

MOUNTAIN HOUSE NEIGHBORHOOD B NOISE ASSESSMENT

San Joaquin County, California

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Prepared for:

Sanidhya Dhir

Prepared by:

Michael S. Thill

ILLINGWORTH & RODKIN, INC.
/// Acoustics • Air Quality ///

429 East Cotati Avenue
Cotati, CA 94931
(707) 794-0400

Project: 23-008

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INTRODUCTION

The Mountain House Neighborhood B project would construct 294 units northwest of the De Anza Boulevard / Central Parkway intersection in San Joaquin County, California. The site is currently undeveloped with existing single-family residences located to the west (Tract 3612). Residential land uses are planned to the north (Tract 3481) and a business park is planned to the south. The existing noise environment at the site is primarily the result of local and distant traffic.

This study evaluates the project's compatibility with the future noise environment expected at the site. Based on the results of the noise monitoring survey conducted for the project and a review of available project plans and information, preliminary acoustical recommendations regarding environmental noise control at private outdoor use areas and project interiors were made. This report includes a discussion of the results of the noise monitoring survey, summarizes future noise levels expected at the project site, and describes measures necessary to reduce noise levels to acceptable levels.

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.

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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		Vacuum cleaner at 10 feet
Commercial area	70 dBA	Normal speech at 3 feet
Heavy traffic at 300 feet		
	60 dBA	Large business office
Quiet urban daytime		Dishwasher in next room
	50 dBA	
Quiet urban nighttime		Theater, large conference room
Quiet suburban nighttime	40 dBA	
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
	10 dBA	Broadcast/recording studio
	0 dBA	

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

Regulatory Background - Noise

San Joaquin County General Plan Policy Document

San Joaquin County¹ has established noise and land use compatibility standards to evaluate a project's compatibility with the noise environment and General Plan policies designed to minimize the effects of noise throughout the community. Single-family residential land uses are acceptable in noise environments of 65 dBA L_{dn} or less.

San Joaquin County has also established policies in the Public Health and Safety Element of the General Plan in order to achieve the goal of ensuring acceptable noise environments for each land use. The following policies are applicable to the proposed project:

PHS-9.1: Noise Standards for New Land Uses – The County shall require development to comply with the noise standards shown in Tables PHS-1 and PHS-2 through proper site and building design, such as building orientation, setbacks, barriers, and building construction practices.

PHS-9.7: Require Acoustical Study – The County shall require a project applicant to prepare an acoustical study for any proposed new residential or other noise-sensitive development when the County determines the proposed development may expose people to noise levels exceeding acceptable General Plan noise levels.

TABLE PHS-1 NON-TRANSPORTATION NOISE LEVEL PERFORMANCE STANDARDS FOR NOISE-SENSITIVE USES AT OUTDOOR ACTIVITY AREAS^{1, 2}		
Noise Level Descriptor	Daytime³ (7:00 am – 10:00 pm)	Nighttime³ (10:00 pm – 7:00 am)
Hourly Leq dB	50	45
Maximum Level, dB	70	65

Notes: These standards apply to new or existing residential areas affected by new or existing non-transportation sources.

¹ Where the location of outdoor activity areas is unknown or is not applicable, the noise standard shall be applied at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards shall be applied on the receiving side of noise barriers or other property line noise mitigation measures.

² Refer to Mountain House Master Plan, Table 11.2, Exterior Noise Standards for Noise-Sensitive Uses Affected by Non-Transportation Noise Sources, Page 11.12, for Mountain House Noise Standards.

³ Each of the noise level standards specified shall be reduced by 5 dB for impulsive noise, single tone noise, or noise consisting primarily of speech or music.

¹ *San Joaquin County General Plan Policy Document*, December 2016.

**TABLE PHS-2
MAXIMUM ALLOWABLE NOISE EXPOSURE FROM TRANSPORTATION NOISE
SOURCES¹**

Noise Sensitive Land Use Types	Outdoor Activity Areas ² (dB Ldn)	Interior Spaces (dB Ldn)
Residential	65	45
Administrative Office	-	45
Child Care Services–Child Care Centers	-	45
Community Assembly	65	45
Cultural & Library Services	-	45
Educational Services: General	-	45
Funeral & Interment Services – Undertaking	65	45
Lodging Services	65	45
Medical Services	65	45
Professional Services	-	45
Public Services (excluding hospitals)	-	45
Public Services (hospitals only)	65	45
Recreation – Indoor Spectator	-	45
Religious Assembly	65	45

Notes: These standards apply to new or existing residential areas affected by new or existing non-transportation sources.

¹ Refer to Mountain House Master Plan, Chapter 11, Noise, for Mountain House Noise Standards.

² Where the location of outdoor activity areas is unknown or is not applicable, the noise standard shall be applied at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards shall be applied on the receiving side of noise barriers or other property line noise mitigation measures.

Existing Noise Environment

To quantify existing ambient noise conditions in the area, a noise monitoring survey was performed between Tuesday, February 7, 2023 and Friday, February 10, 2023. The noise monitoring survey included two long-term noise measurements (LT-1 and LT-2) and three short term measurements (ST-1 through ST-3) as shown in Figure 1.

Long-term noise measurement LT-1 was made at the existing terminus of Central Parkway at Zinnia Way, approximately 1,000 feet north of the Interstate 205 centerline. Hourly average noise levels at this location typically ranged from 51 to 64 dBA L_{eq} except during a few hours where local events increased noise levels to between 64 and 69 dBA L_{eq} . The day-night average noise level was 70 dBA L_{dn} on Wednesday, February 8, 2023 and Thursday, February 9, 2023 when including these localized events and 68 dBA L_{dn} when excluding these localized events from the data set. The daily trends in noise levels at LT-1 are shown in Figures 2 through 5.

Long-term noise measurement LT-2 was made at the existing terminus of S. Dianthus Lane.

Hourly average noise levels at this location typically ranged from 43 to 57 dBA L_{eq} , but similar to the noise levels measured at LT-1, localized events increased noise levels to between 57 and 64 dBA L_{eq} . The day-night average noise level was 58 dBA L_{dn} on Wednesday, February 8, 2023 and Thursday, February 9, 2023. The daily trends in noise levels at LT-2 are shown in Figures 6 through 9.

Three short-term noise measurements were made over 10-minute periods on Tuesday, February 7, 2023. Short-term noise measurement data is summarized in Table 3.

Short-term noise measurement ST-1 was made along the northern boundary of the site, where ambient noise levels appeared to be the result of traffic along Mountain House Parkway. Other sources observed at this location included general aviation aircraft. The 10-minute average noise level measured at ST-1 was 44 dBA L_{eq} .

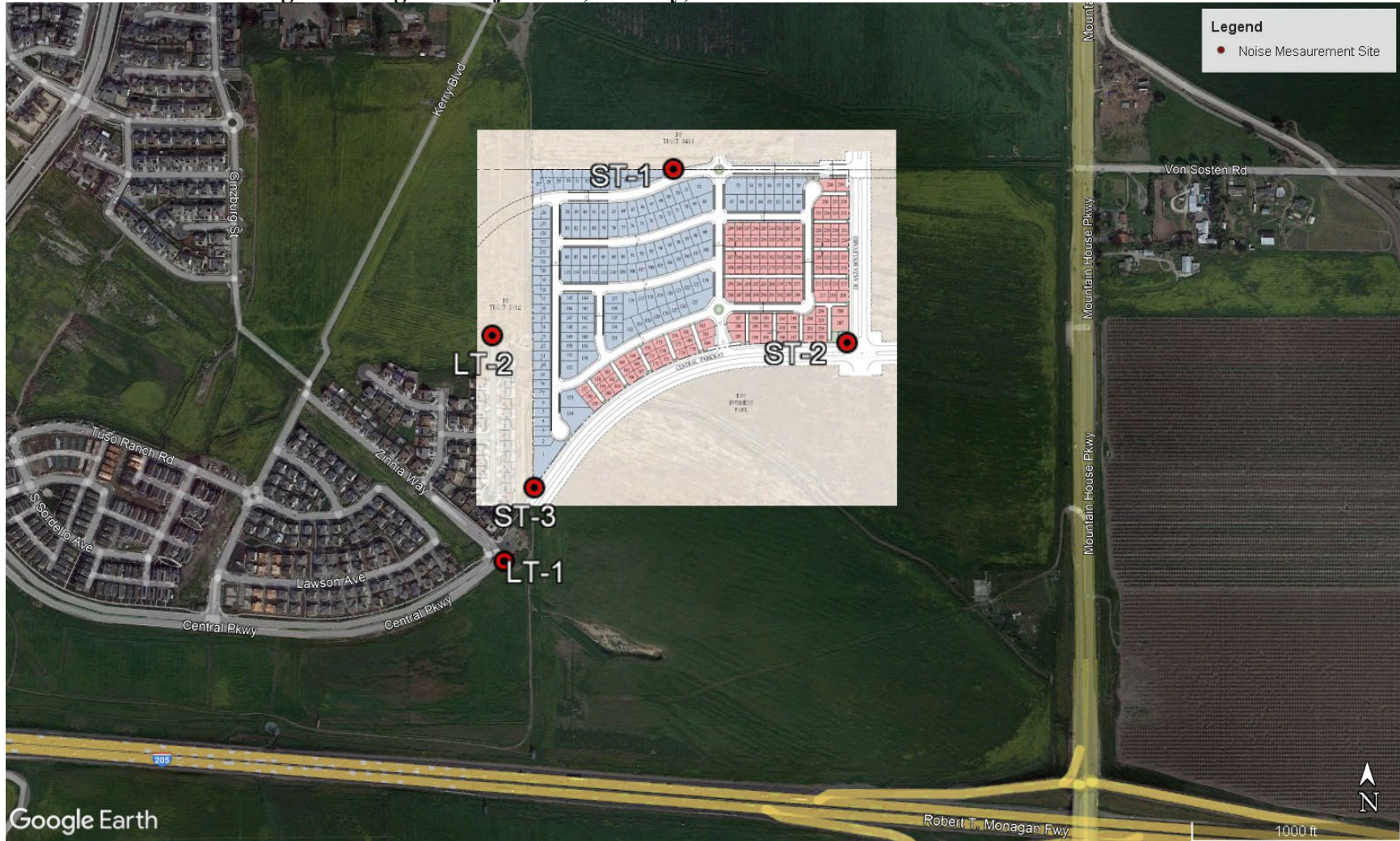
Short-term noise measurement ST-2 was made at the southeast corner of the site near the future intersection of Central Parkway and De Anza Boulevard. Noise from vehicular traffic along Mountain House Parkway typically ranged from 41 to 46 dBA. The 10-minute average noise level measured at ST-2 was 43 dBA.

Short-term noise measurement ST-3 was made at the southwest corner of the site near the existing intersection of Central Parkway and Zinnia Way, and just east of existing residences located along S. Dianthus Court. Noise from vehicular traffic along Interstate 205 typically ranged from 40 to 44 dBA, and the 10-minute average noise level measured was 44 dBA.

TABLE 3 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	Time Beginning	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: North boundary of site	10:10 a.m.	54	54	47	41	40	44
ST-2: Southeast corner of site	10:30 a.m.	46	45	44	43	41	43
ST-3: Southwest corner of site	10:50 a.m.	56	53	46	42	41	44

FIGURE 1 Aerial Image Showing the Project Site, Vicinity, and Noise Measurement Locations



Source: Google Earth, 2023

**Noise Levels at Noise Measurement Site LT-1
Central Parkway at Zinnia Way
Tuesday, February 7, 2023**

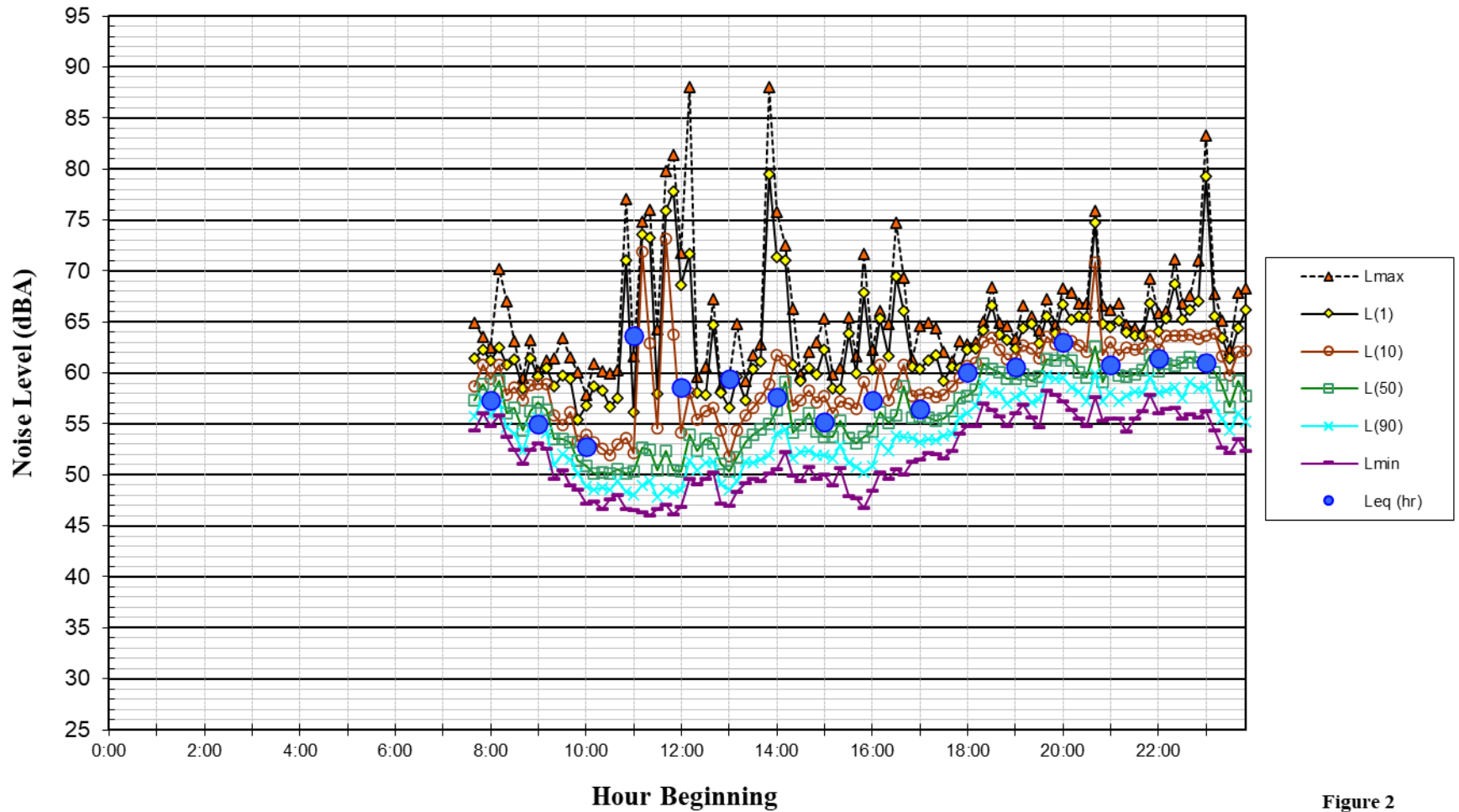


Figure 2

**Noise Levels at Noise Measurement Site LT-1
Central Parkway at Zinnia Way
Wednesday, February 8, 2023**

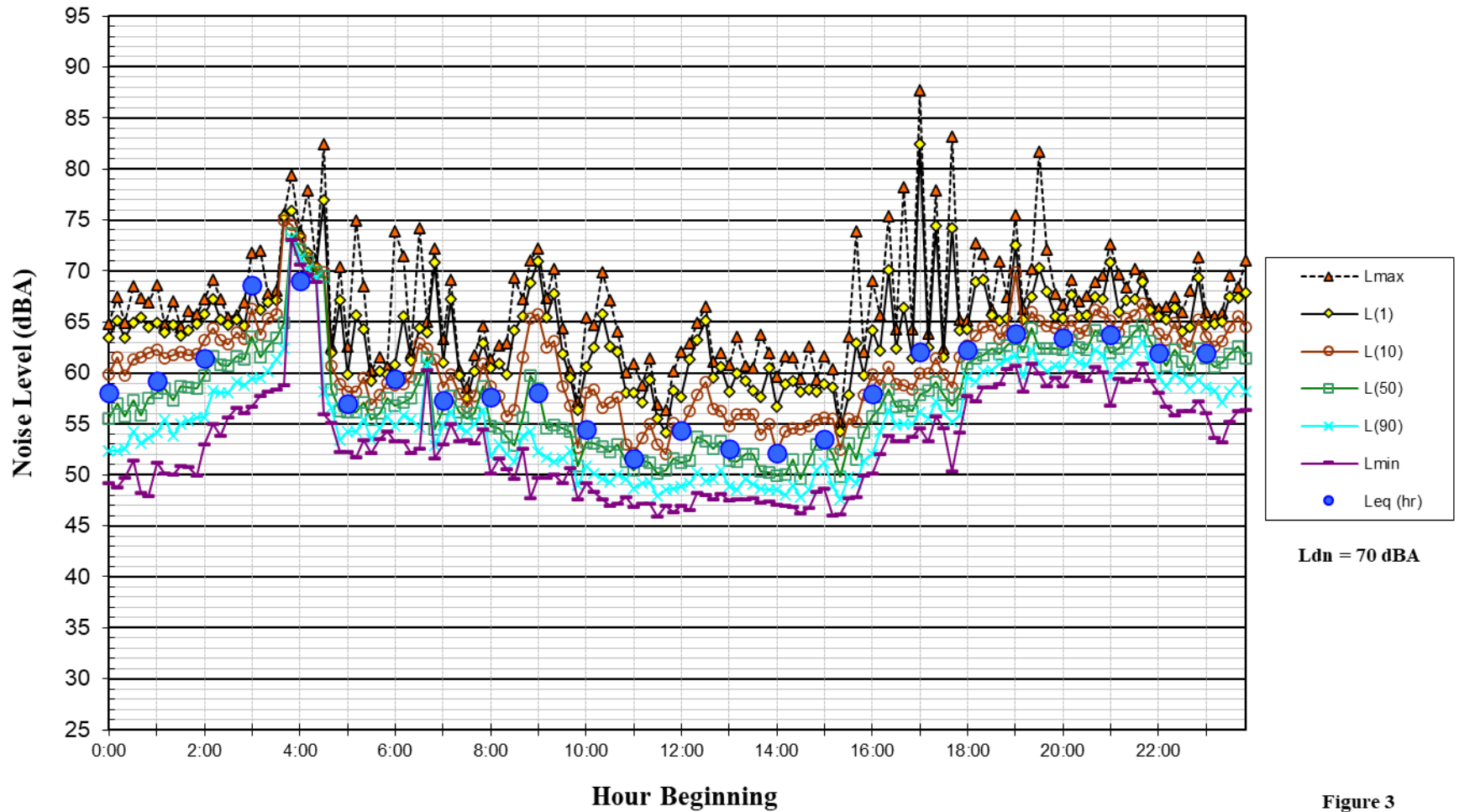


Figure 3

**Noise Levels at Noise Measurement Site LT-1
Central Parkway at Zinnia Way
Thursday, February 9, 2023**

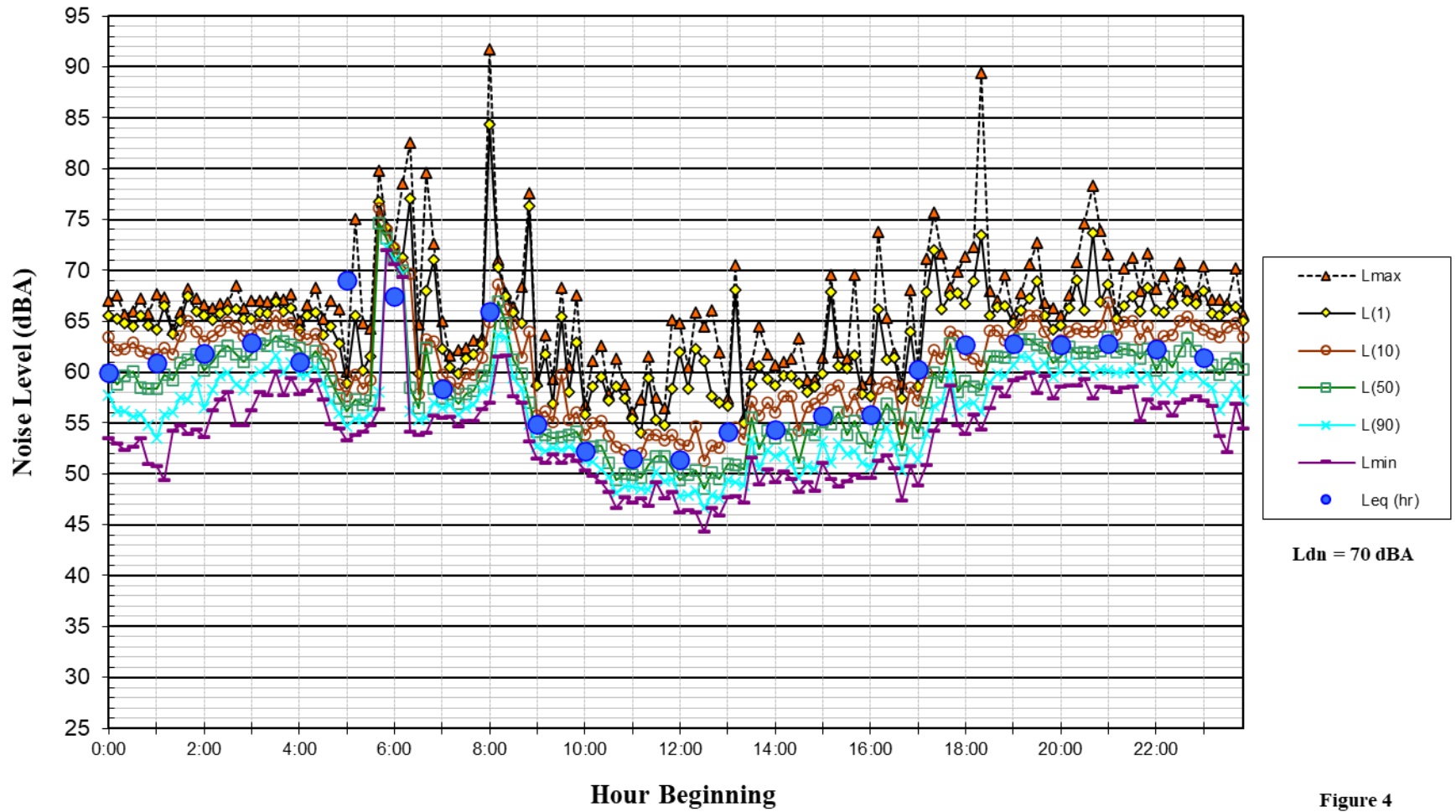


Figure 4

**Noise Levels at Noise Measurement Site LT-1
Central Parkway at Zinnia Way
Friday, February 10, 2023**

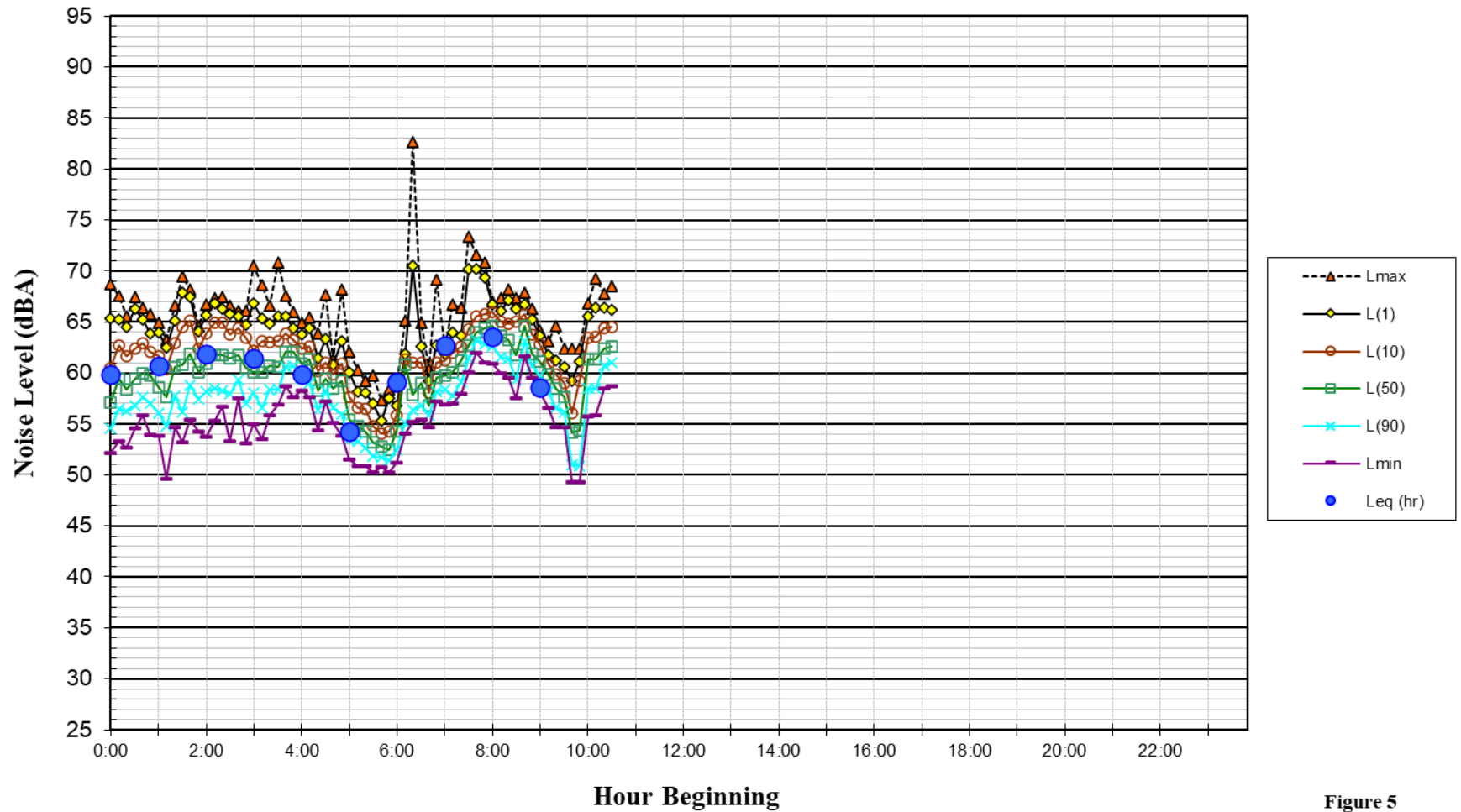


Figure 5

**Noise Levels at Noise Measurement Site LT-2
North Terminus of S. Dianthus Lane
Tuesday, February 7, 2023**

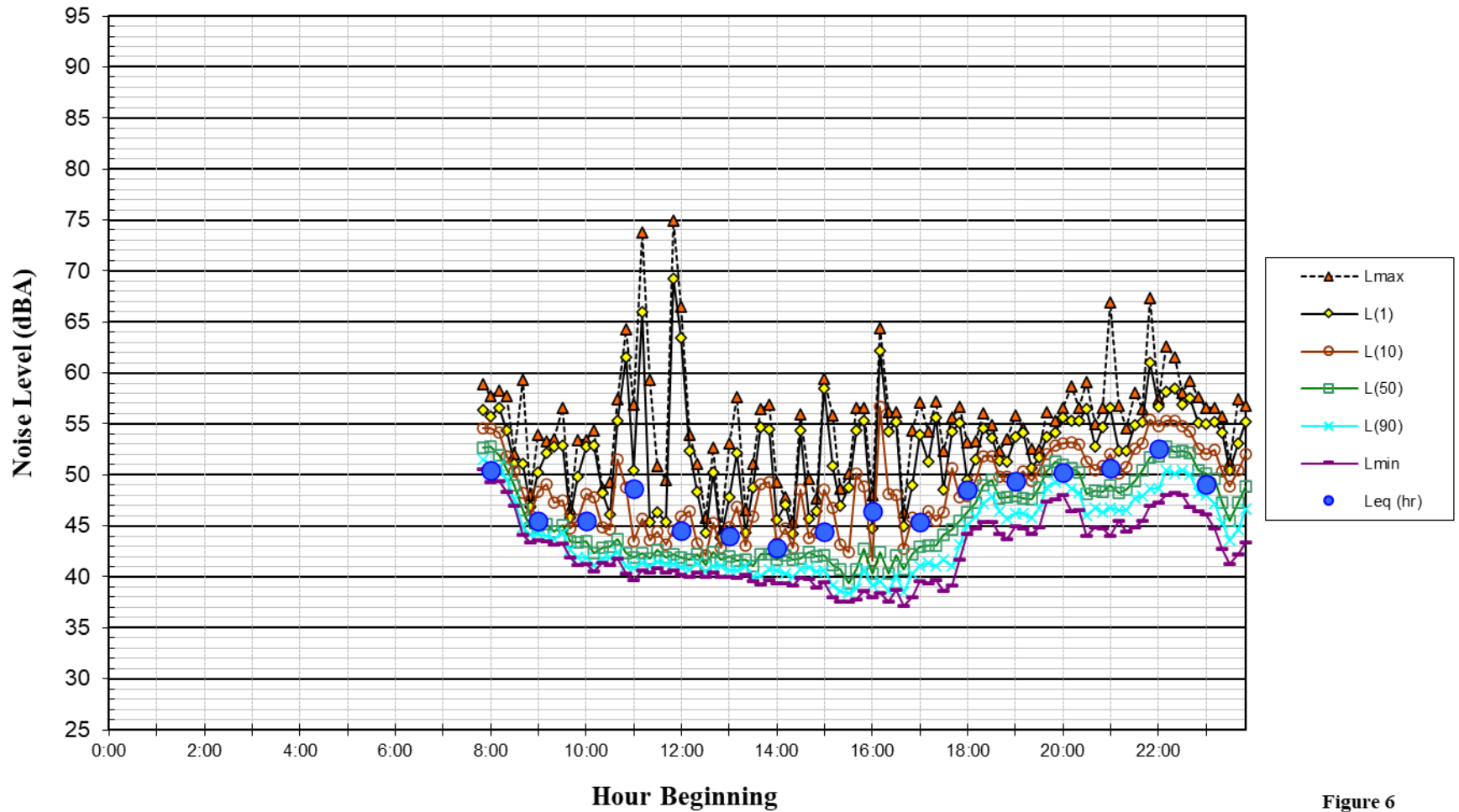


Figure 6

**Noise Levels at Noise Measurement Site LT-2
North Terminus of S. Dianthus Lane
Wednesday, February 8, 2023**

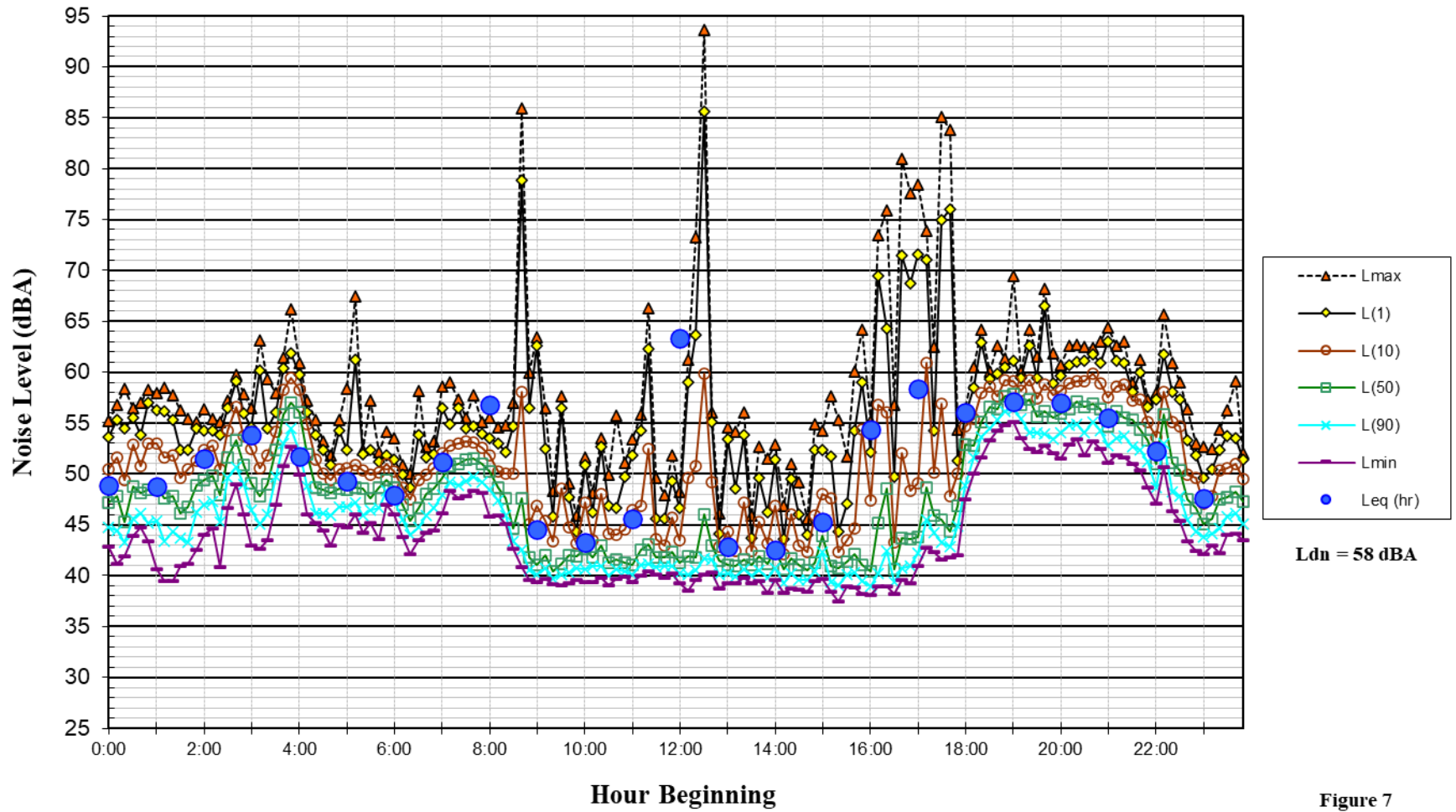


Figure 7

**Noise Levels at Noise Measurement Site LT-2
North Terminus of S. Dianthus Lane
Thursday, February 9, 2023**

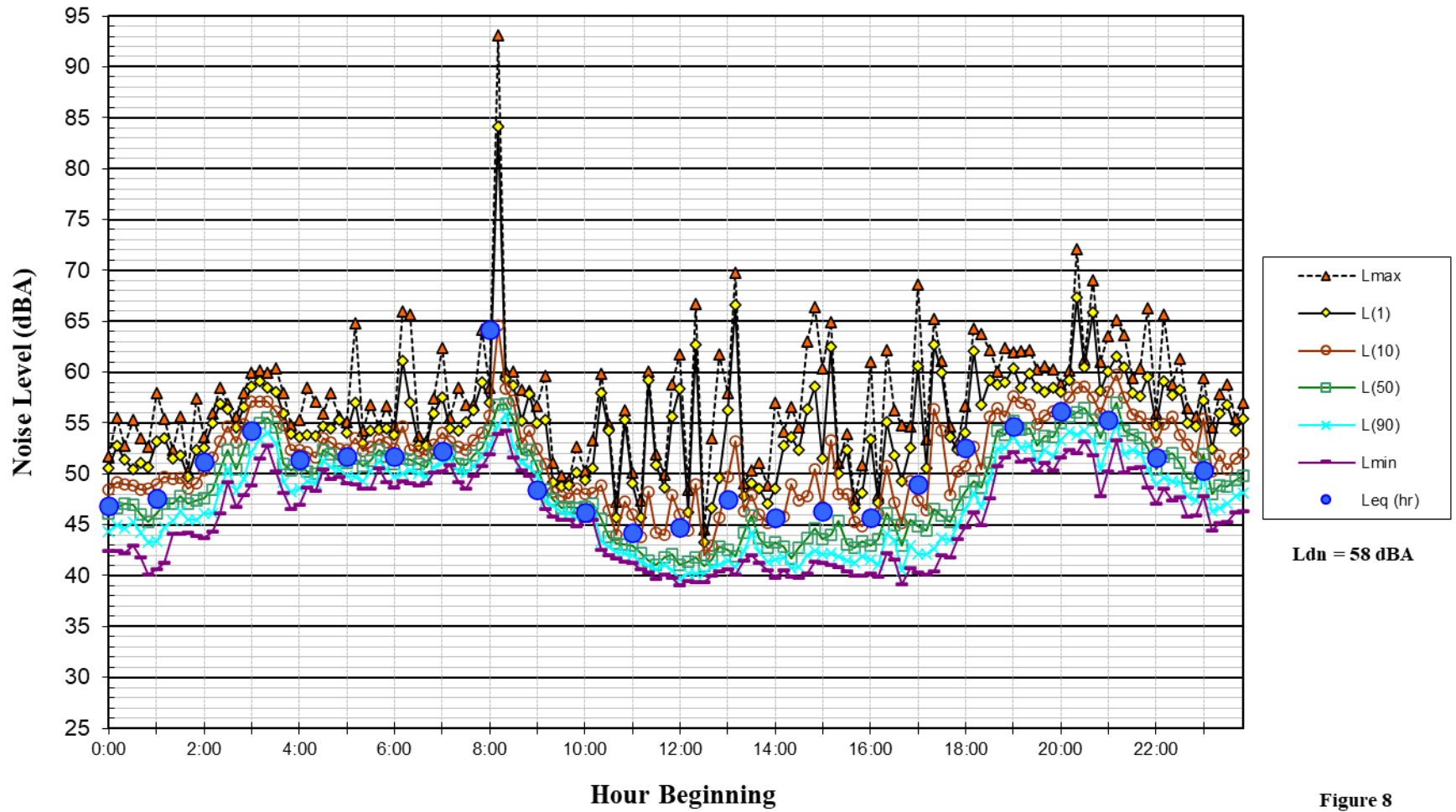


Figure 8

**Noise Levels at Noise Measurement Site LT-2
North Terminus of S. Dianthus Lane
Friday, February 10, 2023**

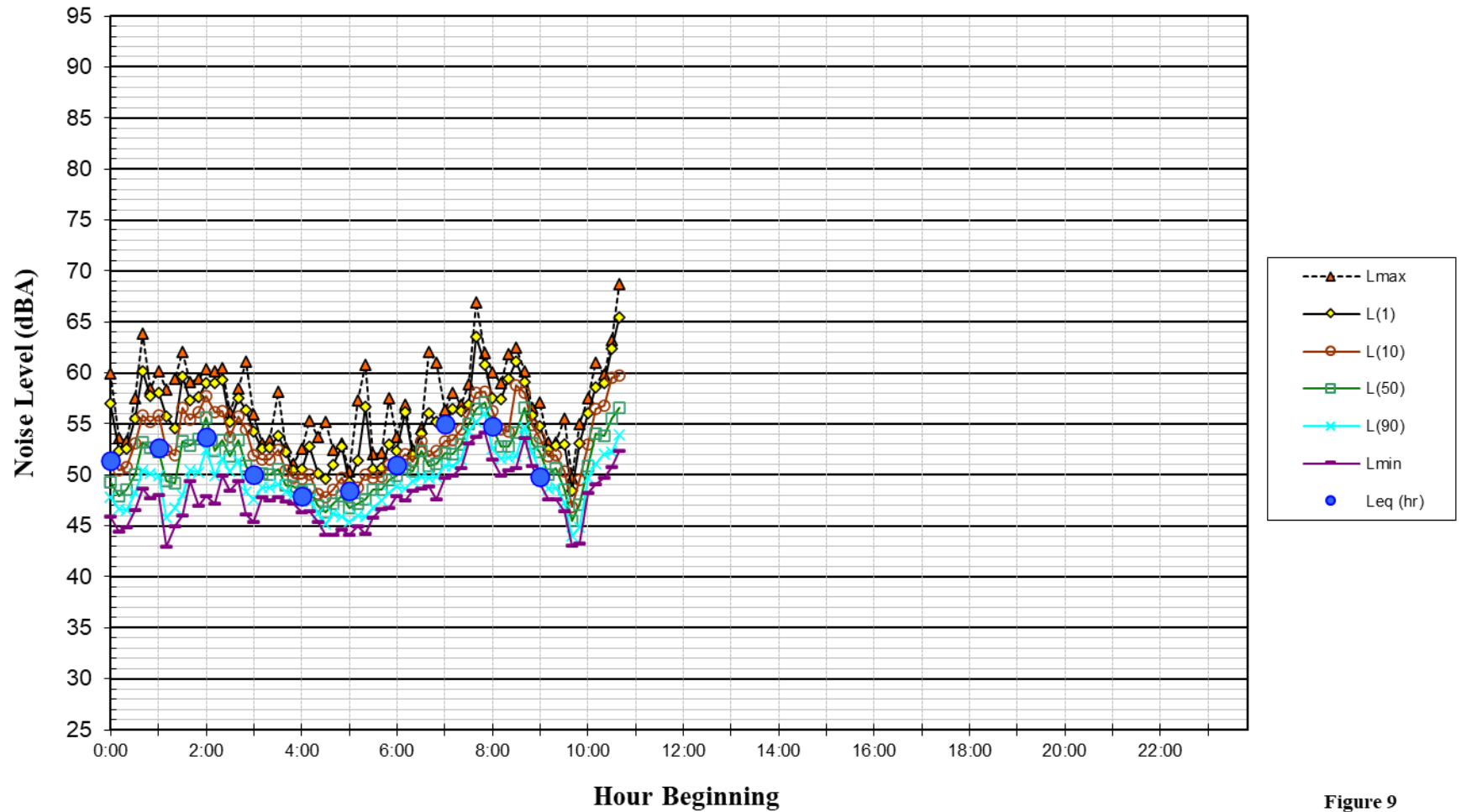


Figure 9

Future Exterior Noise Environment

According to the County's General Plan, exterior noise levels in private outdoor activity areas of residential land uses must not exceed the maximum allowable noise exposure level of 65 dBA L_{dn} .

The future noise environment at the project site will result primarily from local vehicular traffic along Central Parkway and De Anza Boulevard. Central Parkway will continue as a four-lane roadway with a center median that is expected to ultimately connect Mountain House Parkway in the future. De Anza Boulevard is planned as a four-lane roadway bordering the site to the east, and will ultimately connect to the existing segment of De Anza Boulevard at W. Grant line Road.

FHWA's Traffic Noise Model (TNM v. 2.5) was used in the noise analysis for this project. The model input was based on the project's site plan dated October 26, 2022. Future traffic volumes, including the vehicle mix ratio, and traffic speeds were also input into the model. A traffic report published in 2004 for the Mountain House Specific Plan II (SP II) project was used for this study to estimate expected traffic noise levels at the project site under full 2025 buildout conditions.² The traffic report included two buildout scenarios: with and without the inclusion of the Interstate 205 (I-205)/Lammers Interchange. For the purposes of this study, the worst-case scenario was selected. TNM predicts noise levels assuming calm wind conditions with moderate temperatures and humidity.

Noise levels would be highest at residences with direct exposure to Central Parkway and De Anza Boulevard. Using the 2004 traffic report data, 2025 full buildout peak hour traffic would result in peak hour noise levels of up to 69 dBA L_{eq} at 75 feet from the centerline along Central Parkway and 67 dBA L_{eq} at 75 feet from the centerline along De Anza Boulevard. Based on long-term measurement data from Illingworth & Rodkin, Inc.'s noise surveys conducted at the site and in the immediate vicinity, day-night average noise levels are anticipated to be up to 1 dBA higher than peak hour levels, resulting in day-night average noise levels up to 70 dBA L_{dn} at 75 feet from the centerline along Central Parkway and 68 dBA L_{dn} at 75 feet from the centerline along De Anza Boulevard.

To calculate traffic noise levels at the site under future 2040 conditions, traffic volumes for the 2025 scenario were increased by a rate of one percent annually for 15 years. Under this assumption it is anticipated that 2040 traffic noise levels will be up to 1 dBA L_{dn} higher than 2025 levels, resulting in day-night average noise levels up to 71 dBA L_{dn} at 75 feet from the centerline along Central Parkway and 69 dBA L_{dn} at 75 feet from the centerline along De Anza Boulevard. The County's maximum allowable noise exposure level of 65 dBA L_{dn} would be exceeded at private exterior use areas of first row residences located along Central Parkway and De Anza Boulevard. Minimum 6 to 7-foot noise barriers would be required to shield private outdoor activity areas having direct line-of-sight to Central Parkway and De Anza Boulevard and reduce exterior noise levels to 65 dBA L_{dn} . It should also be noted that homes proposed along Central Parkway must front or appear to front the roadway. Where private outdoor activity areas are shielded by the residence, exterior noise levels would be reduced below 65 dBA L_{dn} . Homes at the second row or further towards the interior of the site, would not experience noise levels exceeding County

² TJKM Transportation Consultants, "Mountain House Specific Plan II Traffic Impact Study," November 8, 2004.

criteria. The final heights and limits of noise barriers should be determined when the grading plan is available.

Future Interior Noise Environment

Interior noise levels within new residential units are required to be maintained at or below 45 dBA L_{dn} .

Standard residential construction, assuming windows to be partially open, provides exterior-to-interior noise reduction of approximately 15 dBA. With the windows maintained closed, standard residential construction typically provides 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 is often the method selected to reduce interior noise levels to acceptable levels by 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.

The first row of residential buildings adjacent to De Anza Boulevard would be set back approximately 60 feet from the centerline of the roadway. East-facing rooms would have direct line-of-sight to the roadway without any shielding from adjacent buildings. Southern façades of buildings adjacent to Central Parkway would similarly be directly exposed to noise from vehicular traffic. Noise levels at residential façades approximately 60 feet from the centerline of De Anza Boulevard would be exposed to noise levels up to 70 dBA L_{dn} . Exterior noise levels at residential façades approximately 60 feet from the centerline of Central Parkway would be exposed to noise levels up to 72 dBA L_{dn} .

To reach an interior noise level not exceeding 45 dBA L_{dn} , these units would require a minimum exterior-to-interior noise reduction of 27 dBA. This amount of noise reduction is typical of modern residential construction with moderate performance windows (STC 28-STC 33) in a closed position. To allow residents the opportunity to close windows at their own discretion for the purpose of reducing noise, adequate forced-air mechanical ventilation shall be provided to all first-row units located along De Anza Boulevard and Central Parkway. With provision of forced-air mechanical ventilation to these residences, noise levels would not exceed 45 dBA L_{dn} within any of the proposed residences with windows closed. The final recommendations for noise insulation should be made prior to the issuance of building permits when architectural plans are available.