MADRONE PARKWAY CARPENTERS TRAINING CENTER NOISE AND VIBRATION ASSESSMENT

Morgan Hill, California

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INTRODUCTION

The project proposes to relocate an existing 35,000 square foot carpenters training facility located at 485 Woodview Avenue to a new one-story, 55,000 square foot carpenters training center proposed to be constructed at 18640 Madrone Parkway. The proposed training center would include workshop areas, classrooms, break rooms, offices and a lobby/receptionist area. The maximum height of the proposed building would be 32 feet above ground surface, at the top of the roof.

The building would also include a yard area for outdoor training and material storage. An eight-foot concrete wall would be constructed around the yard area. The existing six-foot concrete wall, located between the residences to the to the north and the project site, would remain.

The project would include a surface parking lot area with 210 parking spaces. Concrete paths would be constructed on-site to provide pedestrian access to the proposed building from the sidewalk on Madrone Parkway and the on-site parking areas. The parking and yard area would be accessed via two new driveways off Madrone Parkway. One of the driveways would have a 25-foot wide easement that transects the northwest corner of the southern adjacent property; the driveway would provide access to the on-site eastern parking lot and yard area. The second driveway would be approximately 32 feet wide and would provide access to the western parking lot area.

This report evaluates the project's potential to result in significant environmental noise impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into two sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and vibration, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions and, 2) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents measures, where necessary, to mitigate the impacts to a less-than-significant level.

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 p.m. - 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. - 7:00 a.m.) 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.

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 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 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. 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 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 a 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 a L_{dn} of 60-70 dBA. Between a L_{dn} of 70-80 dBA, each decibel increase increases the percentage of the population highly annoyed by about 3 percent. 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.

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 or frequent intermittent vibration levels produce. The guidelines in Table 3 represent syntheses of vibration criteria for human response and potential damage to buildings resulting from construction vibration.

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 cause 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. 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 paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from "Historic and some old buildings" to "Modern industrial/commercial buildings." 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.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at 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.

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 p.m. and 7:00 a.m.
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 p.m.to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
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.

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	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial 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 Morgan Hill have established regulatory criteria that are applicable in this assessment. The State of California Environmental Quality Act (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. 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) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

(b) Generation of excessive groundborne vibration or groundborne noise levels;

(c) For a project located within the vicinity of a private airstrip or 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.

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

City of Morgan Hill General Plan. The Safety, Services and Infrastructure Chapter in the Morgan Hill 2035 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 Morgan Hill. The following policies are applicable to the proposed project:

Policy SSI-8.1- *Exterior Noise Level Standards:* Require new development projects to be designed and constructed to meet acceptable exterior noise level standards (as shown in Table SSI-1) as follows:

- Apply a maximum exterior noise level of 60 dBA L_{dn} in residential areas where outdoor use is a major consideration (e.g., backyards in single-family housing developments and recreation areas in multi-family housing projects). Where the City determines that providing an L_{dn} of 60 dBA or lower cannot be achieved after the application of reasonable and feasible mitigation, an L_{dn} of 65 dBA may be permitted.

- Indoor noise levels should not exceed an L_{dn} of 45 dBA in new residential housing units.

- Noise levels in new residential development exposed to an exterior L_{dn} 60 dBA or greater should be limited to a maximum instantaneous noise level (e.g., trucks on busy streets, train warning whistles) in bedrooms of 50 dBA. Maximum instantaneous noise levels in all other habitable rooms should not exceed 55 dBA. The maximum outdoor noise level for new residences near the railroad shall be 70 dBA L_{dn}, recognizing that train noise is characterized by relatively few loud events.

Policy SSI-8.2- *Impact Evaluation:* The impact of proposed development project on existing land uses should be evaluated in terms of the potential for adverse community response based on significant increase in existing noise levels, regardless of compatibility guidelines.

Policy SSI-8.3- *Commercial and Industrial Noise Level Standards:* Evaluate interior noise levels in commercial and industrial structures on a case-by-case basis based on the use of the space.

Policy SSI-8.4- *Office Noise Level Standards:* Interior noise levels in office buildings should be maintained at 45 dBA L_{eq} (hourly average) or less, rather than 45 dBA L_{dn} (daily average).

Policy SSI-8.5- *Traffic Noise Level Standards:* Consider noise level increases resulting from traffic associated with new projects significant if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn}, or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater.

Policy SSI-8.6- *Stationary Noise Level Standards:* Consider noise levels produced by stationary noise sources associated with new projects significant if they substantially exceed existing ambient noise levels.

Policy SSI-8.7- *Other Noise Sources:* Consider noise levels produced by other noise sources (such as ballfields) significant if an acoustical study demonstrates they would substantially exceed ambient noise levels.

Policy SSI-8.9- *Site Planning and Design:* Require attention to site planning and design techniques other than sound walls to reduce noise impacts, including: a) installing earth berms, b) increasing the distance between the noise source and the receiver; c) using non-sensitive structures such as parking lots, utility areas, and garages to shield noise-sensitive areas; d) orienting buildings to shield outdoor spaces from the noise source; and e) minimizing the noise at its source.

Policy SSI-9.1- *Techniques to Reduce Traffic Noise:* Use roadway design, traffic signalization, and other traffic planning techniques (such as limiting truck traffic in residential areas) to reduce noise caused by speed or acceleration of vehicles.

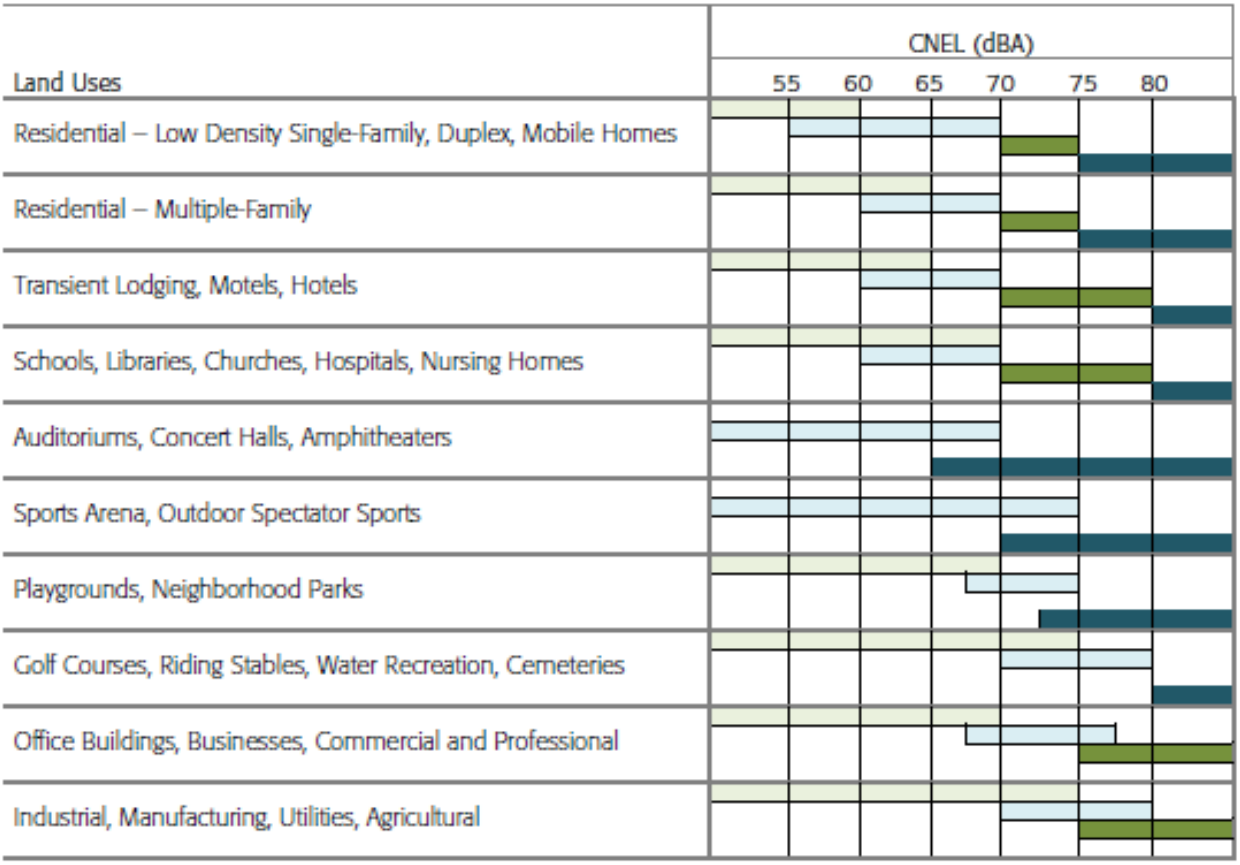
Policy SSI-9.3- *Sound Wall Design:* The maximum height of sound walls shall be eight feet. Residential projects adjacent to the freeway shall be designed to minimize sound wall height through location of a frontage road, use of two sound walls or other applicable measures. Sound wall design and location shall be coordinated for an entire project area and shall meet Caltrans noise attenuation criteria for a projected eight-lane freeway condition. If two sound walls are used, the first shall be located immediately adjacent to the freeway right-of-way and the second shall be located as necessary to meet Caltrans noise requirements for primary outdoor areas. The minimum rear yard setback to the second wall shall be 20 feet.

Policy SSI-9.5- *Noise Studies for Private Development:* In order to prevent significant noise impacts on neighborhood residents which are related to roadway extensions or construction of new roadways, require completion of a detailed noise study during project-level design to quantify noise levels generated by projects such as the Murphy Avenue extension to Mission View Drive and the Walnut Grove Extension to Diana Avenue. The study limits should include noise sensitive land uses adjacent to the project alignment as well as those along existing segments that would be connected to new segments. A significant impact would be identified where traffic noise levels would exceed the "normally acceptable" noise level standard for residential land uses and/or where ambient noise levels would be substantially increased with the project. Project specific mitigation measures could include, but not be limited to, considering the location of the planned roadway alignment relative to existing receivers in the vicinity, evaluating the use of noise barriers to attenuate project-generated traffic noise, and/or evaluating the use of "quiet pavement" to minimize traffic noise levels at the source. Mitigation should be designed to reduce noise levels into compliance with "normally acceptable" levels for residential noise and land use compatibility.

Policy SSI-9.6- *Earth Berms:* Allow and encourage earth berms in new development projects as an alternative to sound walls if adequate space is available.

Policy SSI-9.7- *Sound Barrier Design:* Require non-earthen sound barriers to be landscaped, vegetated, or otherwise designed and/or obscured to improve aesthetics and discourage graffiti and other vandalism.

TABLE SSI-1 STATE OF CALIFORNIA LAND USE COMPATIBILITY GUIDELINES FOR COMMUNITY NOISE ENVIRONMENTS



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:
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and the needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

Normally Unacceptable:
New construction or development should generally be discouraged. If new construction does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable:
New construction or development generally should not be undertaken.

Source: Governor's Office of Planning and Research, General Plan Guidelines 2003.

City of Morgan Hill Municipal Code. The City of Morgan Hill's Municipal Code Chapter 8.28 states that "It is unlawful and a misdemeanor for any person to make or continue, or cause to be made or continued, any loud, disturbing, unnecessary or unusual noise or any noise which annoys, disturbs, injures or endangers the comfort, health, repose, peace or safety of other persons within the city." The following sections of the code would be applicable to the project:

C. Blowers, Fans, and Combustion Engines. The operation of any noise-creating blower, power fan or internal combustion engine, the operation of which causes noise due to the explosion of operating gases or fluids, unless the noise from such blower or fan is muffled and such engine is equipped with a muffler device to deaden such noise;

D. 1. Construction activities as limited below. "Construction activities" are defined as including but not limited to excavation, grading, paving, demolition, construction, alteration or repair of any building, site, street or highway, delivery or removal of construction material to a site, or movement of construction materials on a site. Construction activities are prohibited other than between the hours of seven a.m. and eight p.m., Monday through Friday and between the hours of nine a.m. to six p.m. on Saturday. Construction activities may not occur on Sundays or federal holidays. No third person, including but not limited to landowners, construction company owners, contractors, subcontractors, or employers, shall permit or allow any person working on construction activities which are under their ownership, control or direction to violate this provision. Construction activities may occur in the following cases without violation of this provision:

a. In the event of urgent necessity in the interests of the public health and safety, and then only with a permit from the chief building official, which permit may be granted for a period of not to exceed three days or less while the emergency continues and which permit may be renewed for periods of three days or less while the emergency continues.

b. If the chief building official determines that the public health and safety will not be impaired by the construction activities between the hours of eight p.m. and seven a.m., and that loss or inconvenience would result to any party in interest, the chief building official may grant permission for such work to be done between the hours of eight p.m. and seven a.m. upon an application being made at the time the permit for the work is issued or during the progress of the work.

c. The city council finds that construction by the resident of a single residence does not have the same magnitude or frequency of noise impacts as a larger construction project. Therefore, the resident of a single residence may perform construction activities on that home during the hours in this subsection, as well as on Sundays and federal holidays from nine a.m. to six p.m., provided that such activities are limited to the improvement or maintenance undertaken by the resident on a personal basis.

d. Public work projects are exempt from this section and the public works director shall determine the hours of construction for public works projects.

e. Until November 30, 1998, construction activities shall be permitted between the hours of ten a.m. to six p.m. on Sundays, subject to the following conditions. No power-driven vehicles, equipment or tools may be used during construction activities, except on the interior of a building or other structure which is enclosed by exterior siding (including windows and doors) and roofing, and which windows and doors are closed during construction activities. Construction activities must be situated at least one hundred fifty feet from the nearest occupied dwelling. No delivery or removal of construction material to a site, or movement of construction materials on a site, is permitted. No activity, including but not limited to the playing of radios, tape players, compact disc players or other devices, which creates a loud or unusual noise which offends, disturbs or harasses the peace and quiet of the persons of ordinary sensibilities beyond the confines of the property from which the sound emanates is allowed.

2. If it is determined necessary in order to ensure compliance with this section, the chief building official may require fences, gates or other barriers prohibiting access to a construction site by construction crews during hours in which construction is prohibited by this subsection. The project manager of each project shall be responsible for ensuring the fences, gates or barriers are locked and/or in place during hours in which no construction is allowed. This subsection shall apply to construction sites other than public works projects or single dwelling units which are not a part of larger projects.

G. Loading or Unloading Vehicles and Opening Boxes. The creation of loud and excessive noise in connection with loading or unloading any vehicle or the opening and destruction of bales, boxes, crates and containers;

J. Pile Drivers, Hammers and Similar Equipment. The operation, between the hours of eight p.m. and seven a.m. of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist or other appliance, the use of which is attended by loud or unusual noise.

(Ord. 1405 N.S. § 1, 1998; Ord. 1196 N.S. § 4 Exh. A, 1994; Ord. 328 N.S. § A (part), 1972)

(Ord. No. 2276 N.S., § 29, 5-2-2018)

Chapter 18.76 establishes quantitative noise performance standards:

18.76.090 - Noise.

A. No land use or activity may produce a noise level in excess of the standards in Table 18.76-1.

Table 18.76-1: Maximum Noise Levels

Receiving Land Use	Maximum Noise Level at Lot Line of Receiving Use [1]
Industrial and Wholesale	70 dBA
Commercial	65 dBA
Residential or Public/Quasi Public	60 dBA

Notes:
[1] The planning commission may allow an additional 5 dBA noise level at the lot line if the maximum noise level shown in Table 18.76-1 cannot be achieved with reasonable and feasible mitigation.

B. Noise standards in Table 18.76-1do not apply to noise generated by vehicle traffic in the public right-of-way or from temporary construction, demolition, and vehicles that enter and leave the site of the noise-generating use (e.g., construction equipment, trains, trucks).
C. All uses and activities shall comply with Municipal Code Chapter 8.28 (Noise).

(Ord. No. 2277 N.S., § 5(Exh. A), 6-6-2018)

Existing Noise Environment

The project site is located at 18640 Madrone Parkway, near the intersection of Madrone Parkway and Lightpost Way, in the City of Morgan Hill. The 4.9-acre lot is mostly undeveloped with a paved driveway running through the property. The site is located in an area with industrial uses to the east, vacant land to the south across Madrone Parkway, a parking lot to the west, and residential and vacant land to the north. U.S. Highway 101 is located roughly 600 feet east of the project site. The noise environment at the site and in the surrounding area results primarily from vehicular traffic along Madrone Parkway to the south of the site. Secondary noise sources include traffic noise from U.S. Highway 101 and industrial noise from the adjacent land uses. Occasional overhead aircraft are also audible at times at the project site.

The existing facility is located at 485 Woodview Avenue, roughly 750 feet south of the proposed new location. The 2.5-acre lot houses the current 35,000 square foot carpenters training facility, with industrial uses to the north, west and south, and a vacant lot to the east. The noise environment at the existing site and in the surrounding area results primarily from the facility itself, including power tool and hand tool noise coming from the facility when the roll-up doors are open. Secondary noise sources include vehicular traffic along Woodview Avenue to the south of the site and industrial noise from the adjacent land uses.

A noise monitoring survey was performed at the site beginning on Tuesday, March 12, 2019 and concluding on Friday, March 15, 2019. The monitoring survey included two long-term noise measurements and five short-term noise measurements, which are shown in Figures 1 and 2.

Long-term noise measurement LT-1 was made in the rear parking lot of the existing facility, approximately 75 feet from two large roll-up doors accessing the training area. The daily trend in noise levels at LT-1 is shown in Figures 3 through 6. There are instantaneous peaks in the figures that could be representative of vehicle noise in the parking lot as vehicles arrived on site between

6:00 a.m. and 7:00 a.m., and noise from the dumping of used construction materials into nearby bins. There is a forklift on site as well, however the sound of the forklift is infrequent and typically below the sound levels produced by other training activities. Hourly average noise levels at LT-1 ranged from 50 to 77 dBA L_{eq} during daytime hours but were typically 65 dBA $L_{eq\ or}$ less during time periods that were not influenced by loud events occurring very close to the sound level meter. Hourly average noise levels at night ranged from 46 to 69 dBA L_{eq}. The day-night average noise level measured on Wednesday, March 13, 2019 was 66 dBA L_{dn}, and 66 dBA L_{dn} on Thursday, March 14, 2019.

LT-2 was made near the south side of the proposed new site location, approximately 45 feet from the centerline of Madrone Parkway. Hourly average noise levels at this location typically ranged from 60 to 74 dBA L_{eq} during the day and from 52 to 63 dBA L_{eq} at night. The day-night average noise level measured on Wednesday, March 13, 2018 was 67 dBA L_{dn}, and 68 dBA L_{dn} on Thursday, March 14, 2019. The daily trend in noise levels at LT-2 is shown in Figures 7 through 10.

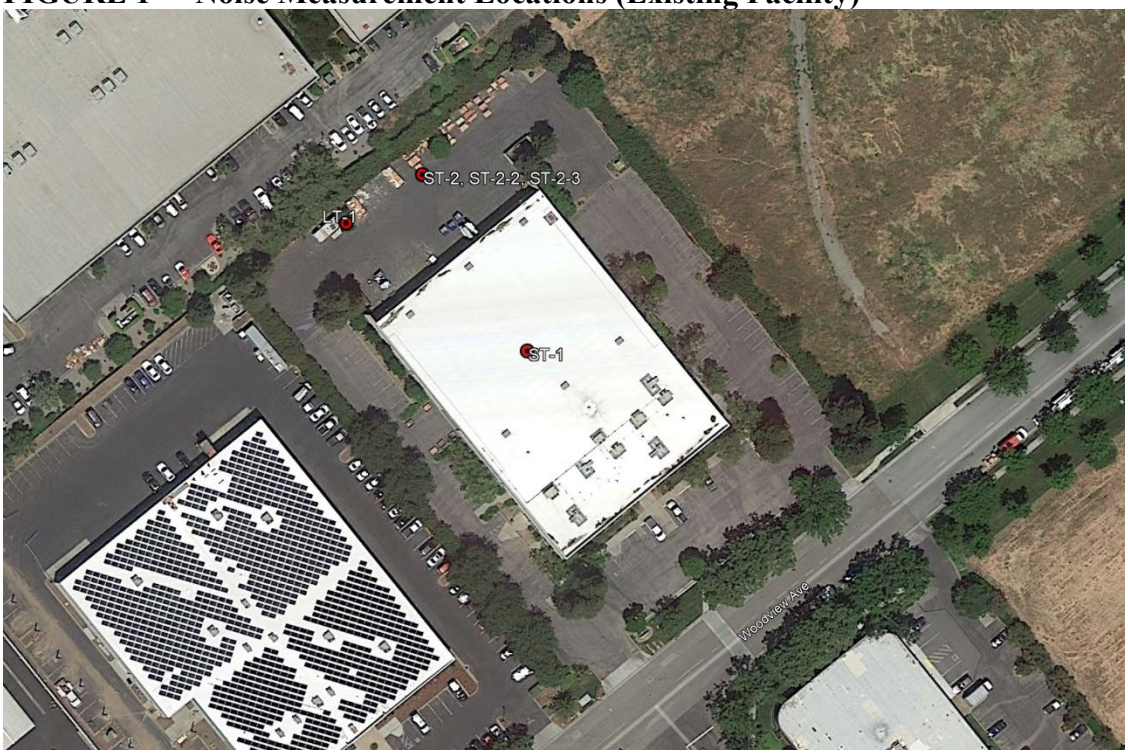
Short-term noise measurements were made on Tuesday, March 12, 2019 between 11:50 a.m., and 1:10 p.m. and on Friday, March 15, 2019 between 12:20 p.m., and 12:35 p.m. The results of these short-term measurements are summarized in Table 4.

Noise measurement ST-1 was made inside the existing facility during typical carpenters training sessions, involving a variety of hand tools and power tools. This measurement was made near the center of the shop, over a 10-minute period, approximately 100 feet away from hammering, 15 feet from circular sawing, and 100 feet from metal working. Typical noise levels from hammering ranged from 70 to 86 dBA, and typical noise levels from circular saws ranged from 78 to 83 dBA. Typical noise levels from metal working ranged from 70 to 80 dBA. The 10-minute average noise level measured at ST-1 was 83 dBA $L_{eq(10\text{-}min)}$.

Noise measurement ST-2 was made outside the existing facility, in the rear parking lot, approximately 75 feet from the two large roll-up doors that were open to the training shop. The same types of tools used during noise measurement ST-1 were being used during noise measurement ST-2. Typical noise levels from hammering ranged from 55 to 68 dBA, and typical noise levels from circular saws ranged from 60 to 65 dBA. The 10-minute average noise level measured at ST-2 was 65 dBA $L_{eq(10\text{-}min)}$. Noise measurements ST-2a and ST-2b were made in the same location as ST-2 and are intended to show the difference in noise levels with the roll-up doors open and the roll-up doors closed respectively. The 5-minute average noise level measured at ST-2a was 59 dBA $L_{eq(5\text{-}min)}$ and the 5-minute average noise level measured at ST-2b was 49 dBA $L_{eq(5\text{-}min)}$. Based on the results of these measurements, noise levels were approximately 10 dBA less when the roll-up doors were in the closed position.

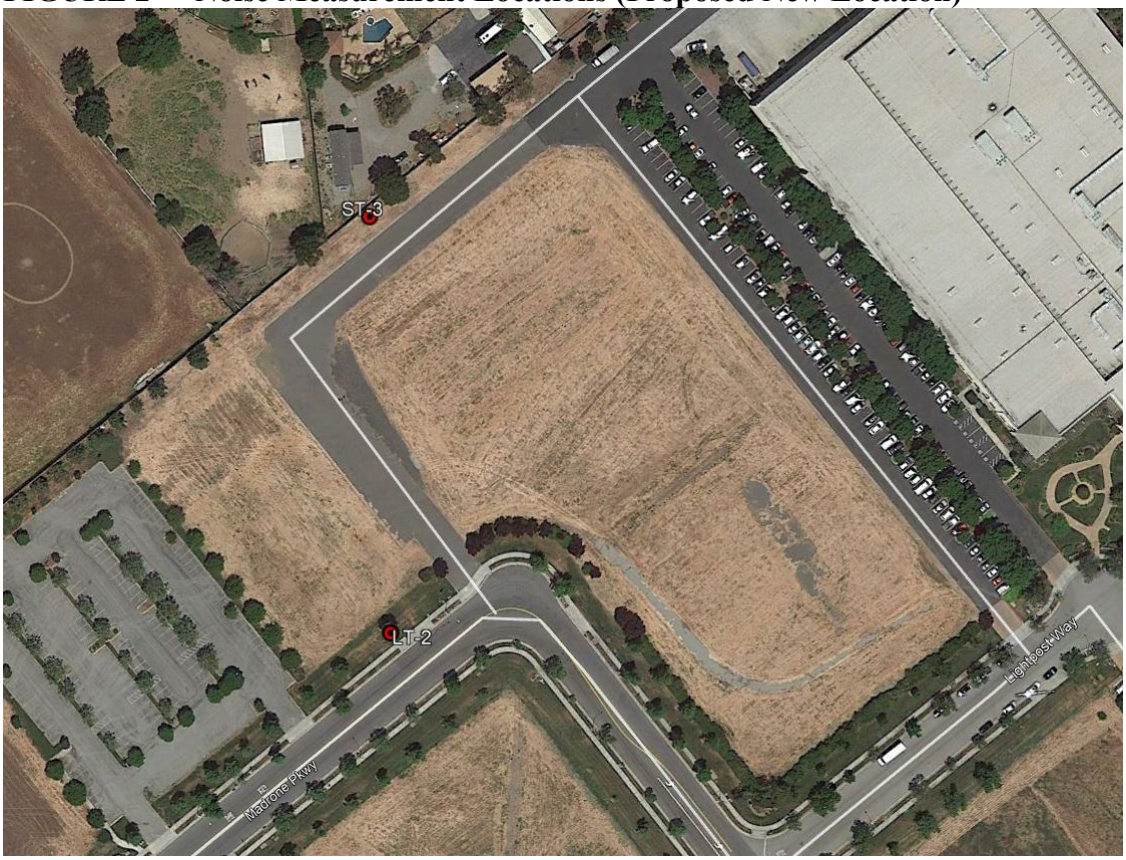
Noise measurement ST-3 was made at the north end of the proposed new facility property location, near the closest residence, and approximately 400 feet from the center line of Madrone Parkway. The primary sources of noise in this location were from traffic along Madrone Parkway to the south and U.S. Highway 101 to the east. Typical noise levels from traffic along Madrone Parkway ranged from 48 to 56 dBA, and typical noise levels from traffic along U.S. Highway 101 ranged from 48 to 52 dBA. The 10-minute average noise level measured at ST-3 was 51 dBA $L_{eq(10\text{-}min)}$.

FIGURE 1 Noise Measurement Locations (Existing Facility)



Source: Google Earth 2018.

FIGURE 2 Noise Measurement Locations (Proposed New Location)



Source: Google Earth 2018.

FIGURE 3 Daily Trends in Noise Levels at LT-1, Tuesday, March 12, 2019

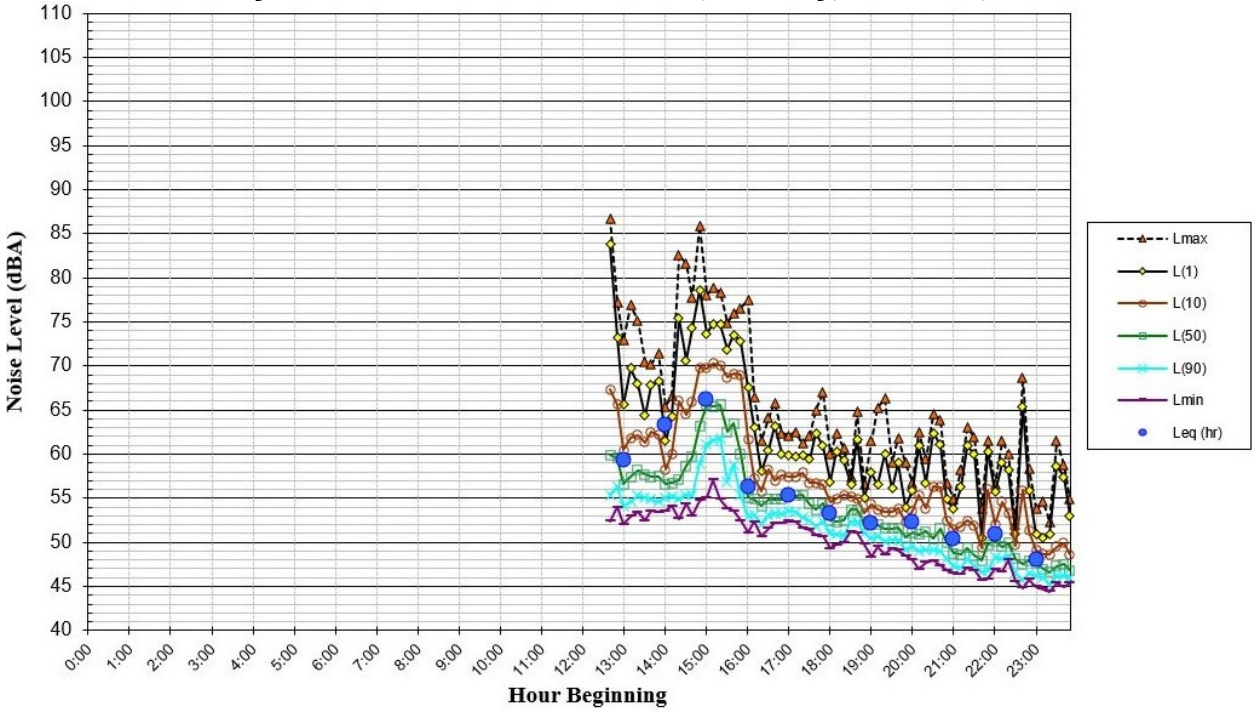


FIGURE 4 Daily Trends in Noise Levels at LT-1, Wednesday, March 13, 2019

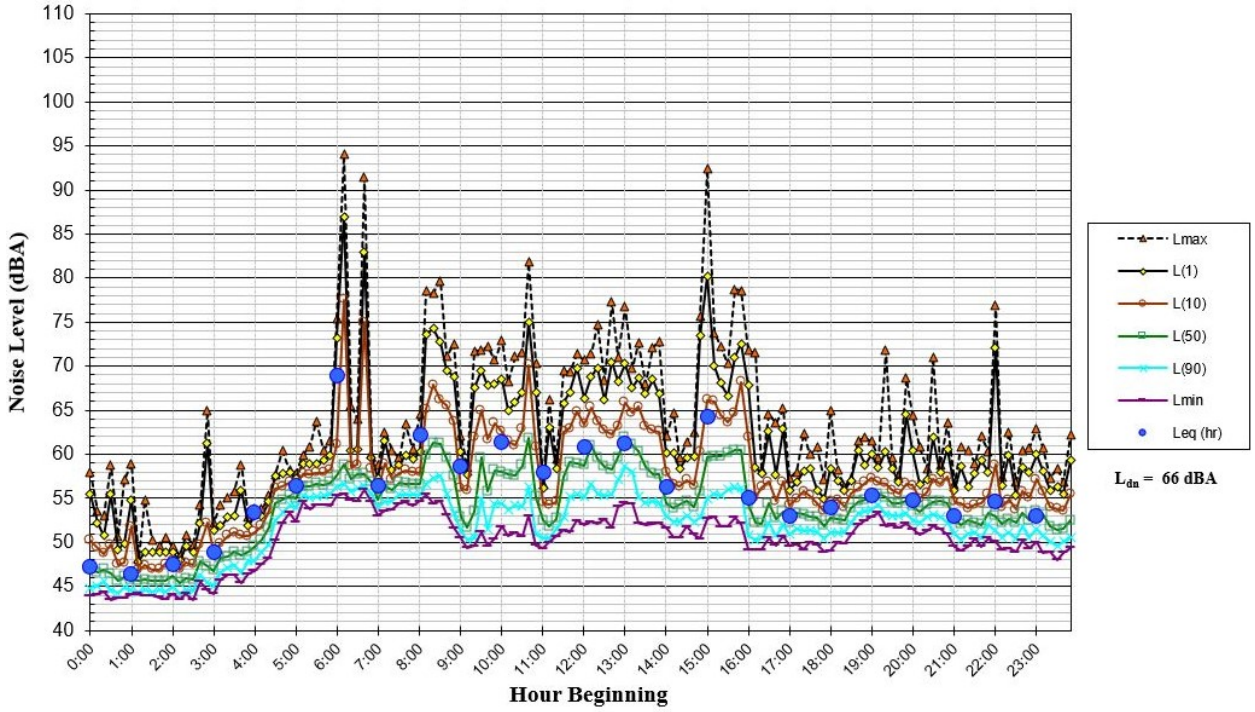


FIGURE 5 Daily Trends in Noise Levels at LT-1, Thursday, March 14, 2019

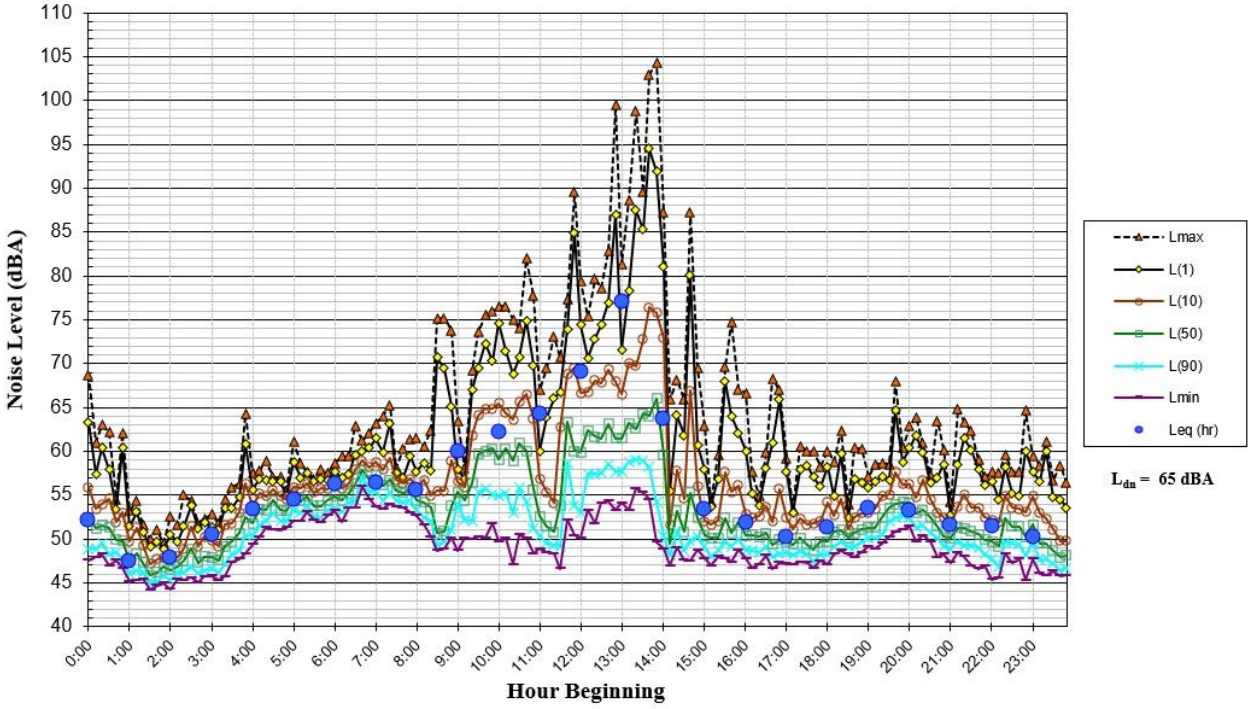


FIGURE 6 Daily Trends in Noise Levels at LT-1, Friday, March 15, 2019

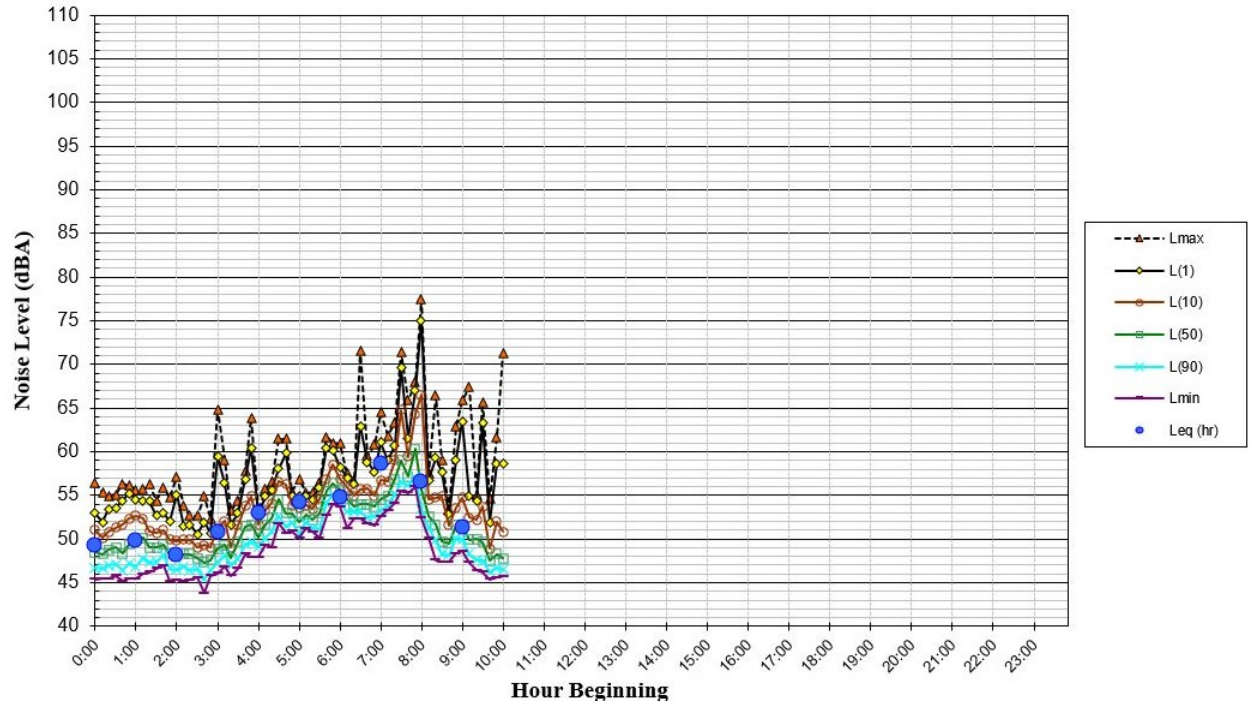


FIGURE 7 Daily Trends in Noise Levels at LT-2, Tuesday, March 12, 2019

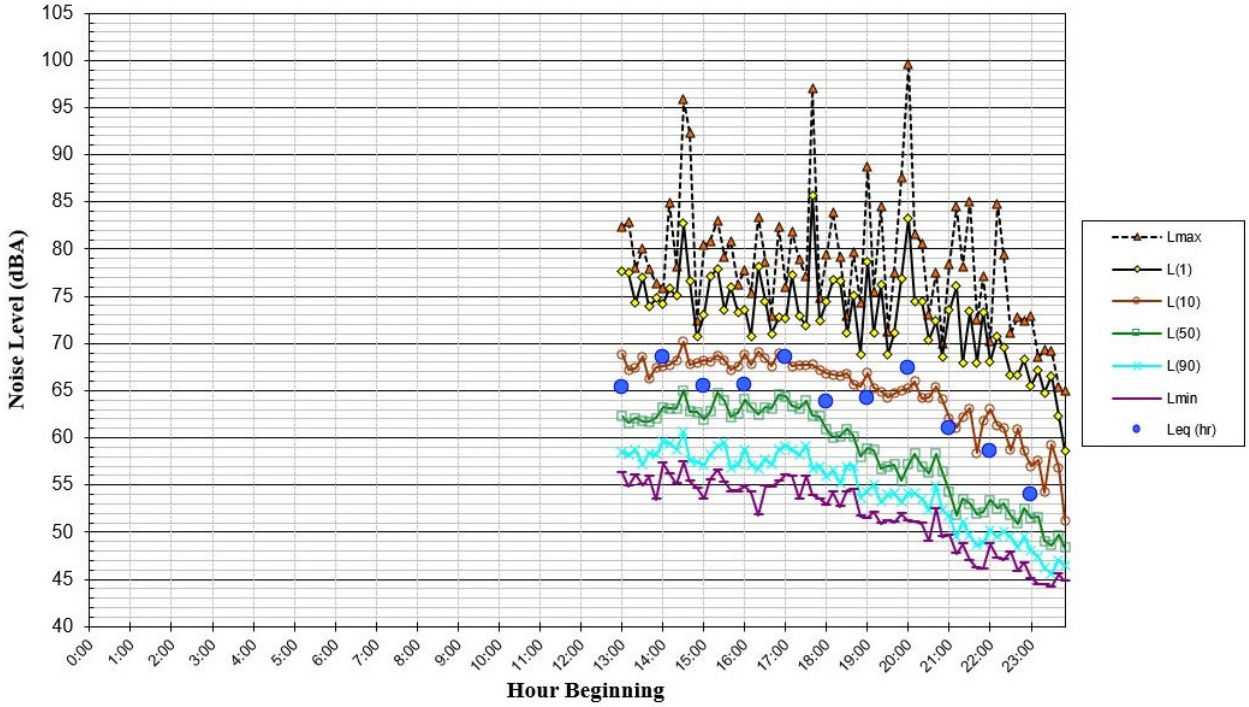


FIGURE 8 Daily Trends in Noise Levels at LT-2, Wednesday, March 13, 2019

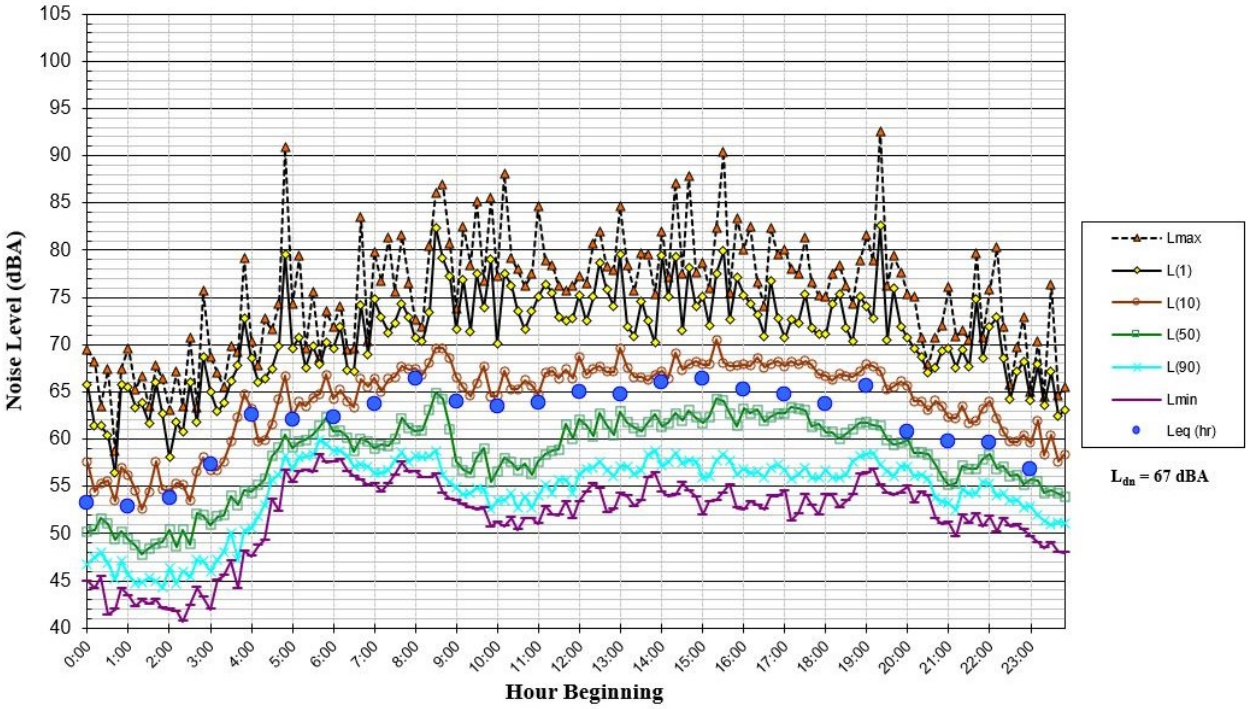


FIGURE 9 Daily Trends in Noise Levels at LT-2, Thursday, March 14, 2019

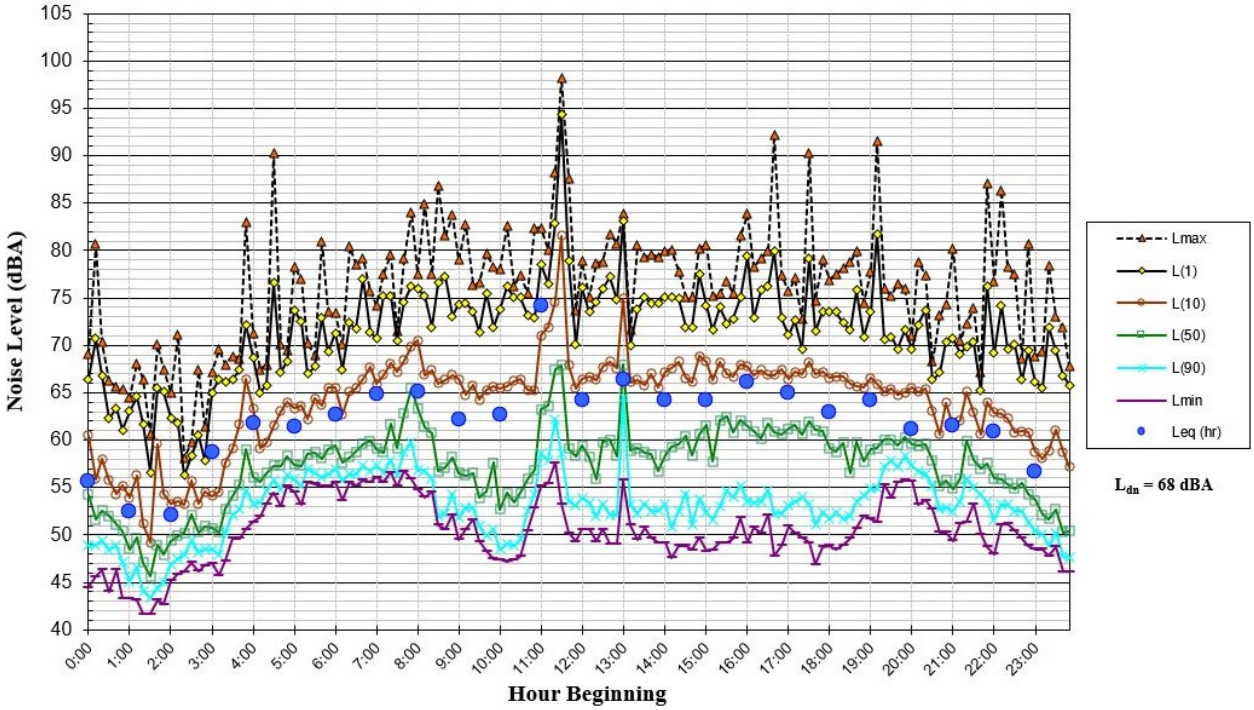


FIGURE 10 Daily Trends in Noise Levels at LT-2, Friday, March 15, 2019

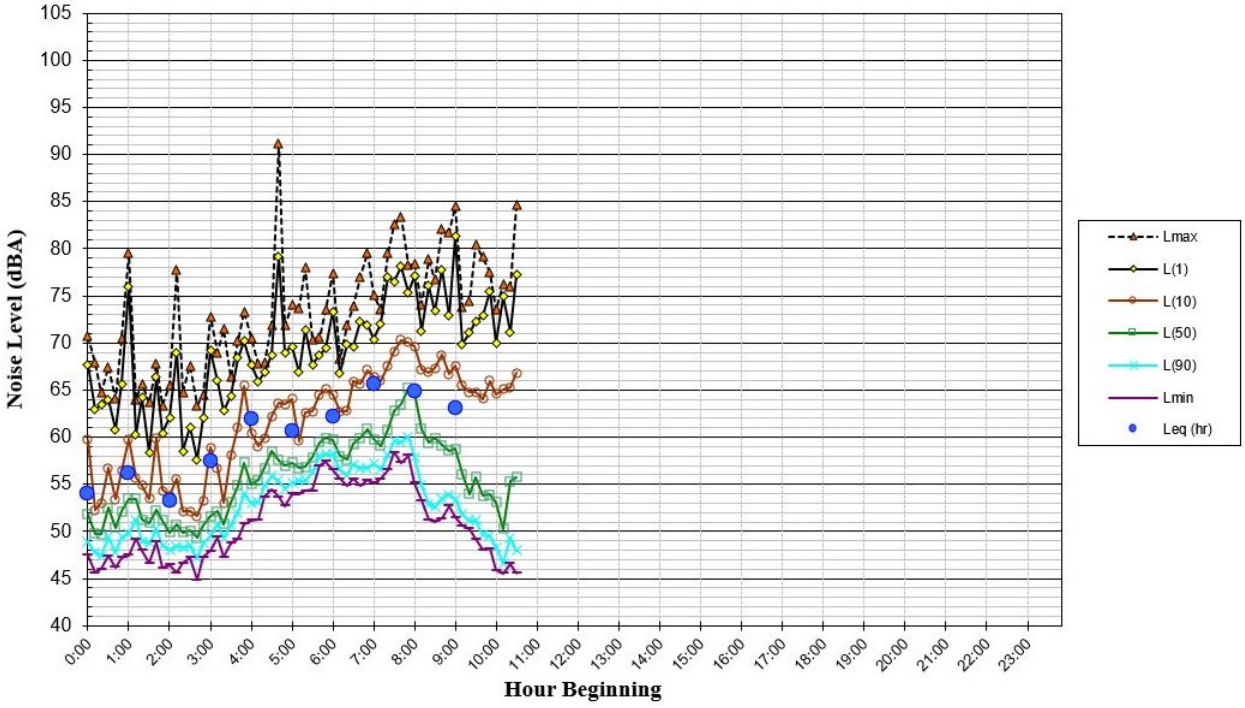


TABLE 4 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	Date, Time	Measured Noise Level, dBA					
		L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10\text{-}min)}$
ST-1: In Center of Room Inside Existing Training Facility	3/12/2019, 11:50-12:00	93	92	86	80	73	83
ST-2: ~75 Feet from Roll-up Doors at Existing Training Facility	3/12/2019, 12:10-12:20	77	74	69	63	57	65
ST-2-2 and ST-2-3: Same Location as ST-2 (Doors Open, Doors Closed)	3/15/2019, 12:20-12:25	69	65	62	58	54	59
	3/15/2019, 12:30-12:35	58	55	52	49	46	49
ST-3: North Side of Proposed New Location	3/12/2019, 1:00-1:10	63	59	53	49	47	51

NOISE IMPACTS AND MITIGATION MEASURES

This section describes the significance criteria used to evaluate project impacts under CEQA, 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.

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Temporary or Permanent Noise Increases in Excess of Established Standards.** A significant impact would be identified if project construction or operations would result in a substantial temporary or permanent increase in ambient noise levels at sensitive receivers in excess of the local noise standards contained in the General Plan or Municipal Code.

- **Generation of Excessive Groundborne Vibration.** A significant impact would be identified if the construction of the project would generate excessive vibration levels.

- **Exposure of Residents or Workers to Excessive Noise Levels in the Vicinity of a Private Airstrip or an Airport Land Use Plan.** A significant impact would be identified if the project would expose people residing or working in the project area to excessive aircraft noise levels.

Impact 1 **Temporary or Permanent Noise Increases in Excess of Established Standards**. Temporary noise increases resulting from project construction activities and permanent noise increases resulting from project traffic and on-site activities would not exceed the standards established in the City's General Plan and Municipal Code at the nearby sensitive receptors. **This is a less-than-significant impact.**

Temporary Construction Noise Increases

The project would include the construction of a 55,000 square foot building. Equipment that would be used during construction includes tractors, excavators, graders, cranes, forklifts, industrial saws, and paving equipment. The construction duration would be approximately nine months. The proposed construction hours are 7:30 a.m. to 4:30 p.m., Monday through Friday.

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

Chapter 8.28 of the City of Morgan Hill's Municipal Code establishes allowable hours of construction between 7:00 a.m. and 8:00 p.m., Monday through Friday, and between the hours of 9:00 a.m. to 6:00 p.m. on Saturday. Construction activities may not occur on Sundays or federal holidays.

While quantitative noise thresholds for temporary construction are not provided in the City's General Plan or Municipal Code, the Fundamentals section of this report provides a threshold of 45 dBA for speech interference indoors. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction and a 25 dBA exterior-to-interior reduction for standard commercial/industrial construction, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impacts would be considered significant if project construction activities exceed 60 dBA L_{eq} at nearby residences or 70 dBA L_{eq} at nearby industrial/commercial land uses and exceed the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

Construction activities generate considerable amounts of noise, especially during earth-moving activities and during the construction of the building's foundation when heavy equipment is used. 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. The hauling of excavated materials and construction materials would generate truck trips on local roadways as well. Typical hourly average construction-generated noise levels for residential buildings are about 81 to 88 dBA L_{eq} measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.), as shown in Table 5. The typical range of maximum instantaneous noise levels for construction equipment used at this site would be 77 to 90 dBA L_{max} at 50 feet, as shown in Table 6.

TABLE 5 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

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

TABLE 6 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

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
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.

The typical hourly average construction-generated noise levels from Table 5 for industrial land uses (77 to 89 dBA L_{eq}) were used to estimate the range of construction noise levels expected at the nearest residential and industrial land uses. The typical hourly average noise levels were calculated considering the distance from the acoustic center of the construction site (assumed to be the center of the proposed building) to the nearest receptors. The nearest residential land uses are located approximately 200 feet to the northwest as measured from the acoustic center of the project site. At 200 feet, hourly average noise levels during busy construction periods would range from 65 to 77 dBA L_{eq}. The nearest industrial land uses are located approximately 300 feet to the northeast. At 300 feet, hourly average noise levels during busy construction periods would range from 61 to 73 dBA L_{eq}. Construction noise levels at these nearby receptors would at times exceed the 60 dBA L_{eq} and 70 dBA L_{eq} noise level thresholds, but the proposed duration of construction activities is only nine months.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Construction activities will be conducted in accordance with the provisions of the City's General Plan and the Municipal Code, which limits temporary construction work to between the hours of 7:00 a.m. and 8:00 p.m. Monday through Friday and between 9:00 a.m. to 6:00 p.m. on Saturday. Construction is prohibited on Sundays and federal holidays. Further, the City shall require the construction crew to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity. A construction noise control plan, including, but not limited to, the following construction best management controls will be implemented as a standard condition of project approval:

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used. Any enclosure openings or venting shall face away from sensitive receptors.

- Utilize "quiet" air compressors and other stationary noise sources where technology exists.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will 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 the reasonable and feasible controls outlined above would reduce construction noise levels emanating from the site in order to minimize disruption and annoyance. With the implementation of these measures, the lack of high-intensity construction equipment required for the proposed project, and the fact that noise generated by construction activities would occur over a temporary period, the temporary increase in ambient noise levels at receptors near the project site would be a less-than-significant impact.

Permanent Offsite Traffic Noise Increases

A significant permanent noise increase would occur if the project would substantially increase noise levels at existing sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn} at residences; or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater at residences. Noise-sensitive receptors along roadways serving the project site are currently exposed to noise levels exceeding 60 dBA L_{dn} . Therefore, a significant impact would occur if traffic due to the proposed project would permanently increase ambient levels by 3 dBA L_{dn}. For reference, a 3 dBA L_{dn} noise increase would be expected if the project would double existing traffic volumes along a roadway.

The AM and PM peak hour turning movements for 7 intersections in the project vicinity were provided in the traffic study prepared for the proposed project. To determine the permanent traffic noise level increase along each roadway segment included in the traffic study, the existing plus project peak hour traffic volumes were compared to the existing traffic volumes. The increase in peak hour noise levels was conservatively assumed to correlate to the increase expected in day-night average noise levels. In all cases, the existing plus project traffic volumes were calculated to result in traffic noise increases of 0 to 1 dBA L_{dn}. Therefore, the proposed project would not cause a substantial permanent noise level increase at noise-sensitive receptors in the project vicinity. This is a less-than-significant impact.

A significant cumulative impact would occur if two criteria are met: 1) if the cumulative traffic noise level increase was 3 dBA L_{dn} or greater for future levels exceeding 60 dBA L_{dn} or was 5 dBA L_{dn} or greater for future levels at or below 60 dBA L_{dn}; and 2) if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA L_{dn} or more attributable solely to the proposed project.

Cumulative traffic noise level increases were calculated by comparing the cumulative traffic volumes and the cumulative plus project volumes to existing traffic volumes. Traffic noise increases of 3 dBA L_{dn} or more were calculated along the north and south approaches of the Butterfield Boulevard and Cochrane Road intersection under both the cumulative and cumulative plus project traffic scenarios. Since the same increase was calculated for the cumulative and the cumulative plus project scenarios, the project's contribution would be 0 dBA L_{dn}, which would not be considered "cumulatively considerable." This is a less-than-significant impact.

Permanent Onsite Noise Increases

Parking/Circulation

Noise sources within the proposed parking lot would include vehicle circulation, engine starts, doors slams, human voices, and occasional car alarms. The sound of slow moving vehicles, engines starting, doors closing, and people talking in the parking lot would be expected to reach maximum levels of 50 to 60 dBA at a distance of 50 feet.

Existing ambient noise levels at the nearest residential land uses were measured to be 51 dBA L_{eq} during operational hours (see ST-3), and the primary sources of noise at this location were from traffic along Madrone Parkway to the south and U.S. Highway 101 to the east. Typical noise levels from traffic along Madrone Parkway ranged from 48 to 56 dBA, and typical noise levels from traffic along U.S. Highway 101 ranged from 48 to 52 dBA. The estimated L_{dn} noise level at this location was 60 to 61 dBA.

The acoustic center of the parking lot is conservatively assumed to be the center of the lot as it is likely that most vehicles will be parked as close as possible to the main entrance located near the southwest corner of the building. At a distance of 200 feet from the center of the parking lot, noise levels generated by parking and vehicle circulation would range from 38 to 48 dBA, which is below typical daytime ambient noise levels. The L_{dn} noise level attributable to parking lot operations would be 48 dBA at the property line when conservatively assuming parking lot noise

levels of 48 dBA L_{eq} between the hours of 6:00 a.m. through 9:30 p.m. The existing 6-foot noise barrier would provide an additional 5 dBA of noise reduction. Therefore, noise levels resulting from parking lot operations would be 43 dBA L_{dn} or less, and well below typical ambient noise levels, at the nearest residential land uses. This is a less-than-significant impact.

Training Activities

The proposed project would accommodate up to 150 students and 15 employees. The training center would primarily operate as a post-secondary adult apprenticeship program to train individuals, ages 18 to 65, in carpentry. The hours of operation would be from 6:00 a.m. to 5:00 p.m., Monday through Friday. Training would occasionally occur in the evenings, from 5:00 p.m. to 9:30 p.m., Monday through Friday, and on Saturday, from 7:00 a.m. to 5:00 p.m. Evening and weekend operations are anticipated to occur two evenings a week (twice a month) and one Saturday a month. Most training would occur indoors within the classrooms and shops. Outdoor activities in the surveying and layout yard would primarily consist of training in the use of surveying equipment, rigging, forklift, and aerial lift training. These types of outdoor activities produce noise levels less than the training noise levels occurring indoors.

I&R measured noise levels outside the existing facility, approximately 75 feet from the two large roll-up doors that were open to the training shop. Typical noise levels from hammering ranged from 55 to 68 dBA, and typical noise levels from circular saws ranged from 60 to 65 dBA. The 10-minute average noise level measured at ST-2 was 65 dBA $L_{eq(10\text{-}min)}$. Noise levels were approximately 10 dBA less when the roll-up doors were in the closed position.

Based on these data, training noise levels were calculated at the nearest residential and industrial properties assuming the construction of the 8-foot noise barrier proposed along the boundary of the outdoor yards. Under a credible worst-case scenario, the analysis assumed that indoor training (with the roll-up doors open) would produce noise levels reaching 60 dBA L_{eq} at the northwest corner of the site nearest to existing residential outdoor activity areas. The 8-foot noise barrier is calculated to provide 6 to 7 dBA of noise reduction yielding noise levels ranging from 53 to 54 dBA L_{eq} at the nearest residential land uses. Although operational noise levels would be clearly audible and exceed ambient conditions by 2 to 3 dBA on an hourly average basis, the L_{dn} noise level is calculated to be 54 dBA L_{dn} Monday through Friday if such noise levels were to persist between 6:00 a.m. and 9:30 p.m. The L_{dn} noise level produced by Saturday operations would be 51 dBA assuming the hourly average noise level from training would persist between the hours of 7:00 a.m. and 5:00 p.m. Noise levels would be less if the amount of daily training time decreased with respect to the worst-case scenario (which is likely to occur as classroom time would also be expected) or if roll-up door were closed during the training activities (which may also when weather conditions dictate). With the attenuation provided by the 8-foot noise barrier proposed by the project, the L_{dn} noise level at the nearest residential land uses would increase by up to 1 dBA. The noise increase resulting from training activities would not be considered substantial in terms of existing ambient L_{dn} noise levels. Furthermore, hourly average noise levels produced by the project would remain below the 60 dBA “Residential or Public/Quasi Public” threshold outlined in Section 18.76.090 of the Municipal Code. This is a less-than-significant impact.

The 8-foot noise barrier is calculated to provide 6 to 7 dBA of noise reduction at receptors located on the industrial property to the east yielding noise levels ranging from 56 to 57 dBA L_{eq}. The L_{dn} noise level is calculated to be 57 dBA L_{dn} Monday through Friday if these noise levels were to persist between 6:00 a.m. and 9:30 p.m. The L_{dn} noise level produced by Saturday operations would be 54 dBA assuming the hourly average noise level from training would persist between the hours of 7:00 a.m. and 5:00 p.m. Noise levels would be less if the amount of daily training time decreased with respect to the worst-case scenario (which is likely to occur as classroom time would also be expected) or if roll-up door were closed during the training activities (which may also when weather conditions dictate). With the attenuation provided by the 8-foot noise barrier proposed by the project, the L_{dn} noise level at the nearest industrial land uses would increase by less than 1 dBA. The noise increase resulting from training activities would not be considered substantial in terms of existing ambient L_{dn} noise levels. Furthermore, hourly average noise levels produced by the project would remain below the 70 dBA "Industrial" threshold outlined in Section 18.76.090 of the Municipal Code. This is a less-than-significant impact.

Rooftop Mechanical Equipment

The proposed project would include rooftop mechanical equipment for heating, ventilation, and air conditioning. Approximately 12 three- to five-ton air conditioning units would be located on the roof along west side of the building and above the classrooms. A ten-ton unit is proposed above the welding shop near the southeast portion of the building, and a makeup air unit is proposed above the drywall shop near the northeast portion of the building and nearest to residences. All rooftop equipment would be acoustically screened by a minimum 5-foot high, solid mechanical equipment screen. Based on manufacturer's noise data, the proposed equipment is estimated to produce noise levels ranging from 60 to 72 dBA at 10 feet with the makeup air unit producing the highest sound level.

The nearest residential property line would be located about 110 feet from the proposed makeup air unit, which is the predominant source of noise proposed on the roof of the building. The distance separating this unit from other mechanical units on the roof is such that the additional noise from other mechanical equipment would not measurably increase the noise level produced by the makeup air unit alone. The makeup air unit would be shielded from the view of the nearest residence by both the roof of the building and mechanical equipment screen. The shielding provided by the roof of the building and mechanical equipment screen would reduce operational noise levels by about 5 to 8 dBA, and when accounting for the distance between the noise source and receptor, operational noise levels from mechanical equipment are calculated to be 46 dBA or less. Similar noise levels would be expected at the nearest industrial property line. Mechanical equipment noise levels would be well below the 60 dBA "Residential or Public/Quasi Public" threshold and 70 dBA "Industrial" threshold outlined in Section 18.76.090 of the Municipal Code. This is a less-than-significant impact.

Mitigation Measures: **None Required**

Impact 2: **Exposure to Excessive Construction Vibration.** Construction-related vibration levels produced by construction activities occurring at the project site would not be excessive at the nearest residential or industrial land uses. **This is a less-than-significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. The project would include the construction of a 55,000 square foot building. Equipment that would be used during construction includes tractors, excavators, graders, cranes, forklifts, industrial saws, and paving equipment. The proposed project is not expected to require pile driving, which can cause excessive vibration.

The California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards in order to reduce the potential for cosmetic damage to structures. Cosmetic damage is defined as hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. A vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3 above for further explanation). For historical buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. No historical buildings or buildings that are documented to be structurally weakened adjoin the project site. For the purposes of this study, groundborne vibration levels exceeding the 0.3 in/sec PPV limit at the existing adjacent residences or 0.5 in/sec PPV at the existing industrial buildings for would have the potential to result in a significant vibration impact.

Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 7 presents typical vibration levels from construction equipment at 25 feet, which represents the distance of the nearest residential structure to the property line of the project site. Calculations were also made to estimate vibration levels at a distance of 130 feet (to represent the nearest industrial building to the east. Vibration levels are highest close to the source, and then attenuate with increasing distance at the rate $(D_{ref}/D)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet.

At 25 feet, vibration levels due to construction are conservatively calculated to reach 0.210 in/sec PPV, which would not exceed the 0.3 in/sec PPV threshold for residential buildings. At 130 feet, vibration levels are calculated to reach 0.034 in/sec PPV, which would not exceed the 0.5 in/sec PPV threshold for modern industrial buildings. Cosmetic damage (e.g., hairline cracks in plaster, opening of old cracks, etc.) would not be expected at sensitive buildings located 20 feet or further from the project site. Construction vibration may still be perceptible at times, but with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration. This is a less-than-significant impact.

TABLE 7 Vibration Source Levels for Construction Equipment

Equipment		Source PPV (in/sec) at 25 ft.	PPV at 25 ft. Nearest Res. Bldg.	PPV at 130 ft. Nearest Ind. Bldg.
Clam shovel drop		0.202	0.202	0.033
Hydromill (slurry wall)	in soil	0.008	0.004	0.001
	in rock	0.017	0.009	0.003
Vibratory Roller		0.210	0.210	0.034
Hoe Ram		0.089	0.089	0.015
Large bulldozer		0.089	0.089	0.015
Caisson drilling		0.089	0.089	0.015
Loaded trucks		0.076	0.076	0.012
Jackhammer		0.035	0.035	0.006
Small bulldozer		0.003	0.003	0.000

Source: Transit Noise and Vibration Impact Assessment Manual, U.S. Department of Transportation Federal Transit Administration, September 2018 as modified by Illingworth & Rodkin, Inc., April 2019.

Mitigation Measures: None Required

Impact 3 Exposure of Residents or Workers to Excessive Noise Levels in the Vicinity of a Private Airstrip or an Airport Land Use Plan. The project site would not be exposed to excessive aircraft noise. **This is a less-than-significant impact.**

Reid-Hillview Airport and Mineta San José International Airport are public-use airports located approximately 15 and 20 miles northwest of the project site, respectively. The San Martin Airport is located approximately 6 miles southeast of the site. The project site is located well outside of each airport's planning boundary and 60 dBA CNEL noise contour. Noise levels resulting from aircraft are insignificant at the site and would be clearly compatible with the proposed land use. This is a less-than-significant impact.

Mitigation Measures: None Required