APPENDIX I

NOISE BACKGROUND AND DATA

DR13-14

ENVIRONMENTAL NOISE ASSESSMENT MIXED-USE RESIDENTIAL DEVELOPMENT MT. DIABLO BLVD AT DELORES DRIVE LAFAYETTE, CALIFORNIA

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INTRODUCTION

This report presents the results of the environmental noise assessment of the Mixed-Use Residential development proposed at the northwest corner of the Mt. Diablo Boulevard and Delores Drive intersection in Lafayette, California. The project would include three levels of multi-family residential living, underground parking, a restaurant and flexible commercial space at the Mt. Diablo Blvd street frontage and a separate common outdoor use area. The project site is located on the western side of Delores Drive, between Highway 24 to the north and Mt. Diablo Blvd the south. The site and generally slopes to the south away from the Highway, which is elevated as it passes over Delores Drive. The property is currently developed with commercial and office uses, and is bisected by a parcel owned and used by EBMUD as a storage and staging area. Parcels to the east, south and west include multifamily residential, commercial and office uses, and Hwy 24 forms the northern edge of the site. The project site in relation to its surroundings is shown in Figure 1.

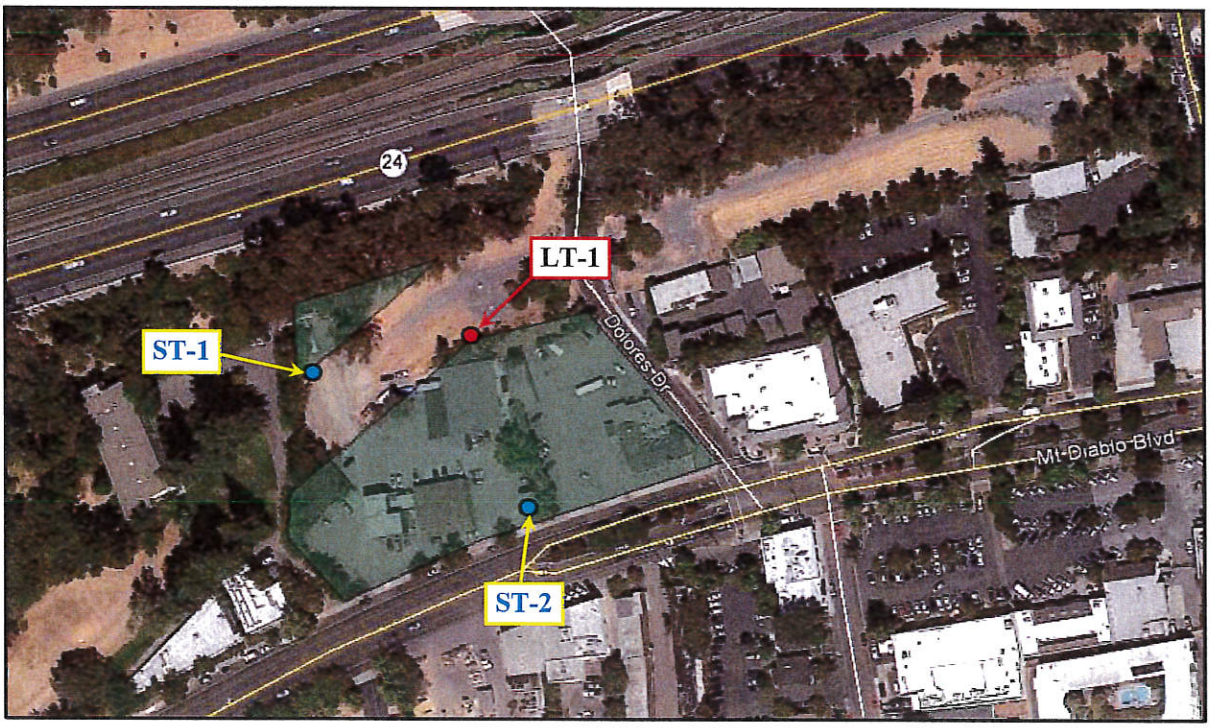

Figure 1: Project Site and Vicinity

Included in this report is a brief description of the fundamentals of environmental noise, a summary of applicable regulatory criteria, and the results of the noise monitoring survey made at the project site. The report then evaluates impacts resulting from the project in terms of noise and land use compatibility. Mitigation is presented to reduce any significant noise impacts on the intended use of the site to less than significant levels.

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.

TABLE 1: Definitions of Acoustical Terms Used in this Report

Term	Definitions
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
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.

There are several methods of characterizing sound. The most common in California is the A-weighted sound level or dBA. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

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
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), Caltrans, November 2009.

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 Day/Night Average Sound Level, L_{dn}, is a measure of the cumulative noise exposure in a community, with a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn}. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 15 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn}. At an L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between an L_{dn} of 60-70 dBA. Between an L_{dn} of 70-80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

REGULATORY BACKGROUND

Regulatory criteria, designed to limit noise exposure at noise sensitive land uses, are established by the State and the City in the form of guidelines, regulations, and policies. These criteria are used as significance criteria in the impact assessment. Applicable criteria established by the State of California and the City of Lafayette General Plan Noise Element are as follows:

California Building Code, Title 24, Part 2

The State of California establishes exterior sound transmission control standards for new hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family dwellings as set forth in the 2010 California Building Code (Chapter 12, Section 1207.11). Interior noise levels attributable to exterior environmental noise sources shall not exceed 45 dBA L_{dn} in any habitable room. When exterior noise levels (the higher of existing or future) where residential structures are to be located exceed 60 dBA L_{dn}, a report must be submitted with the building plans describing the noise control measures that have been incorporated into the design of the project to meet the noise limit.

2010 California Building Cal Green Code, Title 24, Part 11[1]

The Green Building Standards of the State of California Code of Regulations (Title 24, Part 11) establishes mandatory exterior sound transmission control standards for new non-residential buildings as set forth in the 2010 California Green Building Standards Code Sections 5.507.4.1 and 5.507.4.2 Exterior noise transmission as follows[2]:

5.507.4.1 Exterior noise transmission, prescriptive method. Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 in the following locations:

1. Within the 65 CNEL noise contour of an airport.
2. Within the 65 CNEL or L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source as determined by the Noise Element of the General Plan.

5.507.4.1.1 Noise exposure where noise contours are not readily available. Buildings exposed to a noise level of 65 dB Leq-1-hr during any hour of operation shall have exterior wall and roof-ceiling assemblies exposed to the noise source meeting a composite STC rating of at least 45 (or OITC 35), with exterior windows of a minimum STC of 40 (or OITC 30).

5.507.4.2 Performance method. For buildings located as defined in Sections A5.507.4.1 or A5.507.4.1.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level (L_{eq}-1Hr) of 50 dBA in occupied areas during any hour of operation.

5.507.4.2.1 Site features. Exterior features such as sound walls or earth berms may be utilized as appropriate to the project to mitigate sound migration to the interior.

5.507.4.2.2 Documentation of compliance. An acoustical analysis documenting complying interior sound levels shall be prepared by personnel approved by the architect or engineer of record.

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[1] Including changes effective July 1, 2012.

[2] Exception: Buildings with few or no occupants and where occupants are not likely to be affected by exterior noise, as determined by the enforcement authority, such as factories, stadiums, storage, enclosed parking structures and utility buildings.

City of Lafayette General Plan

The City of Lafayette General Plan Noise Element seeks to protect the health and welfare of the community by promoting development which is compatible with established noise standards. The following Noise Element policies are applicable to the proposed project:

Goal N-1 *Ensure that all new development is consistent with the standards for noise.*

Policy N-1.2 Reduce Noise Impacts: Avoid or reduce noise impacts first through site planning and project design. Barriers and structural changes may be used as mitigation techniques only when planning and design prove insufficient.

Program N-1.2.1: Use the City's Noise Ordinance in environmental review of all development proposals and incorporate project design measures to reduce noise to allowable limits.

Program N-1.2.2: Evaluate mitigation measures for projects that would cause a "substantial increase" in noise as defined by the following criteria or would generate unusual noise which could cause significant adverse community response:

a) cause the L_{dn} in existing residential areas to increase by 3 dB or more;
b) cause the L_{dn} in existing residential areas to increase by 2 dB or more if the L_{dn} would exceed 70 dB; or
c) cause the L_{dn} resulting exclusively from project-generated traffic to exceed an L_{dn} of 60 dBA at any existing residence.

Policy N-1.3 Noise and Land Use Compatibility Standards: Ensure that all new noise sensitive development proposals be reviewed with respect to Table 4.9-6: Noise and Land Use Compatibility Standards. Noise exposure shall be determined through actual onsite noise measurements.

Policy N-1.4 Residential and Noise Sensitive Land Use Standards: Require a standard of 40 – 45 L_{dn} (depending on location) for indoor noise level for all new residential development including hotels and motels, and a standard of 55 L_{dn} for outdoor noise, except near the freeway[3]. These limits shall be reduced by 5 dB for senior housing and residential care facilities.

Program N-1.4.1 Use the standards in Policy N-1.2.2 to determine the need for noise studies and require new developments to provide noise attenuation features as a condition of approving new projects.

Program N-1.4.2 Require an acoustical study for all new residential projects with a future L_{dn} noise exposure of 55 L_{dn} or greater. The study shall describe how the project will comply with the Noise and Land Use Compatibility Standards. The studies shall also satisfy the requirements set forth in Title 24, part 2 of the California Government Code, Noise Insulation Standards, for multi-family attached dwellings, hotels, motels, etc. regulated by Title 24.

Program N-1.4.3 Require that all new residential development meet the standards set forth in California Title 24.

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3 Though the City General Plan standards do not explicitly state what the acceptable noise environment near the freeway is, the State's Title 24 standards consider an L_{dn} of 60 dBA as acceptable for residential use, thus a 60 dBA L_{dn} level will be used to judge acceptability of outdoor use areas near the freeway in this assessment.

Goal N-2 *Work to reduce noise to acceptable levels where it now exceeds those standards.*

Policy N-2.1 Reduce Outdoor Noise in Existing Residential Areas: Reduce outdoor noise in existing residential areas where economically and aesthetically feasible

Program N-2.1.1 Consider sound barrier walls, grading and landscaping, and change in traffic patterns as potential measures.

Policy N-2.2 Mitigate Noise Impacts: Mitigate noise impacts to the maximum feasible extent.

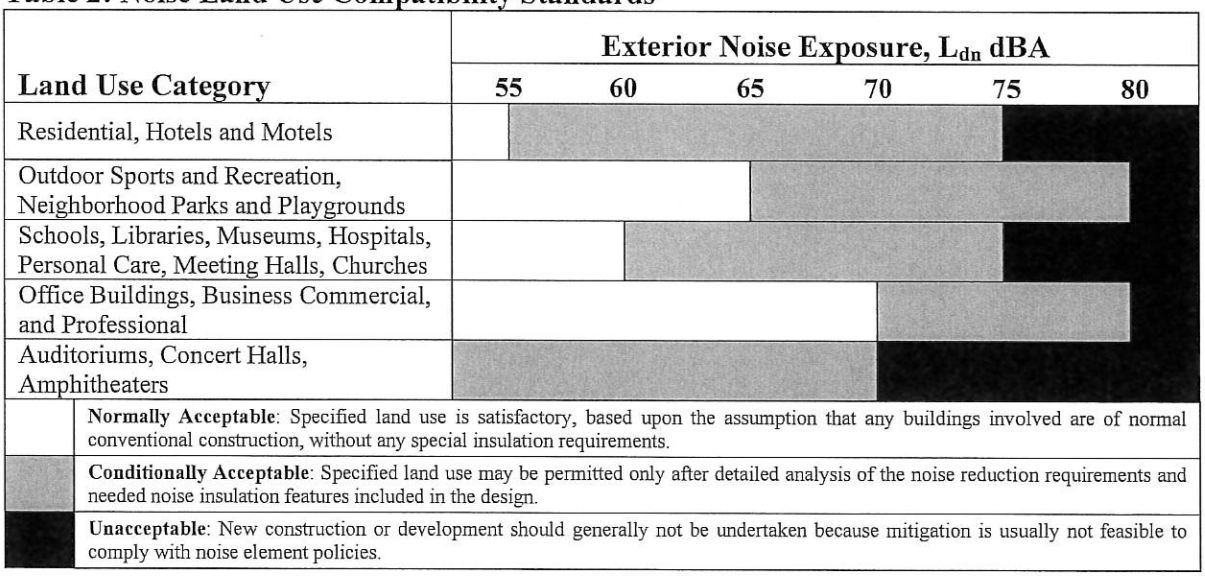
Program N-2.2.7: Recommend acoustical studies for all projects that would be exposed to noise levels in excess of those deemed normally acceptable, as shown in Table 1.

Table 1: Outdoor Noise Limits

Receiving Land Use Category	Time Period	Noise Level Limit Standard, dBA
Single-Family Residential	10 p.m. — 7 a.m. 7 a.m. — 10 p.m.	45 50
Multi-Family Residential, Schools, Libraries, Public Spaces	10 p.m. — 7 a.m. 7 a.m. — 10 p.m.	50 55
Commercial	10 p.m. — 7 a.m. 7 a.m. — 10 p.m.	55 60

Source: Lafayette Municipal Code, Table 5-205.

Table 2: Noise Land Use Compatibility Standards



Source: Lafayette General Plan, Noise Element

EXISTING NOISE ENVIRONMENT

A noise monitoring survey was conducted in the site vicinity between March 12th and 14th, 2014 to quantify the existing noise environment at the site and in the project vicinity. The noise monitoring survey included one long-term noise measurement (LT-1), and two short-term noise measurements (ST-1 and ST-2) as shown on the site aerial (Figure 1, above) and the project's Conceptual Site Plan (Figure 2, below).

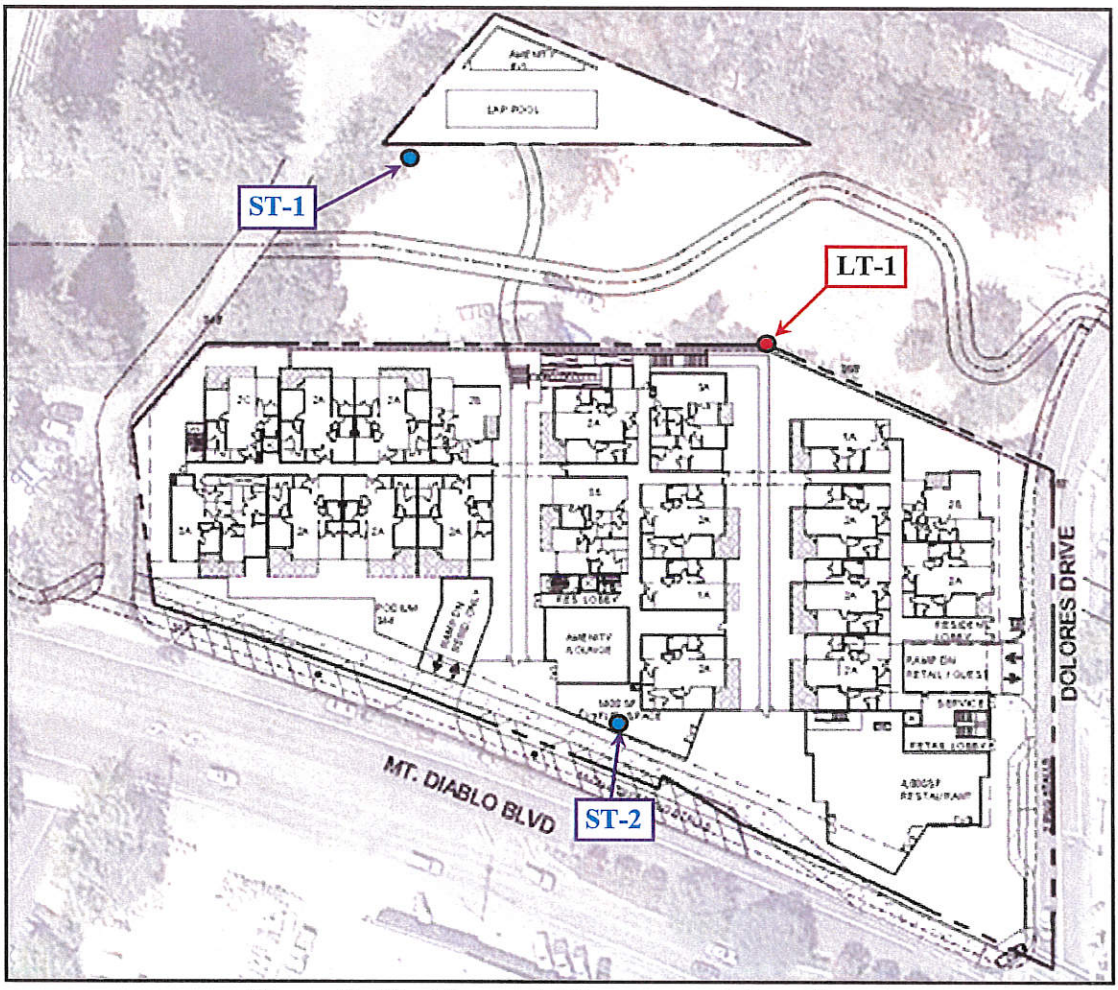
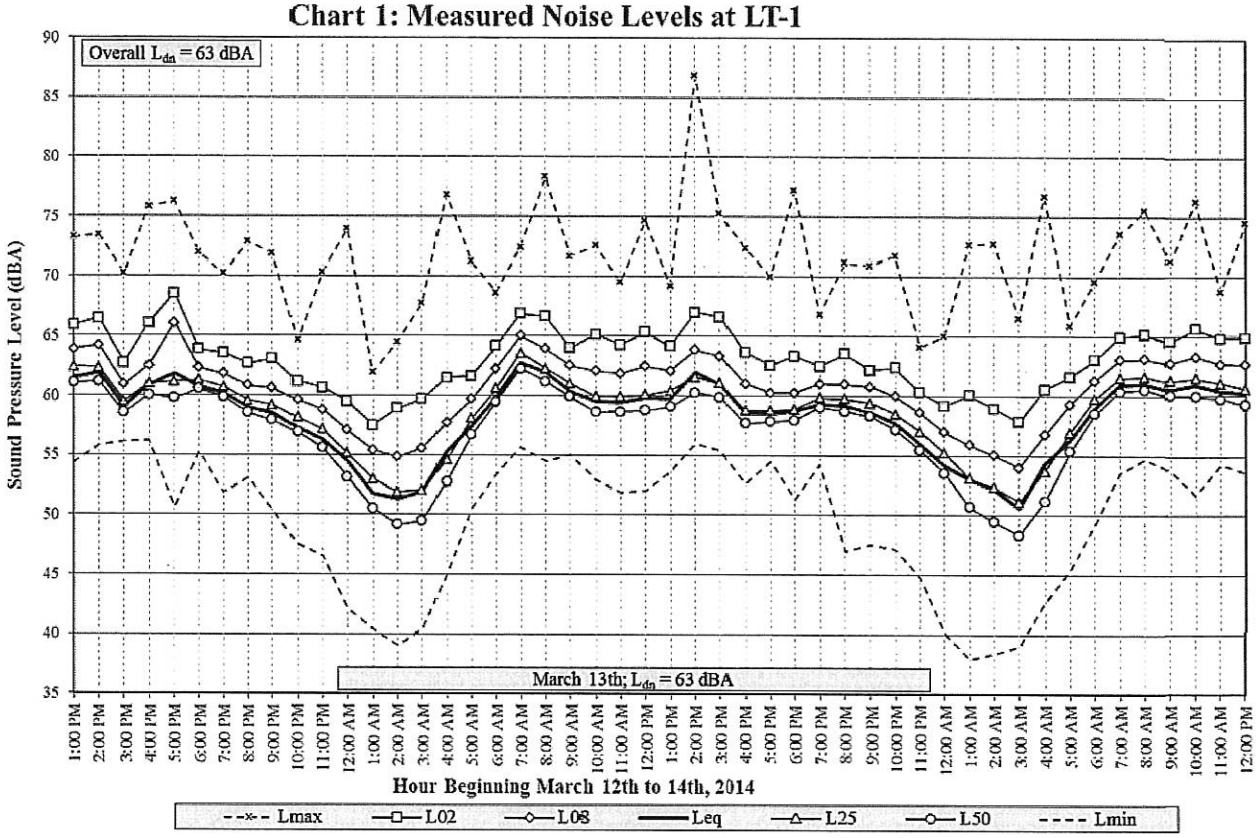


Figure 2: Site Plan and Measurement Locations

Traffic on Highway 24 and Mt. Diablo Blvd. are the predominant noise sources affecting the site. All noise measurements were conducted with Larson Davis Laboratories (LDL) Type I Model 820 Sound Level Meter fitted with a ½-inch pre-polarized condenser microphone and windscreen. The meters were calibrated with a Larson Davis Model CA250 precision acoustic calibrator prior to and following the measurement survey. The internal clocks of the long-term meters were set to less than one second of each other to ensure both identical sound level response and simultaneous operation.

The noise monitor at location LT-1 was positioned at a height of 12 feet above road grade on a tree trunk at the northern edge of the main portion of the site approximately 270 feet north of the Mt. Diablo Blvd. centerline and 270 feet south of the Highway 24 centerline between 1 pm on Wednesday March 12th and 1 pm on Friday March 14th, 2014. Noise levels at this location represent the noise exposure at the facades of residences closest to Hwy 24. The measured noise levels at this location, including the energy equivalent noise level (L_{eq}), maximum (L_{max}), minimum (L_{min}), and the noise levels exceeded 10, 50 and 90 percent of the time (indicated as L_{10}, L_{50} and L_{90}) are shown on Chart 1, following.

Chart 1: Measured Noise Levels at LT-1



A review of Chart 1 indicates that the noise levels at site LT-1 follow a diurnal pattern characteristic of traffic noise, with the average daytime noise levels ranging from 59 to 63 dBA L_{eq}, and the average hourly nighttime noise levels ranging from 51 to 60 dBA L_{eq}. The Average Day/Night noise Level, L_{dn} calculated for March 13th and the entire 48-hour measurement period were 63 dBA.

Short-term noise measurements were made at the eastern corner of the northern pool area (ST-1), and at 65 feet from the centerline on Mt. Diablo Blvd. at the approximate setbacks of future building facades (ST-2). Measurements at these locations were made simultaneously with the long-term measurement LT-1 on a 10-minute basis at an elevation of 5 feet above grade. By correlating these measurement results with those at LT-1, the L_{dn} at location ST-1 (northern pool area) was found to be 61 dBA and the L_{dn} at location ST-2 (building facades facing Mt. Diablo Blvd.) were found to be 67 dBA.

FUTURE NOISE ENVIRONMENT

The proposed mixed-use project includes a restaurant, flex space (possibly office and/or neighborhood retail), and multi-family residential uses. The current site use proposal is shown in Figure 2. The future roadway traffic noise levels on area roadways and highways are expected to increase under future conditions. Though future traffic projections were available, assuming an annual growth rate of between 1% and 2% per year, traffic noise levels in the area would be expected to increase by a maximum of 2 dBA L_{dn} over the next 20 years. Based on this increase, the future L_{dn} noise levels will be 65 dBA at the residential facades closest to Hwy 24, 64 dBA at in the northern pool area, and 70 dBA at the residential and commercial facades closest to Mt. Diablo Blvd.

NOISE ASSESSMENT

Based on the future noise exposures discussed above, all residential buildings will be exposed to future L_{dn} levels of greater than 60 dBA plan and thus require a design level acoustical report per the California Building Code describing the noise control measures needed to meet an interior noise standard of 45 dBA L_{dn} or less. Additionally, because the restaurant and flex space portions of the project would fall within the 65 dBA L_{dn} noise contour under future conditions, a design level acoustical report would also be required for these uses per the State's Cal Green Building Code standards. The future noise exposures discussed above also indicate that environmental noise levels in the common area adjacent to the residential buildings and at the pool area will exceed an L_{dn} of 60 dBA under future conditions, and therefore will require noise mitigation to meet City General Plan Standards. Based on these determinations, we have provided the following discussions and preliminary recommendations for noise control at the proposed outdoor common open space areas and at the interior of the residential and commercial uses on the project site:

Residential Noise Control

Future noise levels at facades of residential units which face and have a clear exposure to Hwy 24 and Mt. Diablo Blvd. are expected to, respectively, be 65 and 70 dBA L_{dn}, possibly resulting in interior noise levels in excess of the State and City 45 dBA L_{dn} standard for residential interiors.

Typical wood frame construction techniques with standard thermal insulating glass in moderately sized (less than one-third of the exterior wall area) closed windows will reduce traffic noise levels by about 25 dBA. When windows are open, traffic noise attenuation from exterior to interior is reduced to between 15 to 17 dBA. Based on this average exterior to interior noise attenuation factors, interior levels in residences which face and have a clear exposure to Hwy 24 and Mt. Diablo Blvd. expected to be at or below an L_{dn} of 45 dBA when standard thermal insulating windows are closed for the purpose of noise control, but an interior level of 45 dBA L_{dn} will likely be exceeded when the windows are open.

Considering the site noise environment and a review of the conceptual site plan, all other residences on the site will likely be exposed to an L_{dn} of 60 dBA or greater due to traffic noise. Based on this average exterior to interior noise attenuation factors, interior levels in these residences may also exceed an L_{dn} of 45 dBA with open windows.

Therefore, we recommended that all residential units on the project site be equipped with mechanical ventilation to allow the windows to remain closed at the residents' option, as an interior noise level of 45 dBA L_{dn} may not be met when windows are open. In our experience a central air-conditioning and heating system, or a central heating system equipped with a "summer switch" which allows the fan to circulate air without the heater on, which is designed to provide a habitable interior environment with the windows closed will meet this requirement.

Once building plans and elevations are available for the project, residential units which face and have a clear exposure to Hwy 24 and Mt. Diablo Blvd. should be reviewed by a qualified acoustical professional to determine the need for sound rated window and/or exterior wall assemblies which will be required to reduce interior noise levels to 45 dBA L_{dn} or lower compliance with the State Building Code.

Additionally project-specific acoustical analyses will be required by the State of California to ensure that interior noise levels can be reduced to 45 dBA L_{dn} or lower.

Restaurant and Flex Space Noise Control

Future noise levels at facades of the non-residential buildings facing Mt. Diablo Blvd. are expected to exceed an L_{dn} of 65 dBA. Following the State of California *Cal Green* Building Code standard, exterior sound transmission control must be incorporated in the design of these buildings using either the prescriptive (section 5.507.4.1) or performance (section 5.507.4.2) analysis methods.

If the prescriptive method is chosen the eastern wall and roof-ceiling assemblies (facing Mt. Diablo Blvd.) shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40 and exterior windows on the southern façade should have a minimum STC rating of 40 or minimum OITC rating of 30.

If the performance method is chosen, wall, window and roof-ceiling assemblies the southern building façades shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level (L_{eq}-1Hr) of 50 dBA in occupied areas during any hour of operation. Because typical building construction techniques with standard thermal insulating glass windows will likely achieve this rating at the project site, the applicant would likely prefer this method. If this method is used, once building plans and elevations are available for these buildings they should be reviewed by a qualified acoustical professional to determine compliance with the State Building Code.

Outdoor Use Area Noise Control

The project includes a common outdoor use northern pool area where the 60 dBA L_{dn} criteria would be applicable. Future L_{dn} noise levels in this area are expected to be 64 dBA. However, the pool area is relatively well shielded from Hwy 24 traffic noise by terrain features but will be only partially shielded by project buildings from Mt. Diablo Blvd. traffic noise. Based on these shielding considerations, traffic on Mt. Diablo Blvd will be the primary source of noise in this outdoor use area. To reduce the overall nose levels in this areas to an L_{dn} of 60 dBA or less, the height of the northern retaining wall should be increased by a height of 6 feet (to an estimated top of wall elevation of 356.5 ft. The extent of this barrier is shown in Figure 3, following.

To be effective as a barrier to noise, this noise barrier wall should be built without cracks or gaps in the face or large or continuous gaps at the base or where they adjoin the homes or each other. The walls should also have a minimum surface weight of 3.0 lbs. per sq. ft. Small, dispersed, gaps for landscape irrigation or drainage, which do not compose more than 0.5% of the wall area, in the base of walls are acceptable. For a wood wall to meet these requirements, we typically recommend that the fence be double faced with butted vertical fence boards on each side with a continuous layer of 1/2" plywood. Using the plywood ensures continued effectiveness of the barrier with age, since wood slats alone have a tendency to warp and separate with age allowing gaps to form and the barrier effect of the wall to diminish. Other acceptable materials include, but are not limited to masonry block and pre-cast concrete panels.

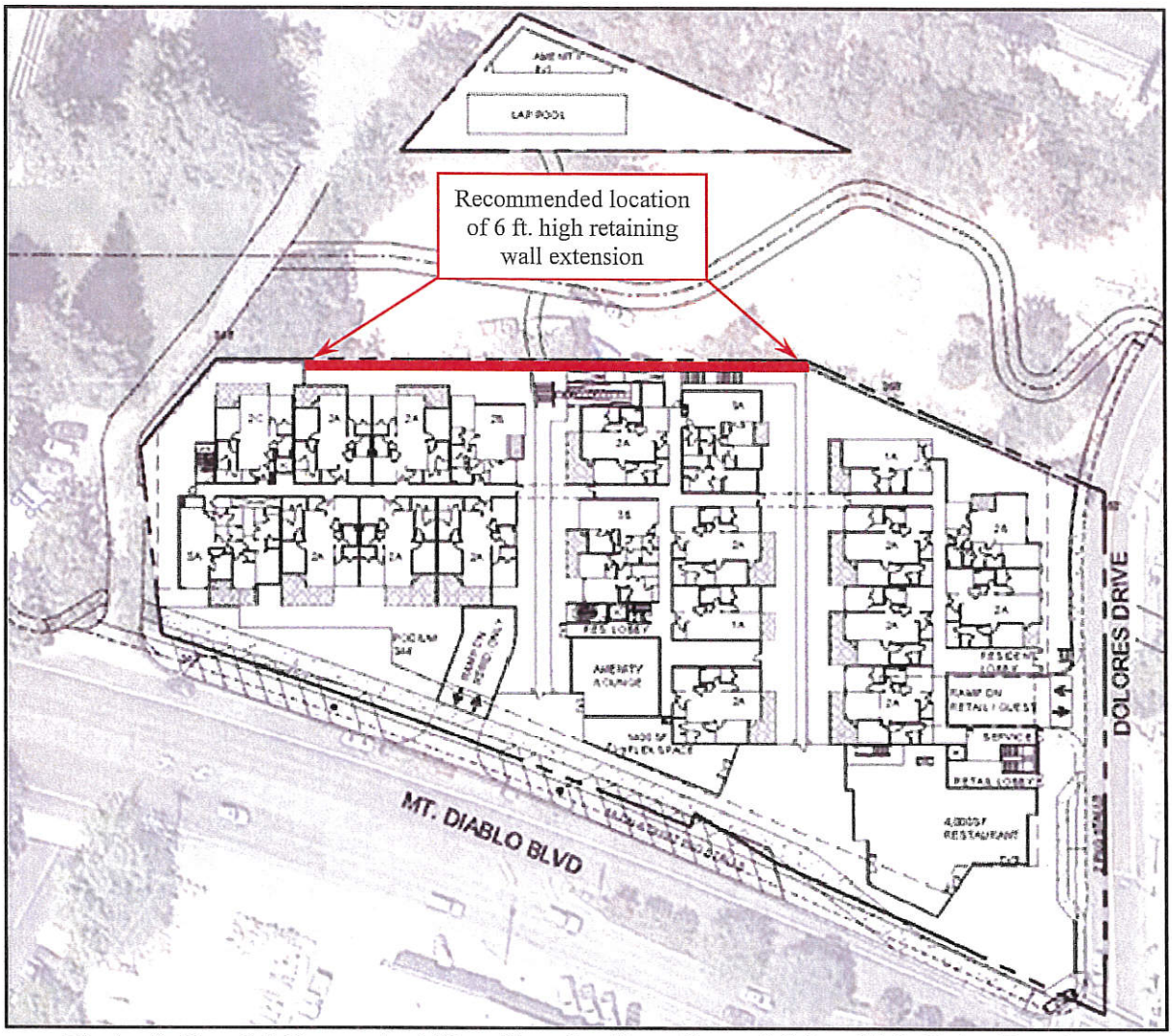


Figure 3: Level 1 Conceptual Plan Showing Locations of 6 foot high Noise Barriers