented to protect future sensitive receptors.

HS-9.14 The City shall encourage new development to identify alternatives to the use of sound walls to attenuate noise impacts. Appropriate techniques include site planning such as incorporating setbacks, revisions to the architectural layout such as changing building orientation to provide noise attenuation for portions of outdoor yards, and construction modifications. In the event that sound walls are the only practicable alternative, such walls should be designed to be as visually pleasing as possible, incorporating landscaping, variations in color and patterns, and/ or changes in texture or building materials.

Table 8-1

LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS



City of Napa Municipal Code. Section 17.52.310 of the Napa Municipal Code establishes the City's noise standards:

> D. Development Projects. Development projects shall address noise standards and policies in the General Plan as follows:
>
> 1. Proposed residential projects and other noise sensitive land uses (such as but not limited to schools and residential care facilities) within 60 dB CNEL contours of highways, arterials and some collectors listed in the General Plan Table 8-2 (not shown) shall prepare a noise analysis as part of the project's CEQA review to identify how 60 dB CNEL noise standards will be met and incorporate needed noise attenuation measures.

3. Nonresidential projects adjacent to residential districts shall locate or design potential noise generation areas, such as, but not limited to, truck parking and loading docks, garbage collection areas, to minimize impacts on adjacent sensitive uses to the extent feasible.

Section 8.08.025 of the Napa Municipal Code regulates noise from construction activity. The applicable portion of this section states that any person engaged in construction activity … shall limit said construction activity as follows:

A. Construction activities throughout the entire duration of the project shall be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Friday. There will be no startup of machines nor equipment prior to 8:00 a.m., Monday through Friday; no delivery of materials nor equipment prior to 7:30 a.m. nor past 5:00 p.m., Monday through Friday; no cleaning of machines nor equipment past 6:00 p.m., Monday through Friday; no servicing of equipment past 6:45 p.m., Monday through Friday; and construction on weekends or legal holidays shall be limited to the hours of 8:00 a.m. to 4:00 p.m., unless a permit shall first have been secured from the City Manager, or designee, pursuant to Section 8.08.050 of the code.

B. All muffler systems on construction equipment shall be properly maintained.

C. All construction equipment shall not be placed adjacent to developed areas unless said equipment is provided with acoustical shielding.

D. All construction and grading equipment shall be shut down when not actively in use.

F. As a separate, distinct, and cumulative remedy established for a violation of this section, the Police and/or the Code Enforcement Officer may issue a stop work order for violation of this section. Such order shall become effective immediately upon posting of the notice. After service of the stop work order, no person shall perform any act with respect to the subject property in violation of any of the terms of the stop work order, except such actions the city determines are reasonably necessary to render the subject property safe and/or secure until the violation has been corrected.

Existing Noise Environment

The project site is located on the east-side of Valle Verde Drive, north of Firefly Lane. The site is currently developed with a vacant assisted living facility. A three-story multi-family development is located to the west, Salvador Channel and single-family residences across the channel to the east, a multi-family development to the south and a City-owned stormwater detention area and trail to the north. Queen of the Valley Medical Center is located west of project site on Firefly Lane. A noise monitoring survey was performed in the vicinity of the project site beginning Wednesday, August 8, 2018 and concluding on Friday, August 10, 2018. The monitoring survey included two long-term noise measurements and one short-term measurement, as shown in Figure 1. Table 4 summarizes the results of the short-term measurement. The results of the long-term noise measurements at LT-1 and, LT-2 are shown in Figures 2 and 3, respectively.

Long-term noise measurement LT-1 was made at a distance of about 25 feet from the centerline of Valle Verde Drive on the backside of the existing covered parking lot area associated with the multi-family development to the west of the project site. The primary noise source at this location was vehicular traffic on the adjacent Valle Verde Drive and Firefly Lane. Emergency vehicles and sirens accessing Queen of the Valley Medical Center frequently pass by the site, generating maximum instantaneous noise levels of 75 to 85 dBA L_{max}. Hourly average noise levels ranged from 46 to 61 dBA L_{eq} at this location during daytime hours and from 37 to 58 dBA L_{eq} at night, with higher hourly average noise levels occurring during periods with emergency vehicle sirens. The day-night average noise level on Thursday, August 9, 2018 was 58 dBA CNEL, with inclusion of emergency vehicle sirens and was calculated to be 53 dBA CNEL, with emergency vehicle sirens removed from the data set.

LT-2 was measured at the northeast corner of the project site, approximately 250 feet from Valle Verde Drive. The primary noise sources at this location were distant vehicular traffic and emergency vehicle sirens from Firefly Lane. Hourly average noise levels at this location ranged from 39 to 46 dBA L_{eq} during the day and from 36 to 43 dBA L_{eq} at night. The day-night average noise level on Thursday, August 9, 2018 was 49 dBA CNEL.

TABLE 4 Summary of Short-Term Noise Measurement Data, August 10, 2018

ID	Location (Start Time)	Measured Noise Levels, dBA				Primary noise source
		L_{10}	L_{50}	L_{90}	L_{eq}	
ST-1	At intersection of Valle Verde Drive and Firefly Lane (12:40 pm to 12:50 pm)	72	51	41	58	Traffic on Firefly Lane

FIGURE 1 Noise Measurement Locations

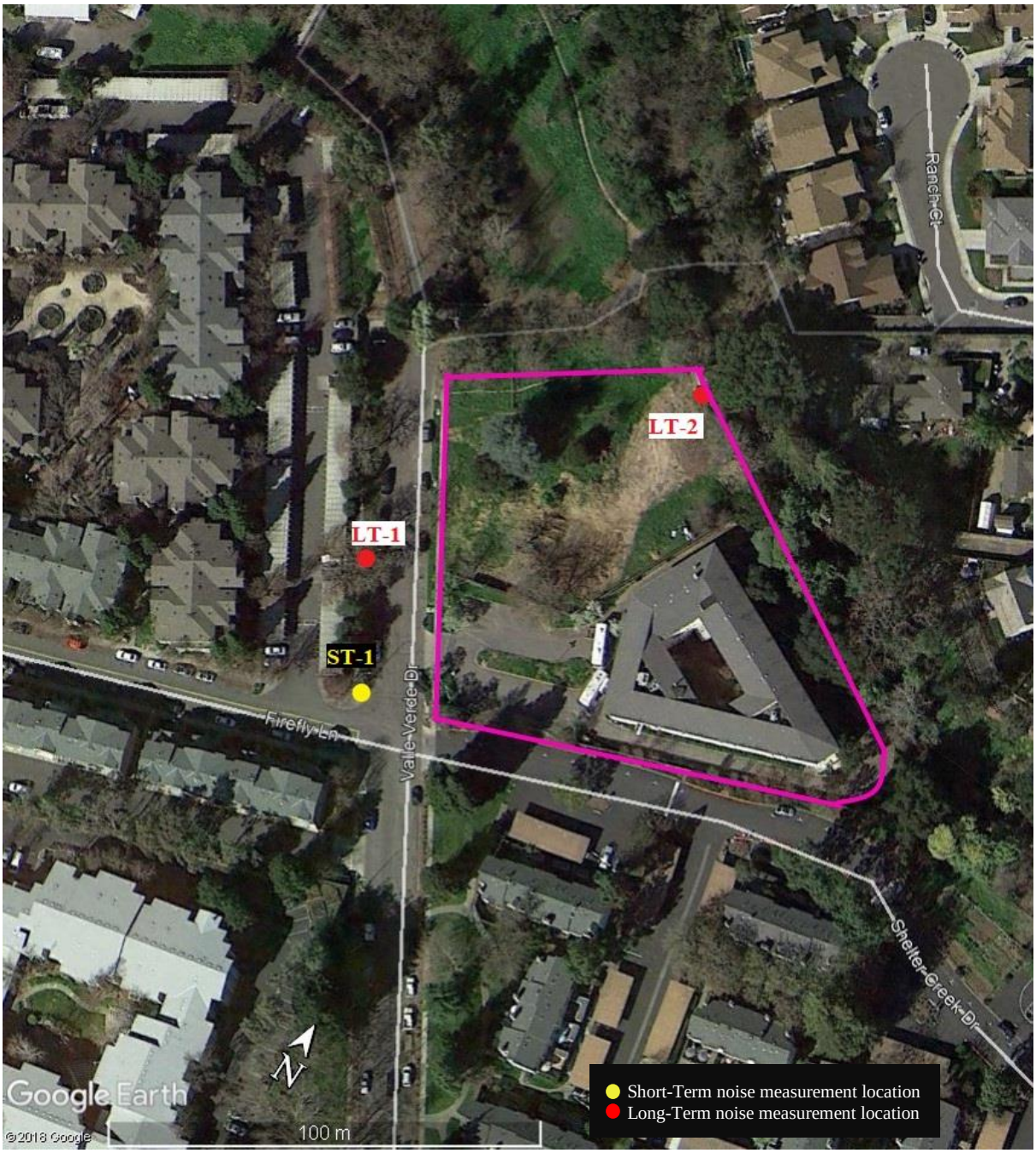


FIGURE 2 Daily Trend in Noise Levels at LT-1

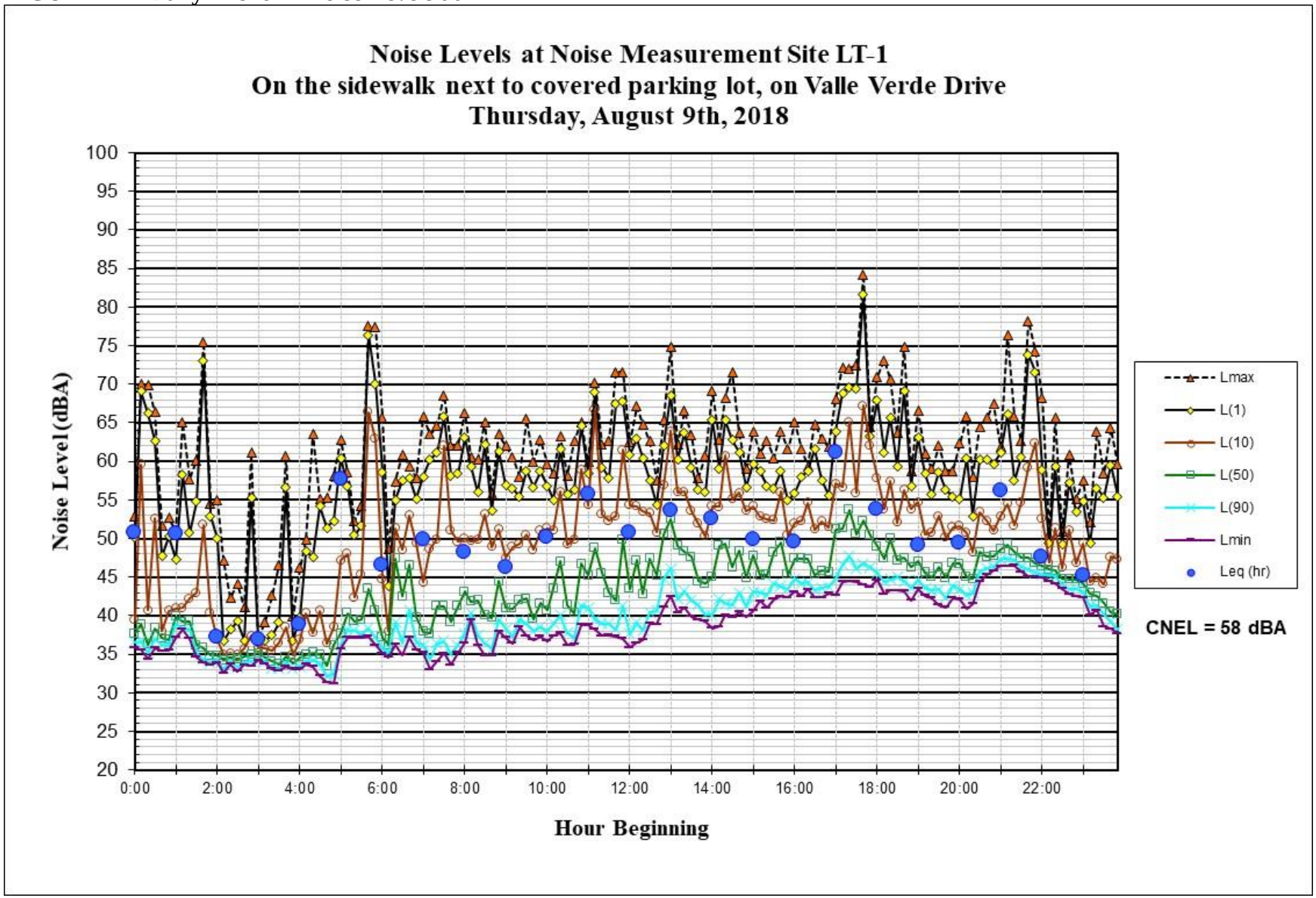
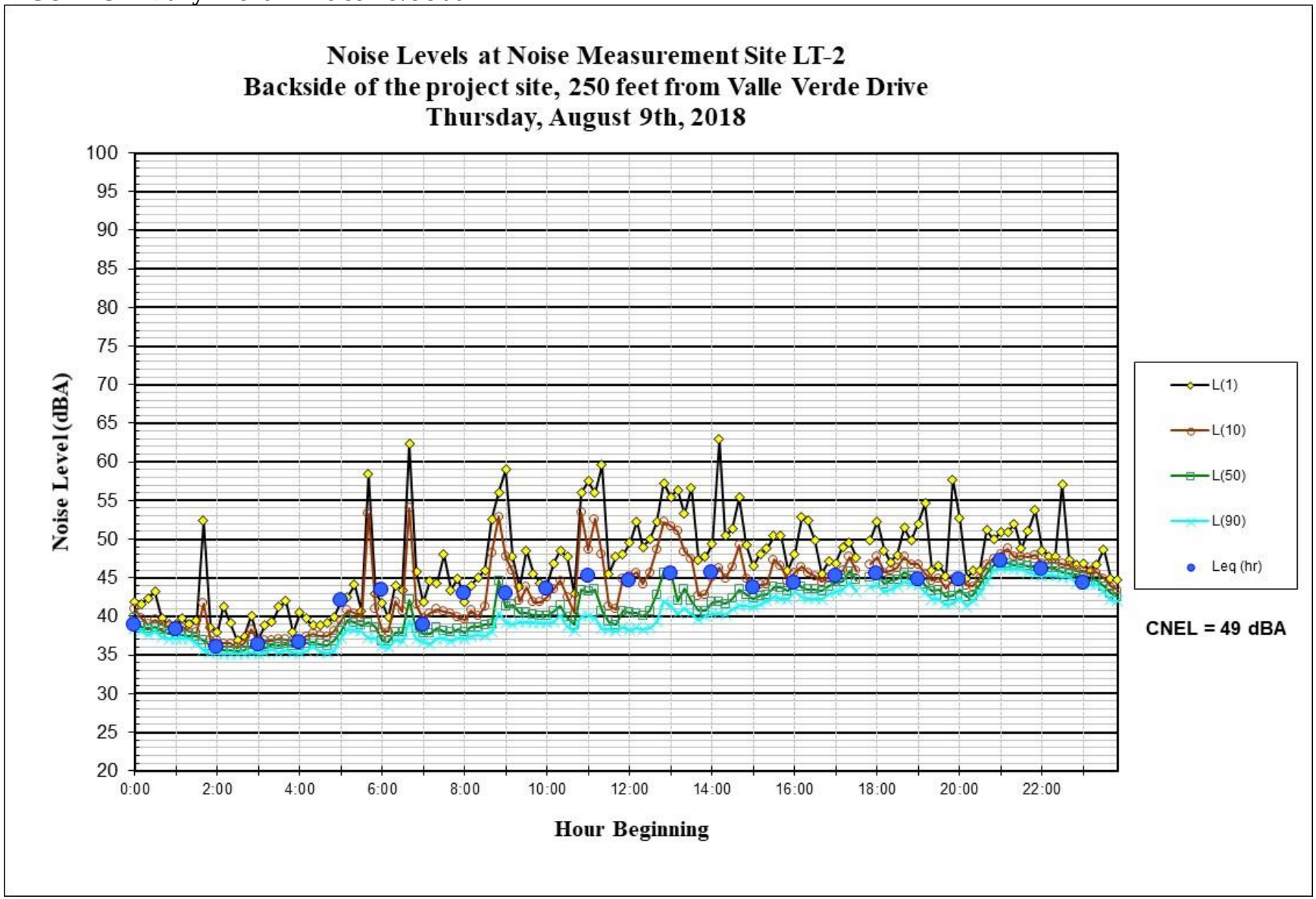


FIGURE 3 Daily Trend in Noise Levels at LT-2



GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The Health and Safety Chapter in the Envision Napa 2020 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 in the City of Napa. 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 acceptable exterior noise level objective is 65 dBA CNEL or less for multi-family residential uses (Table 8-1).

- The City's standard for interior noise levels in residences is 45 dBA CNEL.

- Maximum instantaneous noise levels from emergency vehicle sirens are recommended to be controlled to 55 dBA L_{max} or less inside bedrooms and other living spaces within proposed residences.

Noise and Land Use Compatibility

The project proposes to convert the former Sunrise Assisted Living Facility to Heritage House with 24 one-bedroom units and 66 single-room occupancy (SRO) units. In addition, a new three-story multi-family building (Valle Verde) will be constructed to the north of existing building, and will include 16 two-bedroom units and 8 three-bedroom units. A total of 92 parking spaces will be provided for both buildings.

Valle Verde will include a courtyard patio and BBQ area, play area, shade garden, half basketball court, and picnic area near the building courtyard to the north of the building. Heritage House will have an outdoor patio with benches in its central courtyard. All units in Valle Verde Apartments will have private balconies facing Firefly Lane and Valle Verde Drive.

Future Exterior Noise Environment

The primary noise sources at the site would continue to be vehicular traffic on Valle Verde Drive and Firefly Lane. Based on traffic volumes provided[2], future traffic noise levels along Valle Verde Drive and Firefly Lane are not anticipated to increase under future conditions due to increases in traffic volumes along these roadways.

Exterior use areas of Heritage House would include the outdoor patio located in the central courtyard, which would be exposed to 49 dBA CNEL. Exterior use areas of the multi-family apartment building would include a courtyard patio and BBQ area, play area, shade garden, half basketball court, and picnic area, which would also be exposed to 49 dBA CNEL. Outdoor areas would be shielded by existing and proposed buildings. The private balconies of Valle Verde

[2] Traffic volume data provided in file *3700-3200 Valle Verde Drive Volumes.xlsx* on September 20, 2018.

Apartments would be exposed to ambient noise levels of up to 54 dBA CNEL in balconies facing Valle Verde Drive, not including occasional emergency vehicle sirens, which would vary on a day-to-day basis and would not be anticipated to affect the usability of the outdoor spaces. Noise levels at the exterior use areas of Heritage House and Valle Verde Apartments would not exceed the City's acceptable exterior noise level criteria of 65 dBA CNEL for multi-family residential use.

Future Interior Noise Environment

The City of Napa requires that interior noise levels be maintained at 45 dBA CNEL or less inside residences. Due to the variability in timing and frequency of emergency vehicle sirens, the CNEL requirement is assessed with respect to interior noise levels that do not include the instantaneous maximum noise levels generated by emergency vehicle sirens. Additionally, to minimize the potential for activity interference and sleep disturbance (as recommended above), typical maximum instantaneous noise levels from emergency vehicle sirens should be controlled to 55 dBA L_{max} or less inside bedrooms and other living spaces within proposed residences.

The calculated exterior noise level exposures at building façades were calculated based on noise measurement survey and future increase in traffic. The south façade of Heritage House would be exposed to 59 dBA CNEL and the west façade would be exposed to maximum noise level of up to 56 dBA CNEL. The south façade of Valle Verde Apartment building would be exposed to up to 54 dBA CNEL. Maximum instantaneous noise levels from emergency vehicle sirens would range from 80 to 93 dBA L_{max} at the exterior of the south facing Heritage House façade and from 74 to 87 dBA L_{max} at the exterior of the south facing Valle Verde façade, with typical[3] maximum instantaneous noise levels of 84 dBA L_{max} at Heritage House and 78 dBA L_{max} at Valle Verde.

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 CNEL, 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.

Interior noise levels in multi-family Valle Verde units with standard construction and windows open would be up to 39 dBA CNEL inside units facing Firefly Lane. Interior noise levels of residential units in Heritage House are calculated to be 44 dBA CNEL for units facing Firefly Lane and 41 dBA CNEL for units facing Valle Verde Drive, assuming standard construction only and windows in the open position. Interior noise levels inside both Heritage House and Valle Verde would meet the City's threshold for interior noise.

Typical maximum instantaneous noise levels from emergency vehicle sirens would be anticipated to be 65 dBA L_{max} inside south facing Valle Verde units and 71 dBA L_{max} inside south facing Heritage House, with windows open. These levels exceed the recommended interior noise level of

[3] Typical L_{max} was calculated based on the 0.3 percentile of emergency vehicle siren generated L_{max} levels measured during the noise monitoring survey.

55 dBA L_{max} within living spaces. The inclusion of forced air mechanical ventilation, to allow occupants the option of keeping windows closed to control noise, and windows with STC ratings[4] of 28 or greater, would be sufficient to limit interior noise inside all Valle Verde units and of east, west, and north facing Heritage House units to acceptable maximum instantaneous levels (55 dBA L_{max}), assuming a window to wall ratio of 40% or less. Preliminary calculations indicate that the inclusion of forced air mechanical ventilation and windows with STC ratings of 30 or greater would achieve the 55 dBA L_{max} maximum instantaneous noise level threshold in south facing Heritage House units.

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, for all buildings so that windows can be kept closed to control noise from emergency vehicle sirens.

- Provide sound rated windows to proposed building residential façades to maintain interior maximum instantaneous noise levels due to emergency vehicle sirens at acceptable levels. Preliminary calculations show that sound-rated windows with minimum STC Ratings of 28 or higher would be satisfactory for all Valle Verde units and for east, west, and north facing Heritage House units to achieve acceptable interior noise levels, assuming a windows to wall ratio of 40% or less. Sound-rated windows with minimum STC Ratings of 30 or higher would be needed to reduce interior maximum levels in south facing Heritage House units to achieve acceptable interior noise levels. 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.

[4] **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.

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 San José General Plan 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 CNEL 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 CNEL for single-family residential areas) and/or an increase of 5 dBA CNEL or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use. (General Plan Policy HS-9.1)

- **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: **Conflict with Established Standards.** Operational and construction activities would not exceed the applicable noise thresholds. **This is a less-than-significant impact.**

Mechanical Equipment Noise

Neither the City of Napa General Plan nor the City of Napa Municipal Code regulates noise from industrial operations on other industrial properties. However, the Napa General Plan establishes 60 dBA CNEL as the "normally acceptable" noise exposure level for single family residential land uses, which are located to the east of the site, and 65 dBA CNEL as the "normally acceptable" noise exposure level for multi-family residential land uses, which are located to the west and south of the site. As per the site plan dated April 26, 2018[5], all mechanical equipment would be housed inside an equipment room located on the first floor of Heritage House and Valle Verde Apartments. Indoor mechanical equipment is not anticipated to be audible at adjacent uses. Rooftop equipment is not proposed. This is a **less-than-significant impact**.

Construction Noise

The Napa Municipal Code limits construction hours to between the hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, with no startup of machines nor equipment prior to 8:00 a.m., no delivery of materials nor equipment prior to 7:30 a.m. nor past 5:00 p.m., no cleaning of machines nor equipment past 6:00 p.m., and no servicing of equipment past 6:45 p.m. Construction on weekends or legal holidays is limited to the hours of 8:00 a.m. to 4:00 p.m.. In addition, all muffler systems on construction equipment are required to be properly maintained, all construction equipment is prohibited from being placed adjacent to developed areas unless said equipment is provided with acoustical shielding, and all construction and grading equipment is required to be shut down when not actively in use.

Assuming that all construction activities for the proposed project are conducted in accordance with Section 8.08.025 of the Napa Municipal Code, noise generated by construction activities would not be in excess of the established standards. This would be a **less-than-significant impact.**

Mitigation Measure 1: None required.

Impact 2: **Groundborne Vibration from Construction.** Construction-related vibration levels resulting from construction activities are not calculated to exceed 0.3 in/sec PPV at the nearest structures. **This is a less-than-significant impact.**

City of Napa's General Plan does not specify a vibration limit for construction. Based on the thresholds provided by Caltrans (see Table 3), a construction vibration limit of 0.3 in/sec PPV would minimize damage at buildings of normal conventional construction. A significant impact would occur if buildings adjacent to the proposed construction site were exposed to vibration levels in excess of 0.3 in/sec PPV.

[5] Planning & EIR Submittal, Heritage House and Velle Verde, Napa, California; MWA Architects, April 26, 2018.

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition work, preparation work, excavation of below-grade levels, foundation work, and new building framing and finishing. In addition to the proposed buildings, a stitch pier retaining structure would be constructed parallel to creek channel, extending 40-feet below the parking area.

Table 6 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Construction activities, such as use of saws, excavators, scrapers and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 6 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	0.17
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

Substantial exterior construction is not anticipated for the Heritage House building. The nearest existing structure to Valle Verde Apartments is located 100 feet east. Pile driving is not anticipated for this project. At a distance of 100 feet, vibration levels from construction are anticipated to be 0.046 in/sec PPV or less. 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: **Permanent Traffic Noise Increases.** The project would not result in a substantial permanent traffic noise level increase at existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact**.

A significant noise impact would occur if traffic or activities generated by the project would substantially increase noise levels at sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater, with a future noise

level of less than 60 dBA CNEL, or b) the noise level increase is 3 dBA CNEL or greater, with a future noise level of 60 dBA CNEL or greater.

Traffic data provided by the project's traffic study[1] was reviewed to calculate potential traffic noise level increases attributable to the project expected along roadways serving the site. Roadways evaluated in the analysis included Firefly Lane and Valle Verde Drive. Based on a comparison between traffic volumes under the existing plus project scenario and existing conditions, the traffic noise increase attributable to the project would be less than 1 dBA. This is a **less-than-significant** impact.

Mitigation Measure 3: None required.

Impact 4: **Construction Noise.** Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less-than-significant impact**.

As described in Impact 1, construction would be conducted in accordance with the hours of construction specified within the City of Napa's Municipal Code. Impact 1 also provides best construction management practices to reduce construction noise levels at adjoining properties.

Neither the City of Napa 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.

Project construction is anticipated to occur over a period nine months. Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

Construction activities would be carried out in stages. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 7 and 8. Table 7 shows the average noise level ranges, by construction phase, and Table 8 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise falls with the range of 80 to 90 dBA at a distance of 50 feet from the source.

TABLE 7 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, 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.

TABLE 8 Construction Equipment 50-foot Noise Emission Limits

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:

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: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

Construction activities generate considerable amounts of noise, especially during demolition and earth-moving activities when heavy equipment is used. Pile driving is not anticipated as a method of construction for this project. The construction of the proposed project would involve demolition, site preparation, grading and excavation, trenching, building erection, and paving. The hauling of excavated materials and construction materials would generate truck trips on local roadways as well.

Table 9 shows the anticipated construction noise levels calculated using the Federal Highway Administration (FHWA) software - Roadway Construction Noise Model (RCNM).

TABLE 9 Calculated Construction Noise Levels for Each Phase of Construction

Construction Phase	At Distance of 50 ft.	
	L_{eq}, dBA	**L_{max}, dBA**
Demolition	85	90
Site Preparation	83	85
Grading/Excavation	84	85
Trenching	82	84
Building-Exterior	82	84
Building-Interior	74	77
Paving	83	84

At 50 feet from the noise source, maximum instantaneous noise levels generated by project construction equipment are calculated to range from 77 to 90 dBA L_{max} and hourly average noise levels are calculated to range from 74 to 85 dBA L_{eq}.

Noise sensitive uses surrounding the site include residential buildings located 100 feet east and 160 feet west of the proposed Valle Verde Apartments building. Residences to the east would be exposed to a maximum noise level of 84 dBA L_{max} during demolition phase and maximum noise levels of 71 to 79 dBA L_{max} during other phases of construction. Typical hourly average noise levels of 84 dBA L_{eq} during demolition and 71 to 79 dBA L_{eq} during other phases of construction are anticipated. Noise levels at residences to the west would be about 4 dBA lower due to the increased distance. Typically, small construction projects do not generate significant noise impacts when standard construction best management practices are enforced at the project site and when the duration of the noise generating construction period is limited to one year or less. Construction noises associated with projects of this type are disturbances that are necessary for the construction or repair of buildings and structures in urban areas. Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction materials, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life.

Noise levels would exceed 60 dBA L_{eq} and ambient levels by more than 5 dBA at adjacent residences. However, construction would occur for a period of less than one year. Assuming construction is conducted in accordance with the hours and best management practices specified in Section 8.08.025 of the Napa Municipal Code, this is a **less-than-significant** impact.

Mitigation Measure 4: None required.

HERITAGE HOUSE
NEPA NOISE ASSESSMENT

Napa, California

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Prepared for:

Natalie Noyes
David J. Powers & Associates, Inc.
1611 Telegraph Avenue, Suite 1002
Oakland, CA 94612

Prepared by:

Manasi Biwalkar
Dana M. Lodico, PE, INCE Bd. Cert.

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
429 East Cotati Avenue
Cotati, CA 94931
(707) 794-0400

I&R Job #: 18-109

INTRODUCTION

The Heritage House project proposes to modify the interior of the existing Sunrise Assisted Living Facility at 3700 Valle Verde Drive in City of Napa, California. This building will house 24 one-bedroom units and 66 single-room occupancy (SRO) units with on-site supportive services. A new three-story multi-family apartment building will be constructed to the north of the existing building and will house 16 two-bedroom and 8 three-bedroom affordable housing units.

The project's potential to result in adverse effects with respect to applicable National Environmental Policy Act (NEPA) guidelines is assessed in this report. The report is divided into two sections. 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. The NEPA Noise Assessment Section evaluates noise effects resulting from the project.

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 (*L_{dn} or *DNL)* 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.

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.

Regulatory Background

The U.S. Department of Housing and Urban Development (HUD) environmental noise regulations are set forth in 24CFR Part 51B (Code of Federal Regulations). The following exterior noise standards for new housing construction would be applicable to this project:

- 65 dBA DNL or less – acceptable.

- Exceeding 65 dBA DNL but not exceeding 75 dBA DNL – normally unacceptable (appropriate sound attenuation measures must provide an additional 5 decibels of attenuation over that typically provided by standard construction in the 65 dBA DNL to 70 dBA DNL zone; 10 decibels additional attenuation in the 70 dBA DNL to 75 dBA DNL zone).

- Exceeding 75 dBA DNL – unacceptable.

These noise standards also apply, "… at a location 2 meters from the building housing noise sensitive activities in the direction of the predominant noise source…" and "…at other locations where it is determined that quiet outdoor space is required in an area ancillary to the principal use on the site."

A goal of 45 dBA DNL is set forth for interior noise levels and attenuation requirements are geared toward achieving that goal. It is assumed that with standard construction any building will provide sufficient attenuation to achieve an interior level of 45 dBA DNL or less if the exterior level is 65 dBA DNL or less. Where exterior noise levels range from 65 dBA DNL to 70 dBA DNL, the project must provide a minimum of 25 decibels of attenuation, and a minimum of 30 decibels of attenuation is required in the 70 dBA DNL to 75 dBA DNL zone. Where exterior noise levels range from 75 dBA DNL to 80 dBA DNL, the project must provide a minimum of 35 decibels of attenuation to achieve an interior level of 45 dBA DNL or less.

Existing Noise Environment

The project site is located on the east-side of Valle Verde Drive, north of Firefly Lane. The site is currently developed with a vacant assisted living facility. A three-story multi-family development is located to the west, Salvador Channel and single-family residences across the channel to the east, a multi-family development to the south and a City-owned stormwater detention area and trail to the north. Queen of the Valley Medical Center is located west of project site on Firefly Lane. A noise monitoring survey was performed in the vicinity of the project site beginning Wednesday, August 8, 2018 and concluding on Friday, August 10, 2018. The monitoring survey included two long-term noise measurements and one short-term measurement, as shown in Figure 1. Table 4 summarizes the results of the short-term measurement.

Long-term noise measurement LT-1 was made at a distance of about 25 feet from the centerline of Valle Verde Drive on the backside of the existing covered parking lot area associated with the multi-family development to the west of the project site. The primary noise source at this location was vehicular traffic on the adjacent Valle Verde Drive and Firefly Lane. Emergency vehicles and sirens accessing Queen of the Valley Medical Center frequently pass by the site, generating

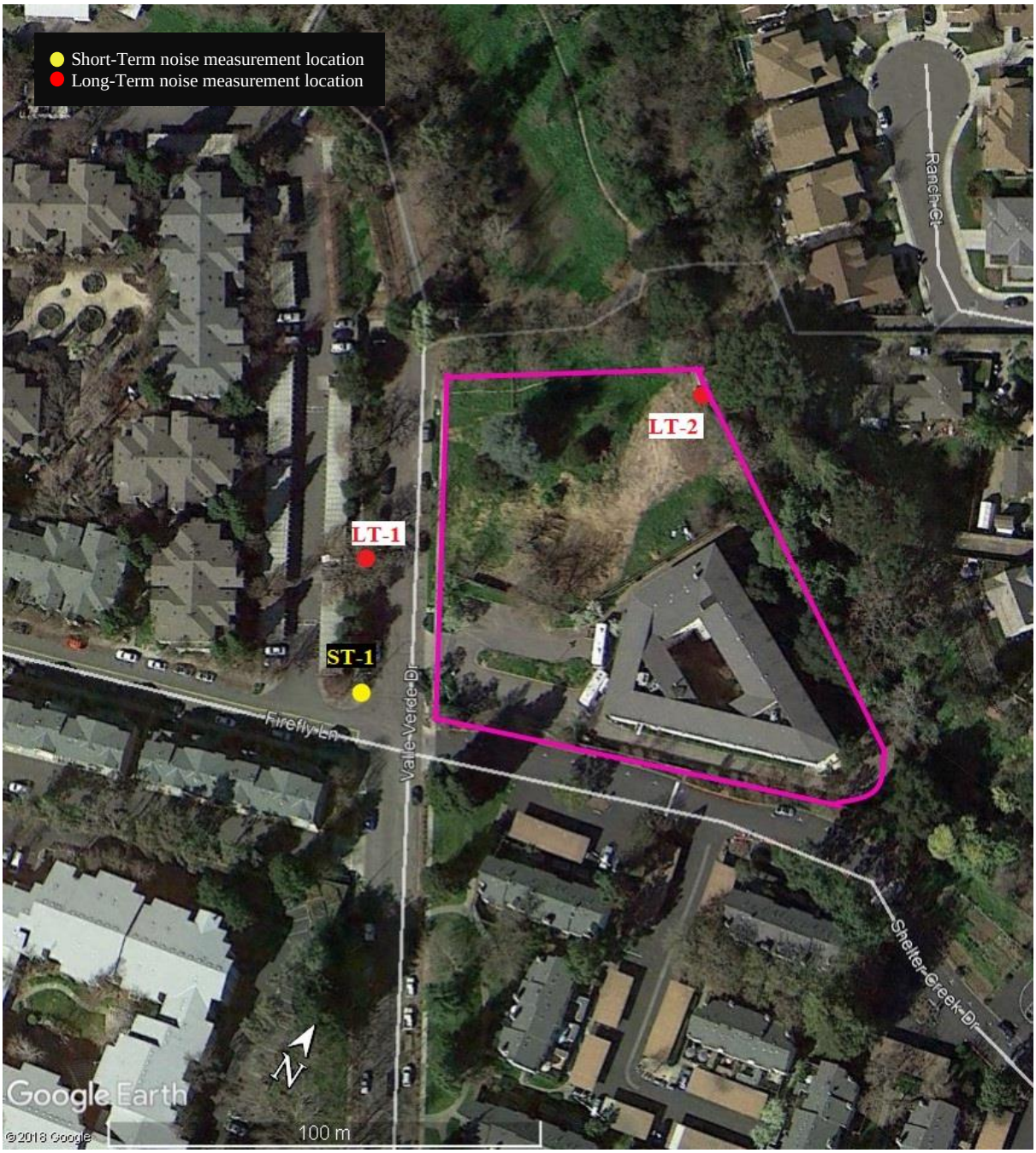
maximum instantaneous noise levels of 75 to 85 dBA L_{max}. Hourly average noise levels ranged from 46 to 61 dBA L_{eq} at this location during daytime hours and from 37 to 58 dBA L_{eq} at night, with higher hourly average noise levels occurring during periods with emergency vehicle sirens. The day-night average noise level on Thursday, August 9, 2018 was 58 dBA DNL, with inclusion of emergency vehicle sirens and was calculated to be 53 dBA DNL, with emergency vehicle sirens removed from the data set.

LT-2 was measured at the northeast corner of the project site, approximately 250 feet from Valle Verde Drive. The primary noise sources at this location were distant vehicular traffic and emergency vehicle sirens from Firefly Lane. Hourly average noise levels at this location ranged from 39 to 46 dBA L_{eq} during the day and from 36 to 43 dBA L_{eq} at night. The day-night average noise level on Thursday, August 9, 2018 was 49 dBA DNL. The results of the long-term noise measurements at LT-1 and, LT-2 are shown in Figures 2 and 3, respectively.

TABLE 4 Summary of Short-Term Noise Measurement Data, August 10, 2018

ID	Location (Start Time)	Measured Noise Levels, dBA				Primary noise source
		L_{10}	L_{50}	L_{90}	L_{eq}	
ST-1	At intersection of Valle Verde Drive and Firefly Lane (12:40 pm to 12:50 pm)	72	51	41	58	Traffic on Firefly Lane

FIGURE 1 Noise Measurement Locations



Source: Google Earth, 2018.

NEPA NOISE ASSESSMENT

Significance Criteria

An adverse effect would result if noise levels at the project site would exceed HUD Guidelines for acceptability. Exterior noise levels exceeding 65 dBA DNL or interior noise levels exceeding 45 dBA DNL would exceed HUD's noise compatibility criteria. Although the HUD guidelines are only specified to apply to new construction (Valle Verde Building), this analysis applies the same criteria to all residences onsite, including the former Sunrise Assisted Living Building (Heritage House Building).

Future Exterior Noise Environment

The primary noise source for the project site is vehicular traffic along Valle Verde Drive and Firefly Lane. Pursuant to the HUD Guidelines, the noise exposure at least 10 years in the future must be considered in addition to the existing noise exposure. Based on the traffic volumes provided[1], future traffic noise levels along Valle Verde Drive and Firefly Lane are not anticipated to measurably increase from existing levels (increase would be less than 1 dBA) under future conditions due to increases in traffic volumes along these roadways.

Exterior use areas of Heritage House would include the outdoor patio located in the central courtyard which would be exposed to 49 dBA DNL. Exterior use areas of Valle Verde Apartments would include a courtyard patio and BBQ area, play area, shade garden half basketball court, and picnic area, which would be exposed to 49 dBA DNL. Outdoor areas would be shielded by existing and proposed buildings. The private balconies of Valle Verde Apartments would be exposed to ambient noise levels up to 54 dBA DNL in balconies facing Valle Verde Drive, not including occasional emergency sirens, which would vary on a day-to-day basis and would not be anticipated to affect the usability of outdoor spaces. Exterior noise levels at all outdoor use areas would be considered "acceptable" by HUD.

Future Interior Noise Environment

Based on floor plans and elevations[2] prepared by *MWA Architects* (dated August 10, 2018), residential units are located on Levels 1 to 3 in Valle Verde and Heritage House Buildings. Façades of new south facing residential units in Valle Verde Building would be exposed to 54 dBA DNL and south and west facing façades of Heritage House would be exposed to future exterior noise levels of up to 59 and 56 dBA DNL, respectively. The predicted exterior noise level would not exceed 65 dBA DNL and would be considered "normally acceptable" under HUD standards. Under HUD standards, it is assumed that with standard construction any building will provide sufficient attenuation to achieve an interior level of 45 dBA DNL or less if the exterior level is 65 dBA DNL or less. Therefore, residential units in Valle Verde Building and Heritage House Building do not require any additional noise mitigation measure to comply with HUD criteria.

[1] Traffic volume data provided in file *3700-3200 Valle Verde Drive Volumes.xlsx* on September 20, 2018.

[2] Heritage House & Valle Verde : Planning & EIR Submittal – Resubmittal, MWA Architects, August 10, 2018

FIGURE 2 Daily Trend in Noise Levels at LT-1

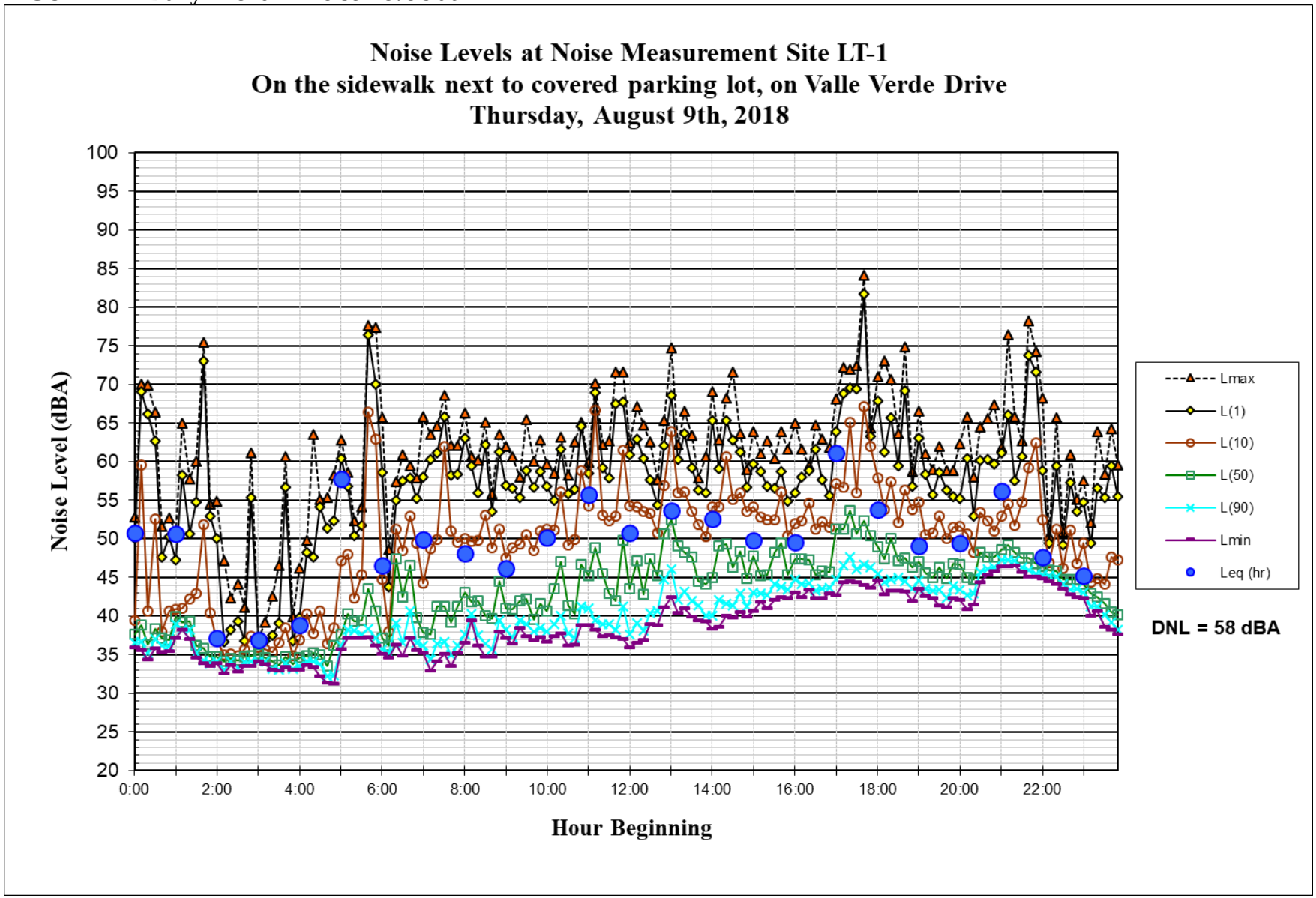


FIGURE 3 Daily Trend in Noise Levels at LT-2