MOUNTAIN HOUSE TOWN CENTER RESIDENTIAL PROJECT ENVIRONMENTAL NOISE ASSESSMENT

San Joaquin County, California

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INTRODUCTION

The proposed project would construct a total of 199 residential units (103 single-family detached and 96 duets) on approximately 16.5-acres of land next to the proposed Mountain House Town Center, southwest of Byron Road and east of Central Parkway, in San Joaquin County, California. The site is currently undeveloped. The noise environment at the site primarily results from traffic along Byron Road.

This study evaluates the proposed project's compatibility with the future noise environment expected at the project site. A noise monitoring survey was conducted at the project site between Wednesday, February 7th, 2024, and Friday, February 9th, 2024. Based on the results of this monitoring survey and a review of the project plans and information, preliminary acoustical recommendations regarding environmental noise control at private backyards 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 the 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 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 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

San Joaquin County General Plan

The Public Health and Safety Element of the San Joaquin County 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 and ensure 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	Daytime[3] (7:00 am – 10:00 pm)	Nighttime[3] (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.

TABLE PHS-2: MAXIMUM ALLOWABLE NOISE EXPOSURE FROM TRANSPORTATION NOISE SOURCES[1]		
Noise Sensitive Land Use Types	**Outdoor Activity Areas[2] (dB L_{dn})**	**Interior Spaces (dB L_{dn})**
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.

Mountain House Master Plan

Chapter Eleven: Noise of the Mountain House Master Plan (referenced in Tables PHS-1 and PHS-2, above) contains the following community specific noise standards which are applicable to the subject project:

11.3.1 Overall Mobile Noise Impacts

Objective: To mitigate noise from mobile sources.

Policies:

a) Berms, barriers, soundwalls, setbacks, landscaping, or some combination of these measures shall be used adjacent to transportation noise sources to reduce indoor and outdoor noise exposure to acceptable levels.

b) Where excessive sound wall heights would be necessary, a combination of setbacks and berms or sound walls shall be considered.

c) Setbacks shall be used in conjunction with noise barriers where necessary to achieve acceptable levels of noise.

e) Noise levels in primary outdoor use areas of new residential development shall not exceed an of 60 dB unless the project design includes reasonable mitigation measures to reduce noise in outdoor activity areas to as close to an L_{dn} of 60 dB as possible. Where it is not possible to reduce noise in outdoor activity areas to an L_{dn} of 60 dB or less using practical application of the best available noise reduction measures, an exterior noise level of up to an L_{dn} of 65 dB may be allowed. Under no circumstances shall interior noise levels exceed an L_{dn} of 45 dB.

Implementation:

a) Noise Control Techniques. Site specific noise control techniques shall be required as a condition of Tentative Map or use permit approval.

c) Noise Studies. Additional noise studies and conditions may be required prior to approval of Development Permits if within noise sensitive areas identified in this Master Plan and/or Specific Plans.

d) Residential Land Uses, Exterior Noise. Noise studies for specific residential projects proposed in noise impacted areas (exposed to an L_{dn} above 60 dB) shall address how noise levels in outdoor use areas, such as backyards, patios, and decks, could be maintained at or below an L_{dn} of 60 dB.

e) Noise-Sensitive Land Uses. Noise studies prepared for noise-sensitive land uses including care facilities, schools, hospitals, and parks shall address how noise levels in outdoor areas could be maintained at or below an L_{dn} of 60 dB.

f) Residential Land Uses, Interior Noise. Interior noise levels for housing proposed to be located in areas exposed to an exterior noise level of an L_{dn} above 60 dB shall be maintained at or below an L_{dn} of 45 dB. Compliance shall be verified prior to the issuance of building permits.

Existing Noise Environment

Byron Road borders the site to the northeast and Central Parkway borders the site to the west. Medium high density residential exists to the west across Central Parkway, north of Arturo Boulevard. Additional residential developments are planned for the area south of Arturo Boulevard, west of Central Parkway. The land to the northeast across Byron Road and the Union Pacific Railroad (UPRR) is not yet developed and designated as public land in the Mountain House Master Plan. The land abutting the site to the southeast is also undeveloped and designated as a community park in the Mountain House Master Plan.

The noise environment at the site and in the surrounding area results primarily from vehicular traffic on Byron Road, with occasional aircraft overflights. Distant construction activities also contribute to ambient (background) noise levels. The UPRR northeast of the site is not in general use, such that the U.S.DOT Crossing inventory for this line documented a usage of less than one train per week[1].

A noise monitoring survey was performed between Wednesday, February 7th, 2024, to Friday, February 9, 2024, that included two long-term (LT-1, LT-2) and three short-term (ST-1 to ST-3) noise measurements, as shown in Figure 1. Noise measurements were conducted with Larson Davis Laboratories (LDL) Type I Model LXT Sound Level Meters fitted with a ½-inch pre-polarized condenser microphones and windscreens. The meters were calibrated with a Larson Davis Model CAL200 precision acoustic calibrator prior to and following the measurement survey.

Figures 2 and 3 show the measured hourly trends in noise levels at LT-1 and LT-2, including the energy equivalent hourly noise level (L_{eq}), maximum (L_{max}), minimum (L_{min}), and the noise levels exceeded 1, 10, 50, and 90 percent of the time (indicated as L_1, L_{10}, L_{50}, and L_{90}).

[1] https://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx, Crossing 751855W.

FIGURE 1 Aerial Image of Noise Measurement Locations and Project Boundary

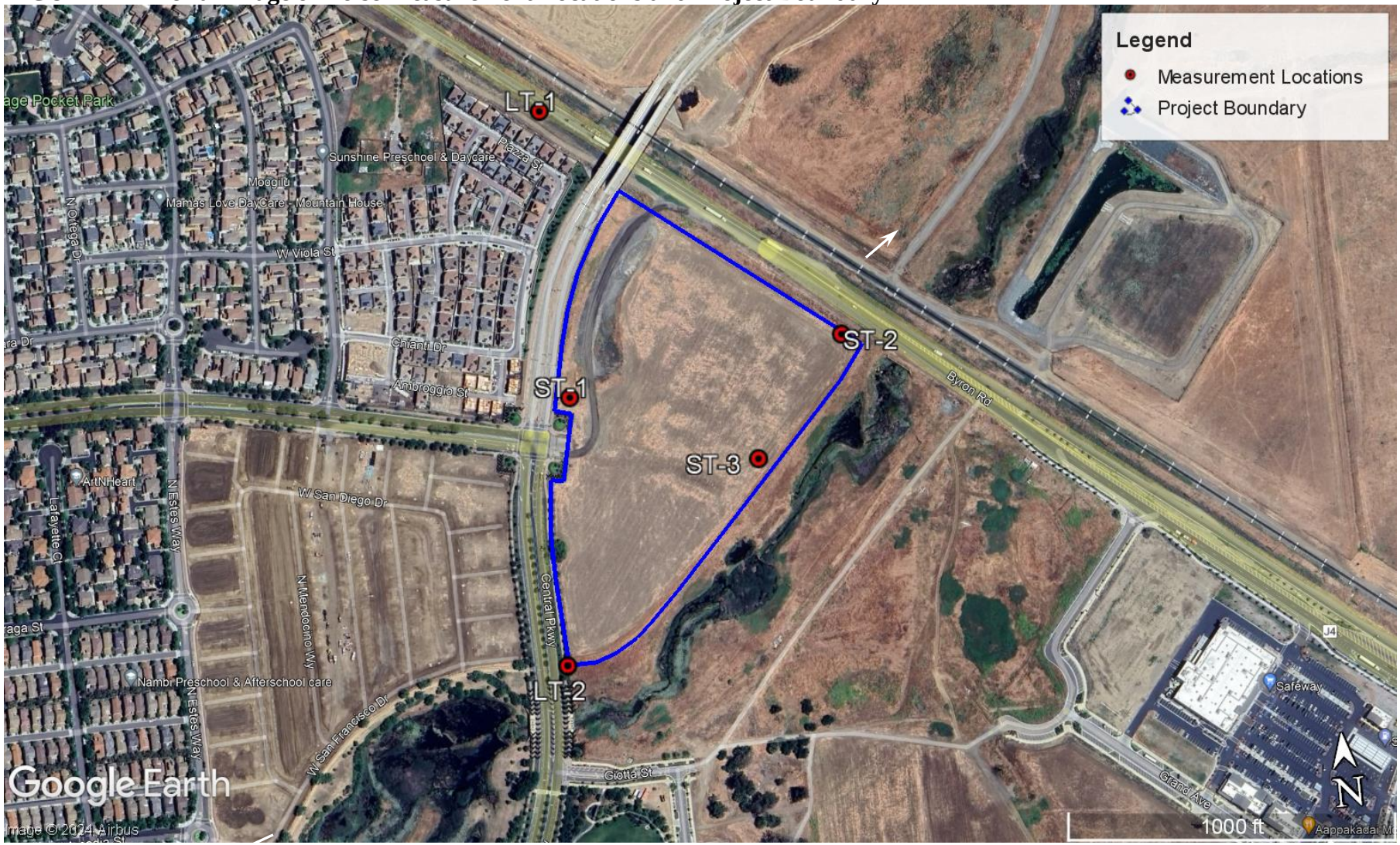


FIGURE 2 Noise Levels at Measurement site LT-1

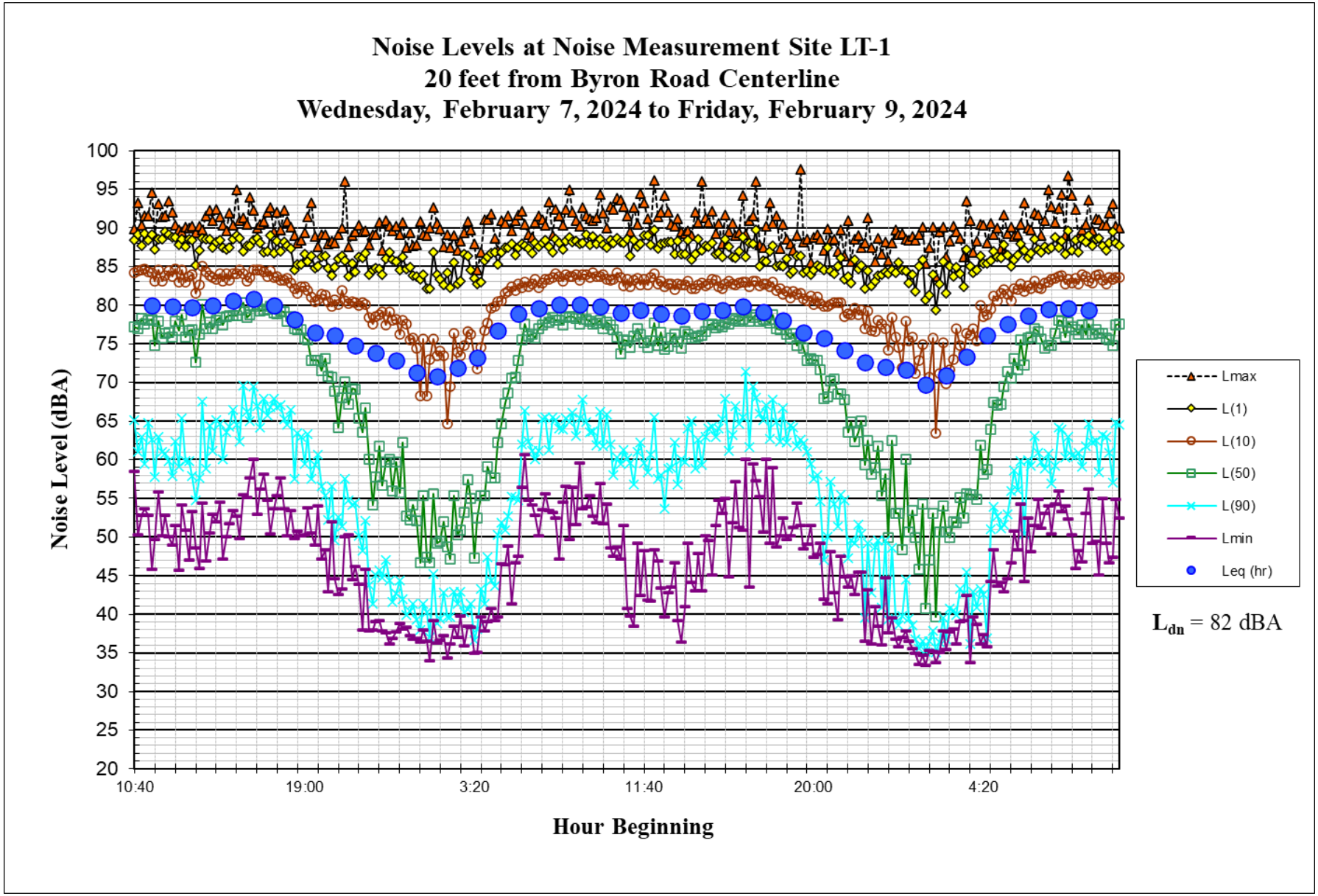
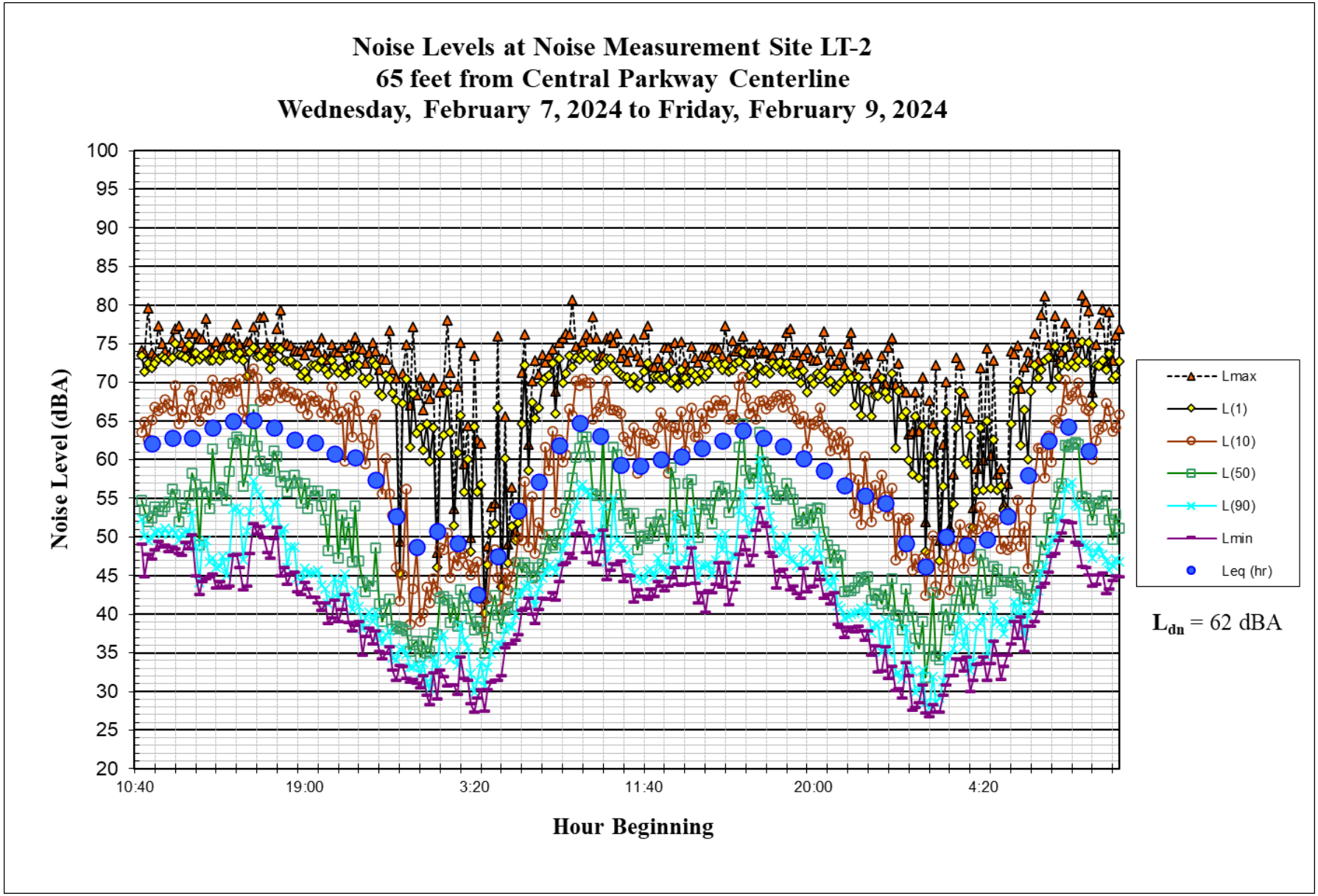


FIGURE 3 Noise Levels at Measurement site LT-2



Long term noise-measurement LT-1 was made northwest of the project site about 20 feet away from the centerline of Byron Road. This measurement quantifies the existing noise environment along the north portion of the project site. Traffic along Byron Road is the primary source of noise for the site. A review of Figure 2 indicates hourly average noise levels at LT-1 typically ranged from 74 to 81 dBA L_{eq} during daytime hours (7:00 a.m. and 10:00 p.m.) and from 70 to 80 dBA L_{eq} during nighttime hours (10:00 p.m. and 7:00 a.m.). The day-night average noise level for Thursday, February 8, 2024, was 82 dBA L_{dn}.

Long term noise-measurement LT-2 was conducted at the south tip of the project site about 65 feet away from the centerline of Central Parkway. This measurement quantifies the existing noise environment along the south and west portion of the project site. The primary noise sources at this location were traffic along Central Parkway and some distant construction during the daytime period. A review of Figure 3 indicates hourly average noise levels at LT-2 typically ranged from 57 to 65 dBA L_{eq} during daytime hours (7:00 a.m. and 10:00 p.m.) and from 43 to 58 dBA L_{eq} during nighttime hours (10:00 p.m. and 7:00 a.m.). The day-night average noise level for Thursday, February 8, 2024, was 62 dBA L_{dn}.

Three short-term noise measurements were made over 10-minute periods concurrently with long-term measurements on Friday, February 9, 2024. The existing L_{dn} at each of these short-term locations was estimated by correlating the short-term measurement data to the data gathered during the corresponding time at positions LT-1 and LT-2. These measurement results and estimated L_{dn} levels are shown in Table 3.

Short-term noise measurement ST-1 was made along the western edge of the site along Central Parkway at a height of approximately 5 feet above grade and approximately 75 feet from the centerline of Central Parkway. The primary noise source at this location was traffic along Central Parkway and some distant construction noise.

Short-term noise measurement ST-2 was made along the northeastern edge of the site at a height of approximately 5 feet above grade and approximately 90 feet from the centerline of Byron Road. The primary noise source at this location was traffic along Byron Road.

Short-term noise measurement ST-3 was made along the eastern boundary of the site about 550 feet away from Byron Road centerline and about 675 feet from the Central Parkway centerline. Noise along Byron Road and Central Parkway were the main contributors to the noise environment around this measurement location.

TABLE 3 Summary of Short-Term Noise Measurement Data, dBA

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}	L_{dn}
ST-1: Western edge of site along Central Parkway: 2/9/2024, 10:00-10:10 am	73	70	50	45	42	55	**54**
ST-2: Northeastern edge of site along Byron Road: 2/9/2024, 10:00-10:10 am	78	77	73	66	49	69	**72**
ST-3: Eastern boundary of site: 2/9/2024, 10:20-10:30 am	54	52	48	45	42	46	**48**

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}, however the Mountain House Master Plan states that "Noise levels in primary outdoor use areas of new residential development shall not exceed an of 60 dB unless the project design includes reasonable mitigation measures to reduce noise in outdoor activity areas to as close to an L_{dn} of 60 dBA as possible." The Mountain House Master Plan further states that, "where it is not possible to reduce noise in outdoor activity areas to an L_{dn} of 60 dB or less using practical application of the best available noise reduction measures, an exterior noise level of up to an L_{dn} of 65 dB may be allowed."

SoundPLAN (v8.2) a three-dimensional ray tracing sound model was used to model the existing, future and mitigated conditions at the project site. Roadway, barrier, terrain features, and receptor locations were input into the SoundPLAN model in a three-dimensional reference coordinate system. The model input was based on the project plans. Current measured traffic volumes along with future traffic volumes, including the vehicle mix ratio, and traffic speeds were also input into the model. SoundPLAN predicts noise levels assuming calm wind conditions with moderate temperatures and humidity.

Noise levels under future conditions along Byron Road and Central Parkway are expected to increase. Existing measured conditions are shown in the form of a noise contour plot (Figure 4). Assuming a conservative two percent increase in traffic volumes for the next twenty years, an increase of 2 dBA L_{dn} would be expected on Byron Road and Central Parkway. Figure 5 shows the future noise contours at the project site.

Based on the future noise contours shown in Figure 5, noise levels throughout the project site range from about 58 dBA L_{dn} towards the south and southeast portion of the site to about 72 dBA L_{dn} at the north edge of the site along Byron Road. The 65 dBA L_{dn} noise contour would be located about 420 feet away from the Byron Road centerline without any berms or sound walls. This means that noise levels would exceed the 65 dBA L_{dn} threshold at the project site in the absence of any noise control measures.

Soundwalls (or a barrier/berm combination) would be required to reduce noise in ground level outdoor activity areas to an L_{dn} of 65 dBA or less. An 8-foot soundwall along the north edges of the project site is proposed to reduce noise levels to 65 dBA L_{dn} in the proposed outdoor residential yards facing Byron Road. 6-foot soundwalls are proposed at the southwest edge of the project site to shield residential backyards from traffic along Central Parkway. Figure 6 shows the noise contours at the project site with the location of the proposed 8-foot and 6-foot soundwalls.

FIGURE 4 Existing (Measured) Noise Contours

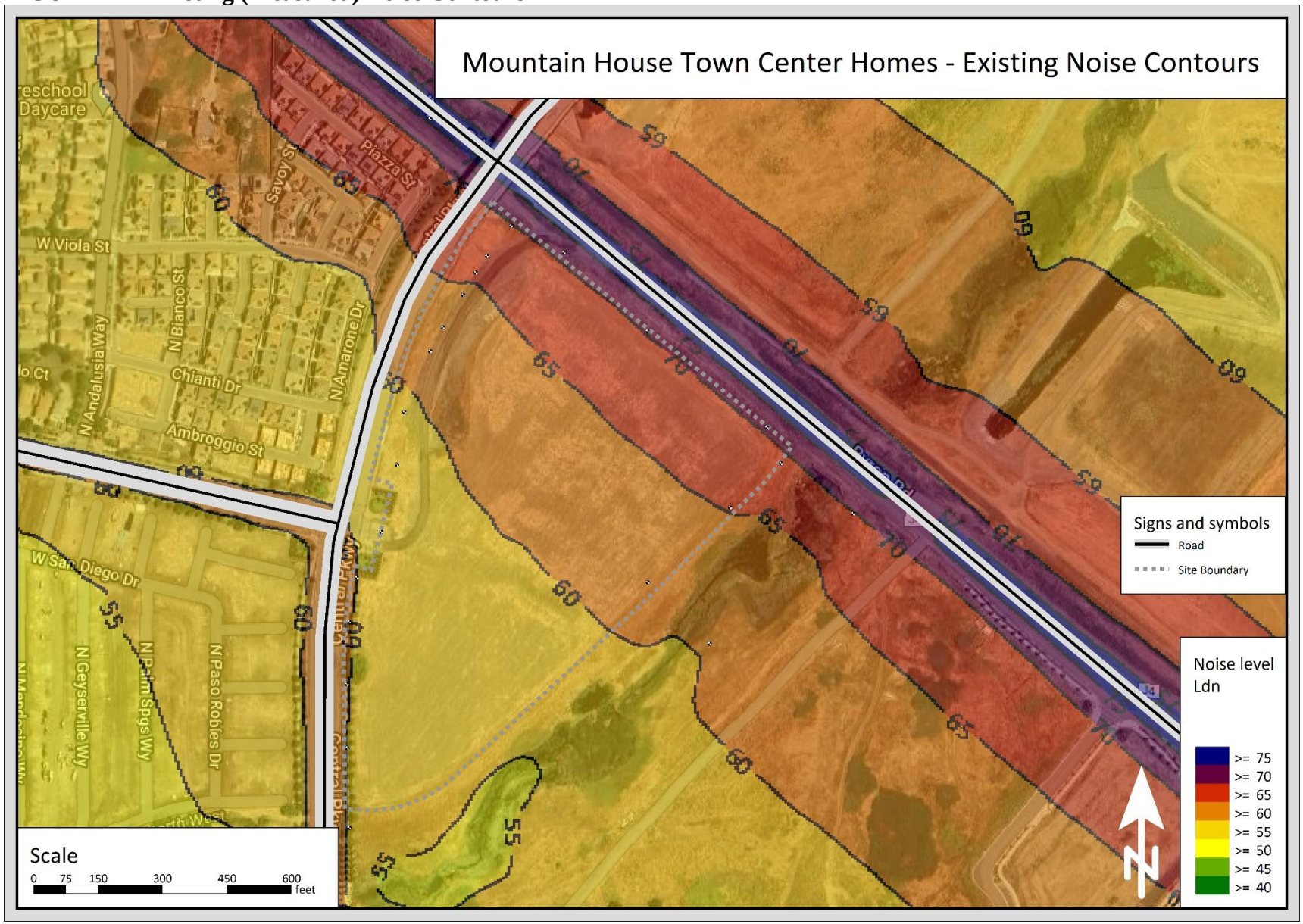


FIGURE 5 Future Noise Contours – No Mitigation

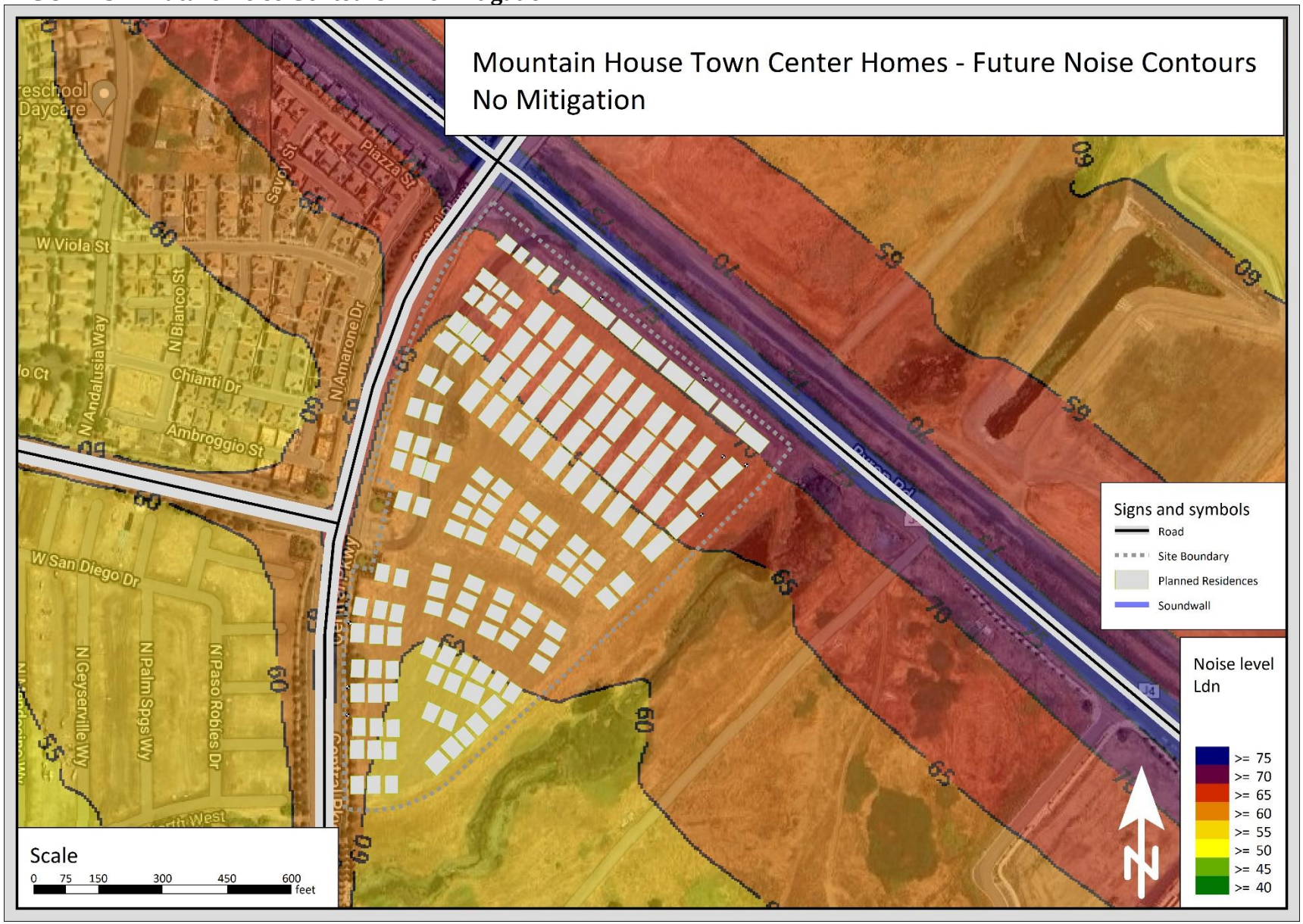
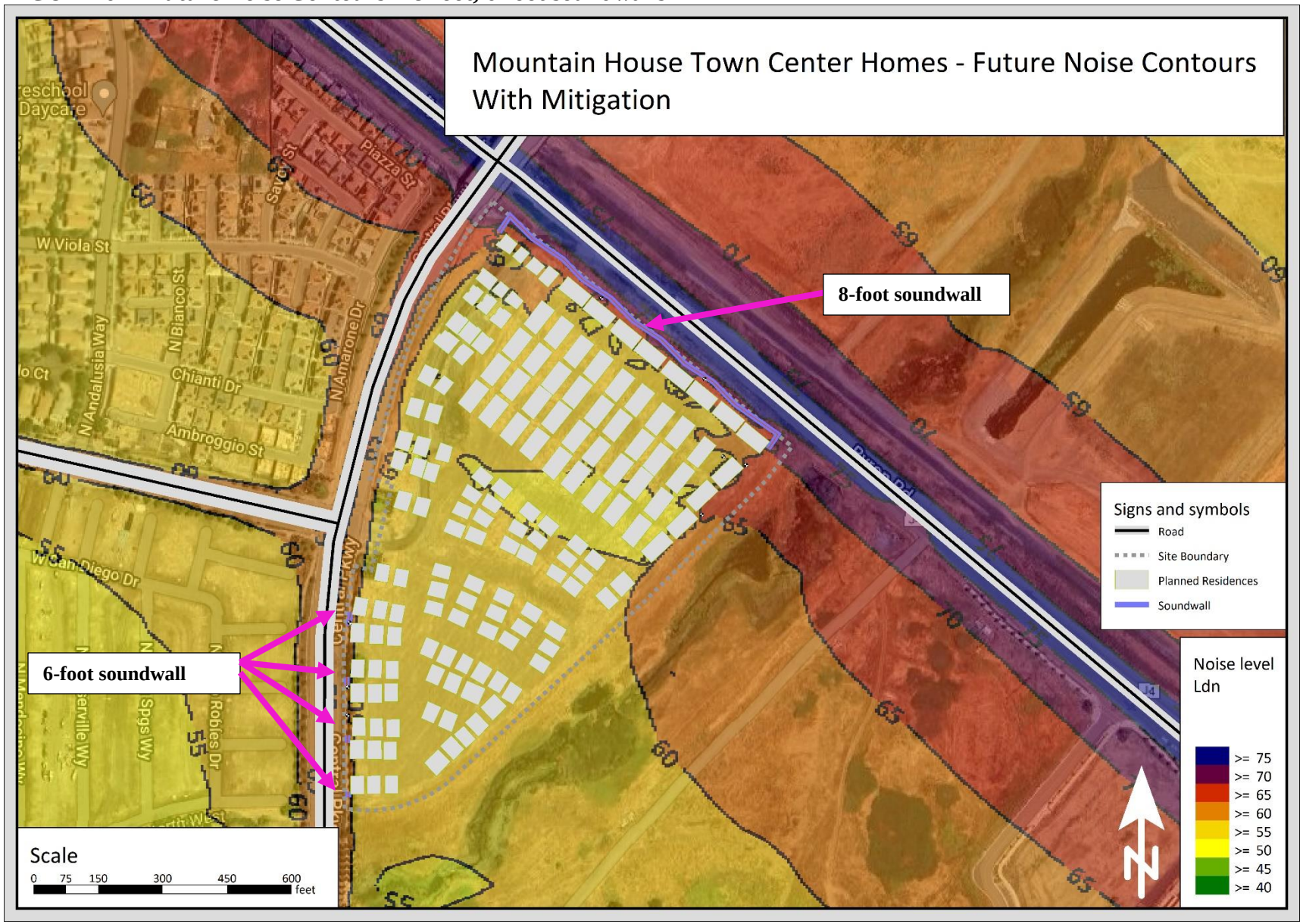


FIGURE 6 Future Noise Contours - 8-foot, 6-foot soundwalls



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.

Based on a review of the project plans, the first row of homes adjacent to Byron Road would be set back approximately 120 feet from the centerline of the road. The upper floor 'primary suite' rooms would have direct line-of-sight to the traffic on Byron Road without shielding from sound walls or berms. The façades of residences located along Byron Road along with homes located along the northwest corner of the site, would be exposed to noise levels up to 72 dBA L_{dn}. To meet the 45 dBA L_{dn} noise standard, homes located along Byron Road will require a minimum exterior-to-interior noise reduction of 27 dBA. Forced-air mechanical ventilation systems and sound-rated construction methods are normally required to achieve this amount of noise reduction. Since no information is currently available regarding the elevations of the homes, based on other similar homes in Central Valley[2], we would expect the homes to be of wood frame construction where the exterior walls are stud framed with cavity insulation with one layer of gypsum board at the interior and fiber cement lap siding or 1 coat exterior plaster over wood sheathing at the exterior[3]. According to the floorplans, the window area for the primary suite of homes along Byron Road would range from 10% to 20% of the total wall area. A minimum Sound Transmission Class (STC) rating of 35 would be needed for the 2nd floor facades facing Byron Road to satisfy the City and County interior noise level standard of 45 dBA L_{dn}.

Homes along Central Parkway set back approximately 80 feet from the centerline of the road would be exposed to noise levels up to 65 dBA L_{dn}. To meet the 45 dBA L_{dn} noise standard, homes along Central Parkway will require a minimum exterior-to-interior noise reduction of 20 dBA. This amount of noise reduction is typical of modern residential construction with windows 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. With the provision of forced-air mechanical ventilation to these residences, and windows closed, noise levels would not exceed 45 dBA L_{dn} within any of the proposed residences in this area.

[2] These include single family home projects within Mountain House and in the Tracy Hills development area.

[3] Considering test results of fiber cement sided walls and considering the combination of 1 coat plaster and wood sheathing to acoustically equivalent to the use of fiber cement siding, the exterior walls with either siding type are expected to have an STC rating of 40 (per Acoustic Systems Test Report TL365A for James Hardie Building Products dated 3-15-9).

Considering the shielding effect of the first row of homes along Byron Road and Central Parkway, the other proposed homes will not require sound rated windows and exterior doors, however these homes will require a forced-air mechanical ventilation system which provides an acceptable amount of fresh air in these homes with windows closed to reduce traffic noise levels at the home interiors to 45 dBA L_{dn} or less.

NOISE CONTROL RECCOMENDATIONS

1. To ensure that the exterior noise levels in the rear yards of the proposed homes facing Byron Road and Central Parkway meet the allowable exterior noise threshold of 65 dBA L_{dn}, a property line soundwall with a minimum height of 8-feet above residential pad elevation is to be built along the north edge and 6-foot soundwalls are to be built along the southwest edge (as shown in Figure 6). The walls should be built without cracks or gaps in the face or large or continuous gaps at the base and have a minimum surface weight of 3 lbs. per sq. ft.

2. To ensure interior noise levels within all homes in the residential development can be kept below 45 dBA L_{dn}, windows with a minimum Sound Transmission Class (STC) rating of 35 should be installed at the 2nd floor primary suites and lofts directly facing Byron Road. Houses located along the northwest edge of the project site would also need windows with a minimum STC rating of 35.

3. For all other houses (second row houses and beyond), standard residential construction would be sufficient in maintaining interior noise levels to 45 dBA L_{dn} or less with windows in 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 should be provided. With the provision of forced-air mechanical ventilation to these residences, and windows closed, noise levels would not exceed 45 dBA L_{dn} within any of the proposed residences in this area.

4. The above noise control recommendations should be confirmed during final design of the proposed project when final floor plans and building elevations are available.

SUMMARY

An 8-foot soundwall relative to pad grade to the rear yards is recommended along the north edge of the site to reduce noise levels to 65 dBA L_{dn} or less at the exterior residential yards of the houses proposed. 6-foot soundwalls are proposed along the southwest edge of the site to reduce exterior noise levels to 65 dBA L_{dn} or less at the residential backyards. To control interior noise levels at the first row of houses directly facing the roadways, 2nd floor façade windows with a minimum STC rating of 35 (for residences facing Byron Road and the northwestern most residences on site should be installed to meet the City and County interior noise level standard of 45 dBA L_{dn}. Standard thermal insulating windows and weather sealed doors will be acceptable at the first-floor level of the homes on these lots, and at the first and second floors of the homes on all other lots on the project site. However, the first-row residences adjacent to the Byron Road and Central Parkway will require a forced-air mechanical ventilation system which provides an acceptable amount of

fresh air in these homes with windows closed. Final recommendations shall be made when the final site, grading, and architectural plans are available.