

Appendix F
Noise Assessment

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***SAN JOSÉ BEHAVIORAL HEALTH HOSPITAL
NOISE AND VIBRATION ASSESSMENT
SAN JOSÉ, CALIFORNIA***

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INTRODUCTION

The San José Behavioral Health Hospital project is located on an undeveloped 5.14 acre site northeast of existing industrial buildings along Enzo Drive in the Edenvale area of the City of San José. The project includes the development of a 71,000 square foot psychiatric hospital supporting approximately 250 staff and 126 beds. The project would provide 190 parking spaces in a surface lot. The hospital will also include a commercial kitchen, dining area, nursing stations, half-court indoor gymnasium, employee operated laundry facilities, and outdoor courtyards.

This report evaluates the project's potential to result in significant 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 land use compatibility utilizing noise and vibration-related 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 DNL. Typically, the highest steady traffic noise level during the daytime is about equal to the DNL 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 DNL with open windows and 65-70 dBA DNL 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; 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 DNL 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 DNL. At a DNL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the DNL 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 DNL of 60-70 dBA. Between a DNL 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 DNL 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.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. 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
Jet fly-over at 1,000 feet	110 dBA	Rock band
Gas lawn mower at 3 feet	100 dBA	
Diesel truck at 50 feet at 50 mph	90 dBA	Food blender at 3 feet
Noisy urban area, daytime	80 dBA	Garbage disposal at 3 feet
Gas lawn mower, 100 feet Commercial area	70 dBA	Vacuum cleaner at 10 feet 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 Quiet suburban nighttime	40 dBA	Theater, large conference room
Quiet rural nighttime	30 dBA	Library Bedroom at night, concert hall (background)
	20 dBA	Broadcast/recording studio
	10 dBA	
	0 dBA	

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

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

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

Regulatory Background – Noise

The State of California and the City of San José 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;

- (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.

Pursuant to recent court decisions, the impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not included in the Impacts and Mitigation Section of this report. Checklist items (a) and (b), regarding the compatibility of the project with noise and vibration levels at the site, are discussed in the General Plan Consistency section of the report. Checklist items (a) through (d) are applicable in the assessment of potential impacts resulting from the proposed project at off-site receptors. Checklist items (e) and (f) are not applicable to this project because the project is not located within an airport land use plan, is not within two miles of an airport, and is not in the vicinity of a private air strip.

CEQA does not define what noise level increase would be considered substantial. Typically, an increase in the DNL noise level resulting from the project at noise sensitive land uses of 3 dBA or greater would be considered a significant impact when projected noise levels would exceed those considered acceptable for the affected land use. An increase of 5 dBA DNL or greater would be considered a significant impact when projected noise levels would remain within those considered acceptable for the affected land use.

2013 California Building Code, Title 24, Part 2. The current (2013) California Building Code (CBC) does not place limits on interior noise levels attributable to exterior environmental noise sources. The July 1, 2015 Supplement to the 2013 CBC corrects this omission, reinstating limits on interior noise levels attributable to exterior environmental noise sources which had been contained in all prior versions of the CBC dating back to 1974. In keeping with the provisions of the 2015 supplement, this report considers interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn} in any habitable room for new dwellings other than detached single-family dwellings.

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 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 San José. The following policies are applicable to the proposed project:

- EC-1.1** Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, state, and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San José include:

Interior Noise Levels

- The City's standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA DNL. Include appropriate site and building design, building construction and noise attenuation techniques in new development to meet this

standard. For sites with exterior noise levels of 60 dBA DNL or more, an acoustical analysis following protocols in the City-adopted California Building Code is required to demonstrate that development projects can meet this standard. The acoustical analysis shall base required noise attenuation techniques on expected Envision General Plan traffic volumes to ensure land use compatibility and General Plan consistency over the life of this plan.

Exterior Noise Levels

- The City’s acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses (Table EC-1). The acceptable exterior noise level objective is established for the City, except in the environs of the San José International Airport and the Downtown, as described below:
 - For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standard for noise from sources other than aircraft and elevated roadway segments.

Table EC-1: Land Use Compatibility Guidelines for Community Noise in San José

LAND USE CATEGORY	EXTERIOR NOISE EXPOSURE (DNL IN DECIBELS (DBA))					
	55	60	65	70	75	80
1. Residential, Hotels and Motels, Hospitals and Residential Care ¹						
2. Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds						
3. Schools, Libraries, Museums, Meeting Halls, Churches						
4. Office Buildings, Business Commercial, and Professional Offices						
5. Sports Arena, Outdoor Spectator Sports						
6. Public and Quasi-Public Auditoriums, Concert Halls, Amphitheaters						

¹Noise mitigation to reduce interior noise levels pursuant to Policy EC-1.1 is required.

Normally Acceptable:

- Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable:

- Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

Unacceptable:

- New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

EC-1.2 Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

- Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain “Normally Acceptable;” or
- Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the “Normally Acceptable” level.

EC-1.7 Require construction operations within San José to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City’s Municipal Code. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

- Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

City of San José Municipal Code. The City’s Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Chapter 20.30.700 states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit. Chapter 20.50.300 states the sound pressure level generated by any use or combination of uses shall not exceed 70 dBA at any property line shared with land zoned for industrial use, except upon issuance and in compliance with a Conditional Use Permit.

Chapter 20.100.450 of the Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.

Regulatory Background – Vibration

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies to achieve the goal of minimizing vibration impacts on

people, residences, and business operations in the City of San José. The following policies are applicable to the proposed project:

- EC-2.3** Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to a building. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

Existing Noise Environment

The San José Behavioral Health Hospital project is located on an undeveloped 5.14 acre site northeast of existing industrial buildings along Enzo Drive in the Edenvale area of the City of San José. Figure 1 shows the project site plan overlaid on an aerial image of the site vicinity. As shown on Figure 1, the project site is near existing industrial land uses located approximately 200 feet southwest, 230 feet south, and 440 feet southeast of the project property lines. The project site is located approximately 850 feet northeast of the centerline of U.S. 101.

A noise monitoring survey was performed beginning on Tuesday, June 7, 2016 and concluding on Thursday, June 9, 2016. The monitoring survey included one long-term noise measurement (LT-1) and three short-term noise measurements (ST-1 through ST-3). All measurement locations are shown in Figure 1 and the daily trends in noise levels for the long-term measurement are shown in Figure 2. The noise environment at the site and at the nearby land uses results primarily from vehicular traffic along U.S. 101.

Long-term noise measurement LT-1 was made in the middle of the project site, approximately 450 feet northeast of Enzo Drive. Hourly average noise levels at this location typically ranged from 52 to 56 dBA L_{eq} during the day and from 45 to 56 dBA L_{eq} at night. The day-night average noise level on Wednesday, June 8, 2016 was 58 dBA DNL.

Short-term noise measurement ST-1 was made in the northwest corner of the project site, approximately 85 feet south of the northern fence line and 105 feet east of the western fence line. The 10-minute average noise level measured at this location between 12:10 p.m. and 12:20 p.m. on Tuesday, June 7, 2016 was 48 dBA L_{eq} . Short-term noise measurement ST-2 was made in the southwest corner of the project site, approximately 90 feet north of the southern fence line and 180 feet east of the western fence line. The 10-minute average noise level measured at this location between 12:30 p.m. and 12:40 p.m. on Tuesday, June 7, 2016 was 51 dBA L_{eq} . ST-3 was made at the west end of Eden Park Place. The 10-minute average noise level measured at this location between 1:00 p.m. and 1:10 p.m. on Tuesday, June 7, 2016 was 49 dBA L_{eq} . Table 4 summarizes the results of the short-term measurements.

FIGURE 1 San José Behavioral Health Hospital Noise Measurement Locations



FIGURE 2 Long Term Noise Level Daily Trends
Noise Levels at Noise Measurement Site LT-1
Mid-Project Site, 450 Feet Northeast of Enzo Drive
Tuesday, June 7 through Thursday June 9, 2016

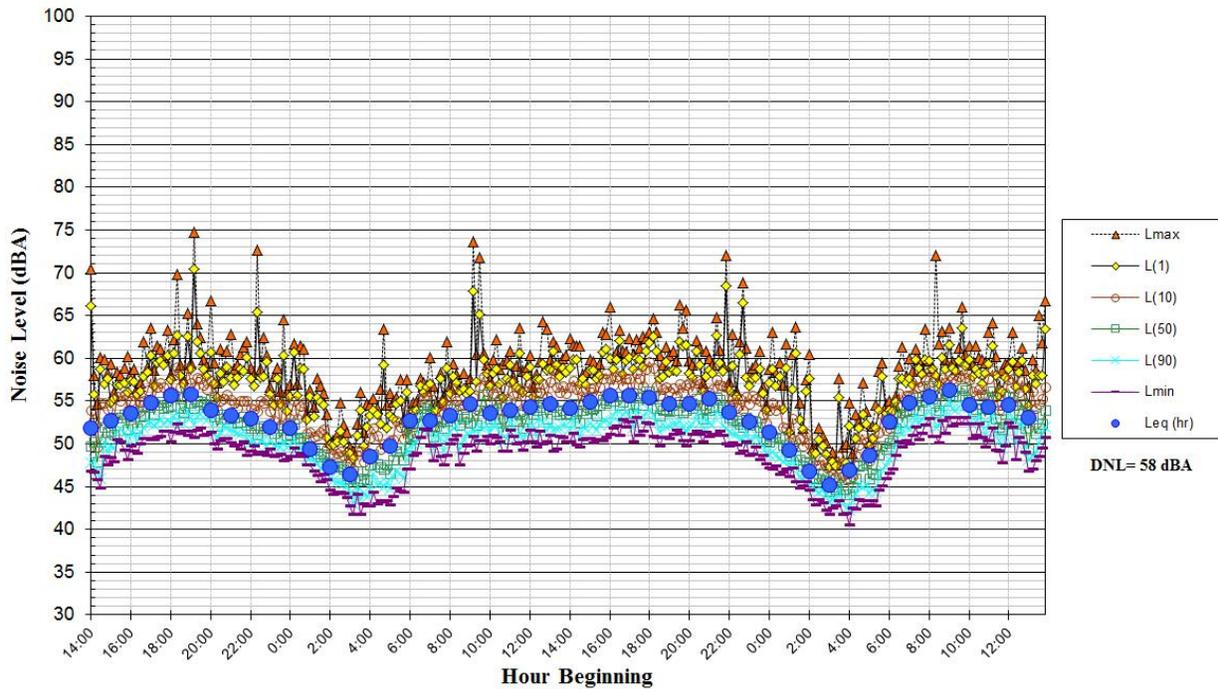


TABLE 4 Summary of Short-Term Noise Measurement Data

Noise Measurement Location	L _{max}	L ₍₁₎	L ₍₁₀₎	L ₍₅₀₎	L ₍₉₀₎	L _{eq}
ST-1: Northwest corner of project site. (6/7/2016, 12:10 p.m. – 12:20 p.m.)	60	54	50	46	45	48
ST-2: Southwest corner of project site. (6/7/2016, 12:30 p.m. – 12:40 p.m.)	59	57	53	50	47	51
ST-3: West end of Eden Park Place. (6/7/2016, 1:00 p.m. – 1:10 p.m.)	64	58	51	47	45	49

**GENERAL PLAN CONSISTENCY ANALYSIS –
COMPATIBILITY OF PROJECT WITH NOISE AND VIBRATION AFFECTING THE
SITE**

Noise and Land Use Compatibility

The Environmental Leadership Chapter in the Envision San José 2040 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 San José. 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 standard is 60 dBA DNL or less for the proposed hospital use.
- The City’s standard for interior noise at the proposed hospital is 45 dBA DNL.

The future noise environment at the project site would continue to result primarily from vehicular traffic along U.S. 101. The Envision San José 2040 General Plan EIR¹ provided future noise level increases in the project vicinity. From this data, traffic noise along U.S. 101 would increase by up to 1 dBA DNL by the year 2035. Therefore, future noise exposures at the hospital facades facing U.S. 101 are calculated to reach up to 60 dBA DNL.

Future Exterior Noise Environment

The project proposes one outdoor dining patio and common open space area adjacent to the north side of the hospital building and two outdoor courtyards; one next to the building’s entryway and the other in the approximate center of the hospital. The proposed two-story hospital building would provide adequate acoustical shielding at receptors in the northern dining patio/common open space area and center courtyard, and the building and a southern barrier would provide acoustical shielding at receptors in the entryway courtyard, resulting in noise levels below 60 dBA DNL. Exterior noise levels would not exceed the City’s 60 dBA DNL exterior noise standard and would be considered compatible with the proposed land use.

¹ Environmental Impact Report for the Envision San José 2040 General Plan, City of San José, June 2011.

Future Interior Noise Environment

The California Building Code and the City of San José require that interior noise levels be maintained at 45 dBA DNL or less. Hospital overnight units would be located on both the first and second levels at all facades. The future exterior traffic noise exposure at all building facades would be at or below 60 dBA DNL.

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 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 DNL, 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 DNL, 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.

For the proposed project, the interior noise level standard would be met with standard construction methods and windows in the closed position.

Measures to Consider to Ensure General Plan Consistency

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

Permit Conditions:

- A qualified acoustical consultant shall review the final site plan, building elevations, and floor plans prior to construction and recommend building treatments to reduce interior noise levels to 45 dBA DNL or lower. Treatments would include, but are not limited to, sound rated windows and doors, sound-rated wall and window constructions, acoustical caulking, protected ventilation openings, etc. 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. Results of the analysis, including the description of the necessary noise control treatments, shall be submitted to the City, along with the building plans and approved design, prior to issuance of a building permit
- Provide a suitable form of forced-air mechanical ventilation for the hospital building, as determined by the local building official, so that windows can be kept closed to control noise.

Vibration and Land Use Compatibility

There may be certain equipment in the hospital that could be sensitive to groundborne vibration from exterior sources. However, there are no sources of vibration able to cause excessive vibration (e.g., railroads) within 500 feet of the proposed building. Groundborne vibration is not expected to be an issue at the project site.

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:

- **Noise Levels in Excess of Standards:** A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the 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 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings. Groundborne vibration levels exceeding 0.08 in/sec PPV would have the potential to result in cosmetic damage to sensitive historic structures.
- **Project-Generated Traffic Noise Increases:** A significant impact would be identified if traffic generated by the project would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.
- **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 commercial land uses, and the ambient by at least 5 dBA L_{eq} , for a period of more than one year would also constitute a significant temporary noise.

Impact 1: Noise Levels in Excess of Standards. The proposed project would not generate noise in excess of standards established in the City's Municipal Code at the nearby sensitive receptors. **This is a less significant impact.**

Stationary Equipment Noise

Chapter 20.30.700 of the City's Municipal Code states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit. Chapter 20.50.300 states the sound pressure level generated by any use or combination of uses shall not exceed 70 dBA at any property line shared with land zoned for industrial use, except upon issuance and in compliance with a Conditional Use Permit.

The proposed project would include mechanical equipment, such as heating, ventilation, and air conditioning systems. Detailed information regarding the number, type, and size, of the mechanical equipment units selected for the project was not available at the time of this study. However, a review of the site plan indicates that most mechanical and electrical equipment would be located within rooms in the northwest corner of the building on the first floor. There would also be an emergency generator located outside of the east side of the hospital building surrounded by a noise barrier.

Typical air conditioning units and heat pumps for hospital buildings produce noise levels that range from about 63 to 67 dBA L_{eq} at a distance of 50 feet. The nearest residential land use would be located approximately 1,500 feet southwest from the mechanical equipment on the project site, across U.S. 101. At this distance, unmitigated mechanical equipment noise levels would range from 33 to 37 dBA L_{eq} , which would be well below ambient traffic noise levels from U.S. 101. Mechanical equipment noise levels would not exceed the noise limits established in the City's Municipal Code. The nearest industrial land use would be located approximately 600 feet southwest from the mechanical equipment on the project site. At this distance, the unmitigated mechanical equipment noise would range from 41 to 45 dBA L_{eq} , which would also not exceed limits established in the City's Municipal Code. This would be a **less-than-significant** impact.

Construction Noise

Chapter 20.100.450 of the City's Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence. This analysis assumes that construction activities will occur between 7:00 am and 7:00 pm Monday through Friday and not on weekends, and the nearest residential land use is approximately 1,000 feet southwest of the project site. Project construction will be consistent with the code limits and the impact is **less-than-significant**.

Mitigation Measure 1: None required.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Construction-related vibration levels resulting from activities at the project site would not exceed 0.2 in/sec PPV at the nearest residential and commercial land uses. **This is a less-than-significant impact.**

The construction of the project may generate vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site preparation work, excavation and grading, foundation work, paving, and new building framing and finishing. This analysis assumes the proposed project would not require pile driving, which can cause excessive vibration.

According to Policy EC-2.3 of the City of San José General Plan, a vibration limit of 0.08 in/sec PPV shall be used to minimize the potential for cosmetic damage to sensitive historical structures, and a vibration limit of 0.20 in/sec PPV shall be used to minimize damage at buildings of normal conventional construction. With no known historical buildings in the vicinity of the project site, a significant impact would occur if nearby buildings were exposed to vibration levels in excess of 0.20 in/sec PPV.

Table 5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may generate substantial vibration in the immediate vicinity. Jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration levels of 0.09 in/sec PPV at a distance of 25 feet. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L _v at 25 ft. (VdB)
Pile Driver (Impact)	upper range	1.158	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

The closest industrial land use to the project site is approximately 200 feet to the southwest of the project property line. The closest residential land uses to the project site are residences approximately 1,000 feet southwest of the project property line and across U.S. 101. At these distances, vibration levels produced by the equipment having the highest potential for high vibration levels (i.e., vibratory roller, impact tools, etc.) would be at or below 0.03 in/sec PPV, which would be below the 0.2 in/sec PPV significance threshold. This is a **less-than-significant** impact.

Mitigation Measures 2: None required.

Impact 3: Substantial Permanent Noise Increase due to Project-Generated Traffic. Project-generated traffic would not cause a permanent 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 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 DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater. The nearest noise-sensitive receptors are across U.S. 101 where the ambient noise levels exceed 60 dBA DNL; therefore, a significant impact would occur if project-generated traffic would permanently increase noise levels by 3 dBA DNL. For reference, traffic volumes would have to double for noise levels to increase by 3 dBA DNL.

Traffic noise levels from U.S.101 dominate the noise environment in the area. The project's traffic study² provided AM and PM project trip assignments for the roadway intersections in the vicinity of the project site. Traffic volume information was reviewed to calculate the permanent noise increase attributable to project-generated traffic. Traffic volumes under the Existing Plus Project scenario were compared to the Existing scenario to calculate the relative increase in the hourly average traffic noise level (L_{eq}) attributable to the proposed project. The change in the DNL is assumed to correlate to the change in the peak hour L_{eq} . After analyzing all the traffic volumes along roadway segments relevant to the project site, traffic noise levels are calculated to increase by 1 dBA DNL or less. Therefore, the proposed project would not cause a substantial permanent noise level increase at nearby noise-sensitive receptors. This is a **less-than-significant** impact.

Mitigation Measures 3: None required.

Impact 4: Substantial Temporary Noise Increase due to Construction. 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.**

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

² Enzo Drive Behavioral Health Care Facility, Hexagon Transportation Consultants Inc., July 2016.

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.

Where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive residential uses in the project vicinity for a period exceeding one year, the impact would be considered significant. For commercial uses, a significant impact would be identified if construction noise were to exceed 70 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} for a period exceeding one year. Additionally, the City considers significant construction noise impacts to have occurred if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months, according to Policy EC-1.7 of the General Plan.

Construction activities for individual projects are typically 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 6 and 7. Table 6 shows the average noise level ranges, by construction phase, and Table 7 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 6 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
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84
I - All pertinent equipment present at site. II - Minimum required equipment present at site.								

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

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The construction of the proposed project would grading

and excavating to lay foundations, trenching, building erection, and paving. The hauling of excavated materials and construction materials would generate truck trips on local roadways as well.

Noise sensitive land uses located near the project site include residences across U.S. 101. Hourly average noise levels due to construction activities during busy construction periods outdoors would range from about 75 to 89 dBA L_{eq} at a distance of 50 feet. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. The noise sensitive land uses (residences) are approximately 1,000 feet from the project site. At these distances, hourly average noise levels during busy construction periods would range from 49 to 63 dBA L_{eq} . Even though construction noise levels would at times be expected to exceed 60 dBA L_{eq} at the nearest noise-sensitive residential uses, the impact would not be considered significant because construction noise levels would not be audible above the ambient traffic noise levels along U.S. 101. Industrial uses would be exposed to construction noise levels of 63 to 77 dBA L_{eq} at a distance of 200 feet. Such noise levels would exceed 70 dBA L_{eq} and the ambient noise environment by at least 5 dBA L_{eq} for a period exceeding one year.

TABLE 7 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.

This analysis assumes best management practices would be used to reduce noise from construction activities. These practices include:

- For projects within 500 feet of residential land uses or within 200 feet of commercial land uses or offices involving substantial noise-generating activities lasting more than 12 months, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.
- Modification, placement, and operation of construction equipment are possible means for minimizing the impact on the existing sensitive receptors. Construction equipment should be well-maintained and used judiciously to be as quiet as possible.
- Construction activities shall be limited to the hours between 7:00 am and 7:00 pm, Monday through Friday, unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.
- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Prohibit all unnecessary idling of internal combustion engines.
- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors.
- Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.
- Notify all adjacent business, residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.
- If conflicts occurred which were irresolvable by proper scheduling, a temporary noise control blanket barrier could be erected, if necessary, along the property lines of the construction site between the site and adjacent buildings.

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

The implementation of these best management practices would reduce the impact to a **less-than-significant** level.

Mitigation Measures 4: No additional measures are required.