CHARCOT AVENUE EXTENSION NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

This report presents the results of the environmental noise assessment conducted for the Charcot Avenue extension project in the City of San José, California. The project proposes to extend Charcot Avenue from Paragon Drive on the west to Oakland Road on the east, a distance of approximately 0.6 miles. The extension includes the construction of an overcrossing across O'Toole Avenue and Interstate 880 (I-880). The extension of Charcot Ave is a part of the Envision San José 2040 General Plan roadway network of the North San José Area Development Policy (NSJADP). The site is adjoined by residential and commercial use buildings and a school to the east of I-880 and commercial use buildings to the west of I-880.

This report evaluates the project's potential to result in significant impacts with respect to the 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, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions at nearby noise sensitive locations 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 mitigation measures, where necessary, to provide a compatible project in relation to adjacent noise sources and land uses.

PROJECT DESCRIPTION

The project alignment consists of Charcot Avenue from its intersection with Paragon Drive on the west side of I-880 to its future intersection with Oakland Road on the east side of I-880. The extension is proposed to consist of a two-lane roadway, with one travel lane in each direction and sidewalks and bike lanes on both sides of the roadway. The planned extension also includes the following roadway adjustments:

- The existing Charcot Avenue/O'Toole Avenue intersection will be eliminated. Access to O'Toole Avenue from Charcot Avenue will be maintained via a new slip ramp along the south side of Charcot Avenue. Access to westbound Charcot Avenue from O'Toole Avenue will not be provided.

- A new traffic signal will be installed at the existing unsignalized Charcot Avenue and Paragon Drive T-intersection.

- Access to adjacent properties along Charcot Avenue between Paragon Drive and Silk Wood Lane will not be provided.

- The extension will follow the current alignment of Silk Wood Lane between Oakland Road and Silk Wood Lane.

- A new pedestrian only signal or High-Intensity Activated crossWalk (HAWK) beacon will be installed along Charcot Avenue at Silk Wood Lane. A median will be constructed along Charcot Avenue at Silk Wood Lane to restrict turn-movements.

- The existing unsignalized intersection of Silk Wood Lane and Oakland Road will be replaced by a new signalized intersection. The proposed lane configurations at the intersection consist of one left-turn and one shared left-right turn lane on Charcot Avenue and two northbound left-turn lanes and six through lanes on Oakland Road.

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 notably 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

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 L_{dn} and nighttime levels are 10 dB 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 to 17 dB with open windows. With standard construction and closed windows in good condition, the noise attenuation factor is around 20 dB for an older structure and 25 dB for a newer dwelling. Sleep and speech interference is therefore of concern when exterior noise levels are about 57 to 62 dBA DNL with open windows and 65 to 70 dBA DNL if the windows are closed. Levels of 55 to 60 dBA are common along collector streets and secondary arterials, while 65 to 70 dBA is a typical value for a primary/major arterial. Levels of 75 to 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.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	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.

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 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
0.25	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 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

The State of California and the City of San José have established regulatory criteria that are applicable in this noise assessment. The State's CEQA guidelines are used to assess the potential significance of environmental noise impacts pursuant to local policies set forth in the City of San José General Plan and Municipal Code.

2018 State CEQA Guidelines. The California Environmental Quality Act (CEQA) contains guidelines to evaluate the significance of environmental noise and vibration impacts attributable to a proposed project. Under CEQA, noise and vibration 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.

Checklist items (a) and (b) are applicable to the proposed project. The project would not expose people residing or working in the project area to excessive aircraft noise levels; therefore, item (c) is not carried further in this analysis.

Regulatory Background – Noise

The City of San José has established the following noise guidelines applicable to this analysis.

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:

<u>Interior Noise Levels</u>

The City's standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA DNL.

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).

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	

[1]Noise 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. 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

The City of San José has established the following vibration guidelines applicable to this analysis.

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 land use in the project area to the west of I-880 is predominantly industrial and commercial office buildings. To the west of Oakland Road, the land use within the project area is residential, commercial, and institutional (i.e., school). The project proposes to connect these two areas by extending Charcot Avenue over I-880.

A noise monitoring survey was conducted from January 10th through 12th, 2018 to document existing noise conditions along the project corridor. The noise monitoring survey included two long-term (48-hour) measurements and six short-term (10-minute) noise measurements. Noise measurement locations are shown on Figure 1. The daily trend in noise levels over the noise monitoring periods for LT-1 and LT-2 are shown in Figures 2 through 7.

Long-term site LT-1 was located on the western side of the project alignment, about 50 feet from the centerline of Charcot Avenue at Paragon Drive. The primary noise source at this location was distant traffic traveling along I-880 and local traffic on Charcot Avenue. Hourly average noise levels at LT-1 ranged from 58 to 69 dBA L_{eq} during the day and from 51 to 65 dBA L_{eq} during the night. The day-night equivalent noise level at LT-1 was calculated to be 67 dBA DNL.

Long-term site LT-2 was located on Silk Wood Lane, 180 feet from the centerline of Oakland Road. The primary noise sources at LT-2 were vehicles traveling along Oakland Road and local recreational noise during activities taking place at the Orchard School playing fields located across Silk Wood Lane. Hourly average noise levels at LT-2 ranged from 57 to 65 dBA L_{eq} during day and 48 to 59 dBA L_{eq} during night-time. The day-night equivalent noise level at LT-2 was calculated to be 63 dBA DNL.

Short-term (10-minute interval) noise measurements were made at six locations within the project study limits to complete the noise monitoring survey. Table 4 summarizes the results of the short-term measurements. Location ST-1 was shielded by a 5-foot-high barrier and location ST-2 was shielded by a row of residential buildings on Silk Wood Lane.

Figure 1: Noise Measurement and Existing Noise Barrier Locations

TABLE 4 Summary of Short-Term Noise Measurement Data, January 12th, 2018

ID	Location (Start Time)	Measured Noise Levels, dBA				Calculated DNL[1], dBA	Primary noise source
		L_{10}	L_{50}	L_{90}	L_{eq}		
ST-1	Backyard of 1937 Bright Willow Circle, shielded by 5 foot high barrier (11:30 a.m.)	57	54	50	55	57	Traffic on Oakland Road, Children playing in the field across Silk Wood Lane
ST-2	West corner of Bright Willow Circle & Bramble Wood Lane, second row of homes (11:50 a.m.)	50	48	47	49	52	Traffic on Oakland Road
ST-3	1813 Silk Wood Lane (12:10 p.m.)	66	62	59	63	57 (Traffic)*	Children playing on the playground across the road
ST-4	60 feet from center of Oakland Road, north of Silk Wood Lane (12:30 p.m.)	76	70	63	72	72	Traffic on Oakland Road, Trucks across Oakland Road
ST-5	Outdoor use area for 850 Charcot Ave, 155 feet from center of O'Toole Avenue (01:00 p.m.)	63	61	59	61	64	Traffic on I-880, O'Toole Avenue
ST-6	50 feet from center of Charcot Avenue, east of Paragon Drive (01:20 p.m.)	71	63	53	67	67	Traffic on Charcot Avenue

* The primary ambient noise source at this location during the noise monitoring survey was recreational activities occurring adjacent to the site at the Orchard School fields. Due to the variability of the playground and field use, the DNL resulting from these activities would vary. The existing traffic generated DNL at this location was calculated to be 57 dBA DNL.

[1] The DNL values at shot-term locations were calculated based on DNL level at nearest long-term locations and the relative setbacks from major noise sources.

Figure 2 – Daily Trend in Noise Levels at LT-1, January 10th, 2018

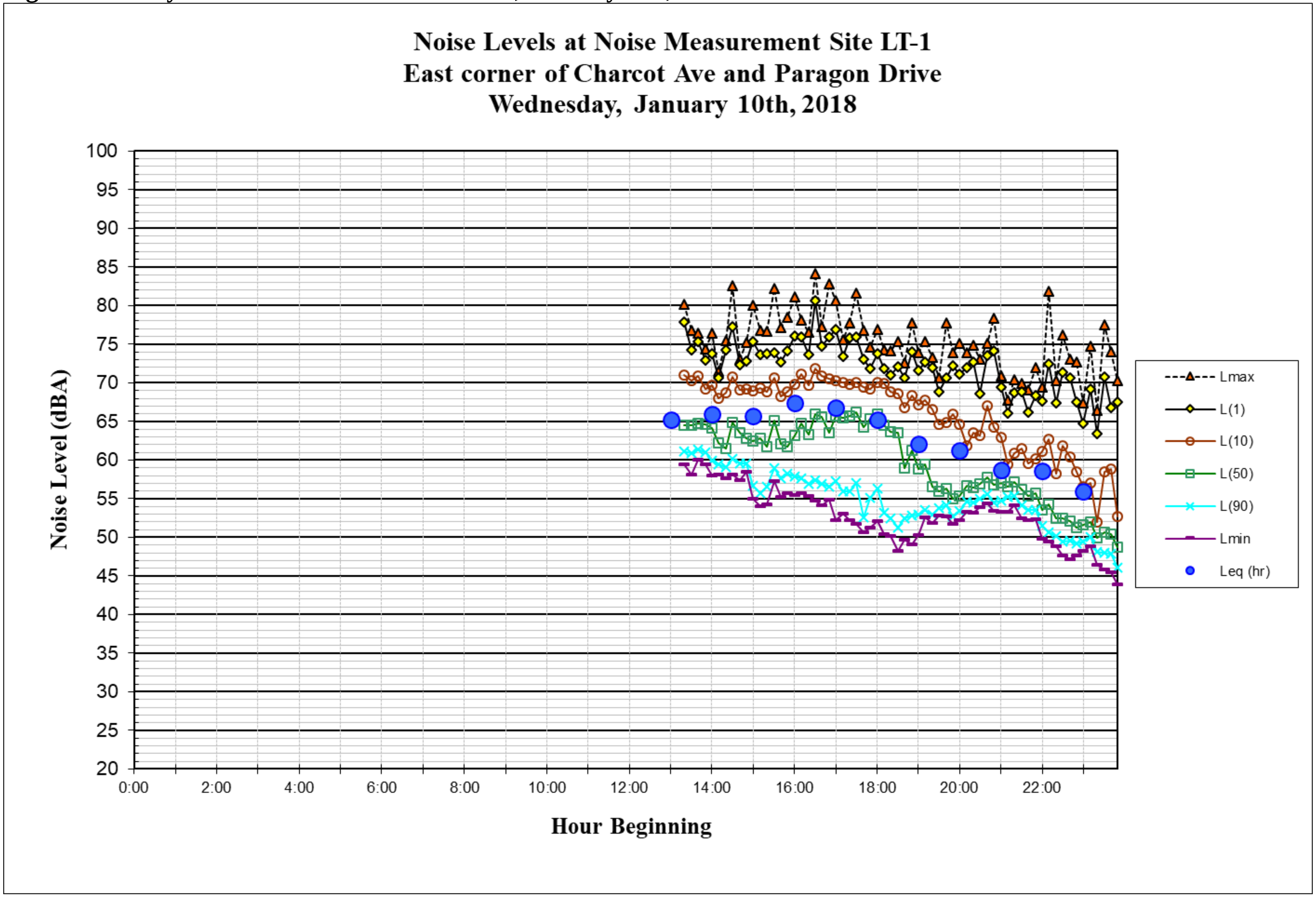


Figure 3 – Daily Trend in Noise Levels at LT-1, January 11th, 2018

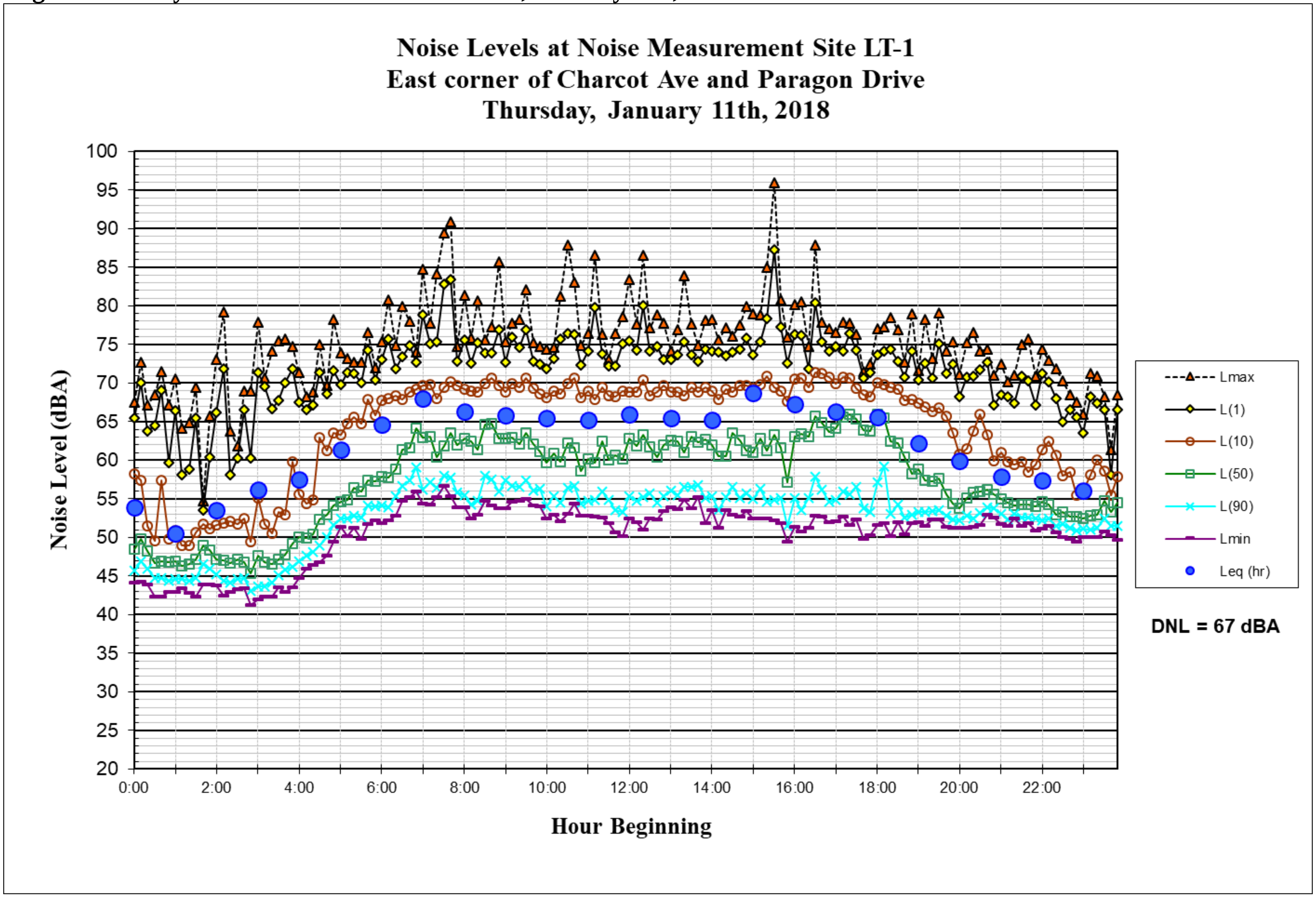


Figure 4 – Daily Trend in Noise Levels at LT-1, January 12th, 2018

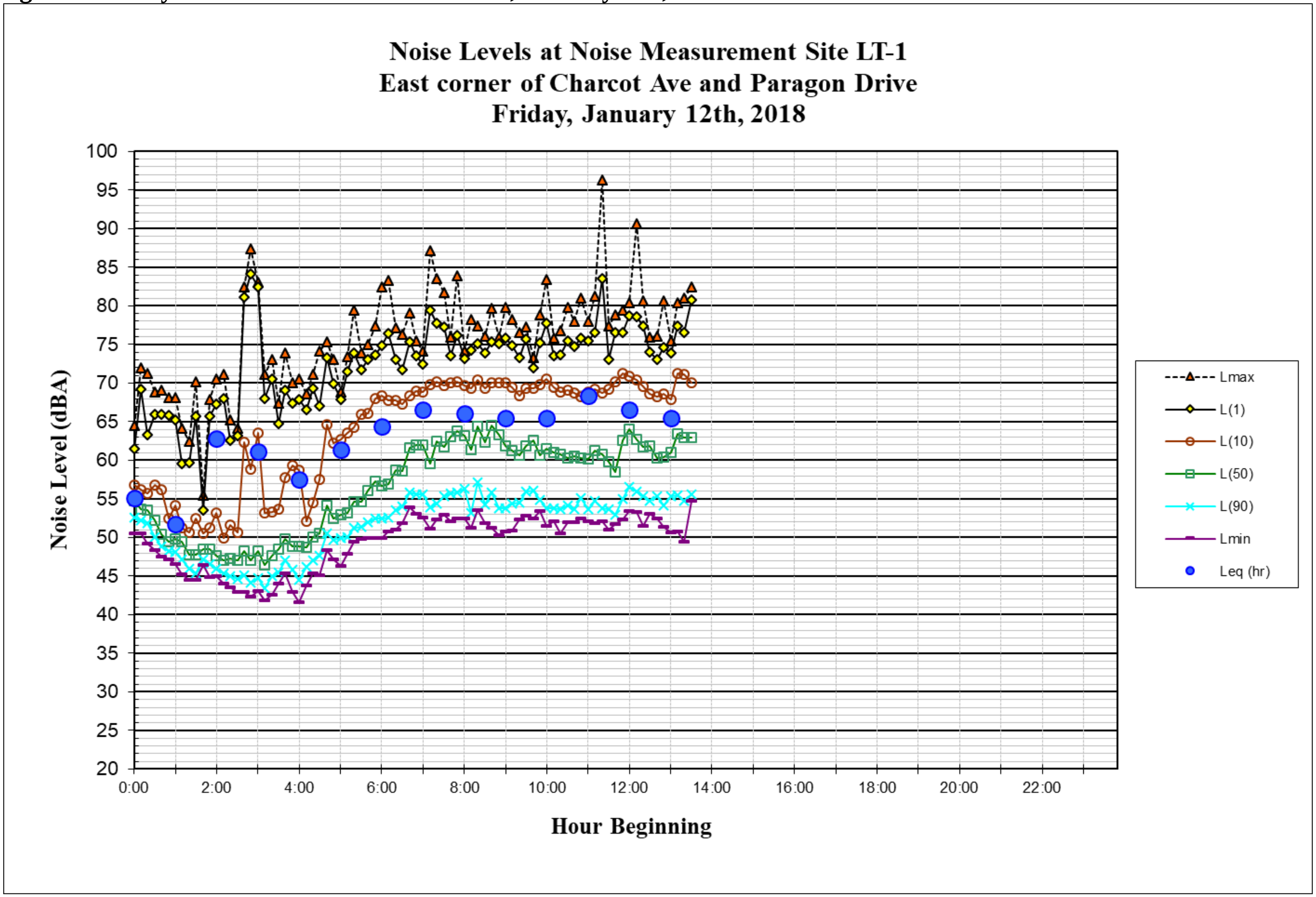


Figure 5 – Daily Trend in Noise Levels at LT-2, January 10th, 2018

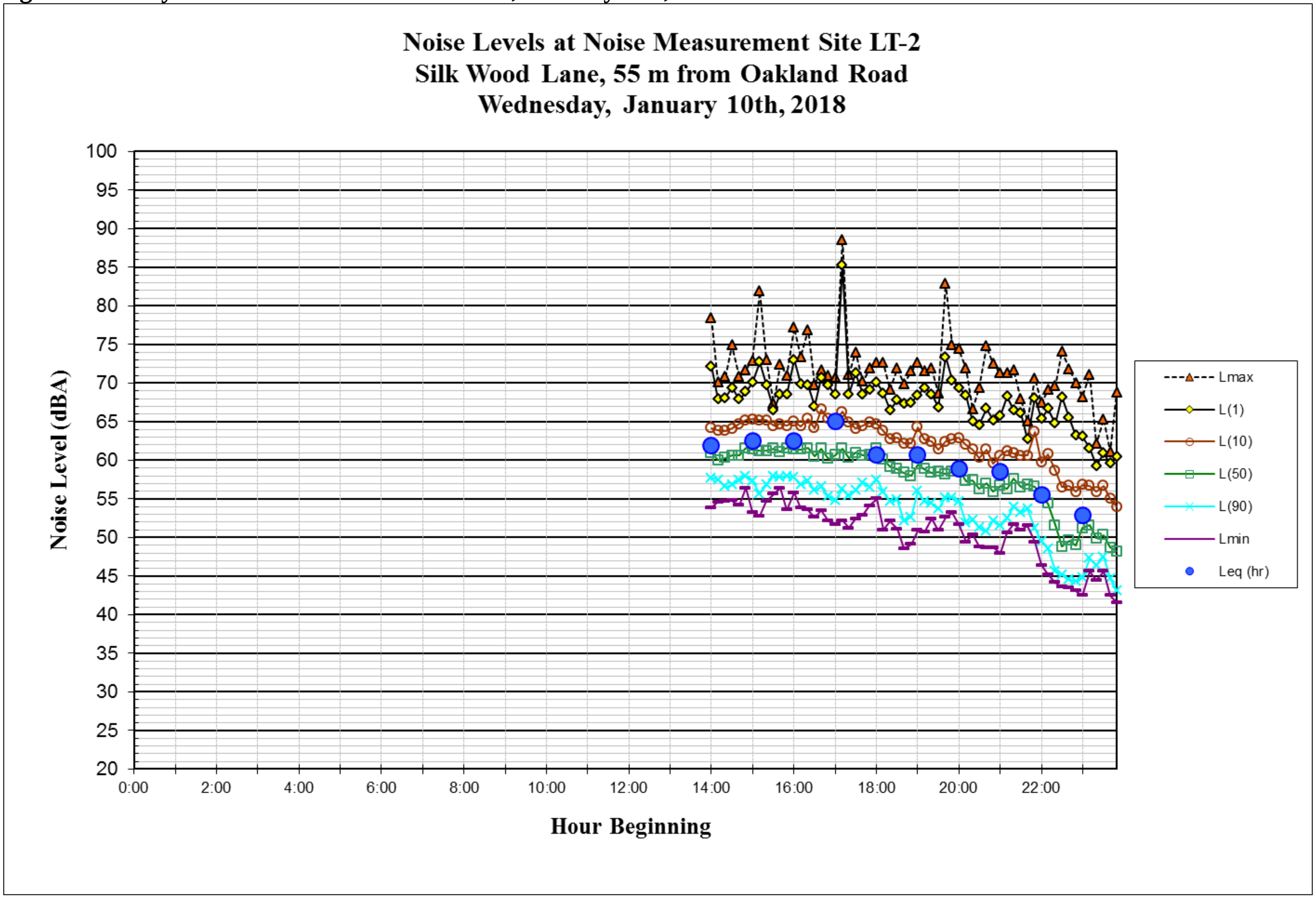


Figure 6 – Daily Trend in Noise Levels at LT-2, January 11th, 2018

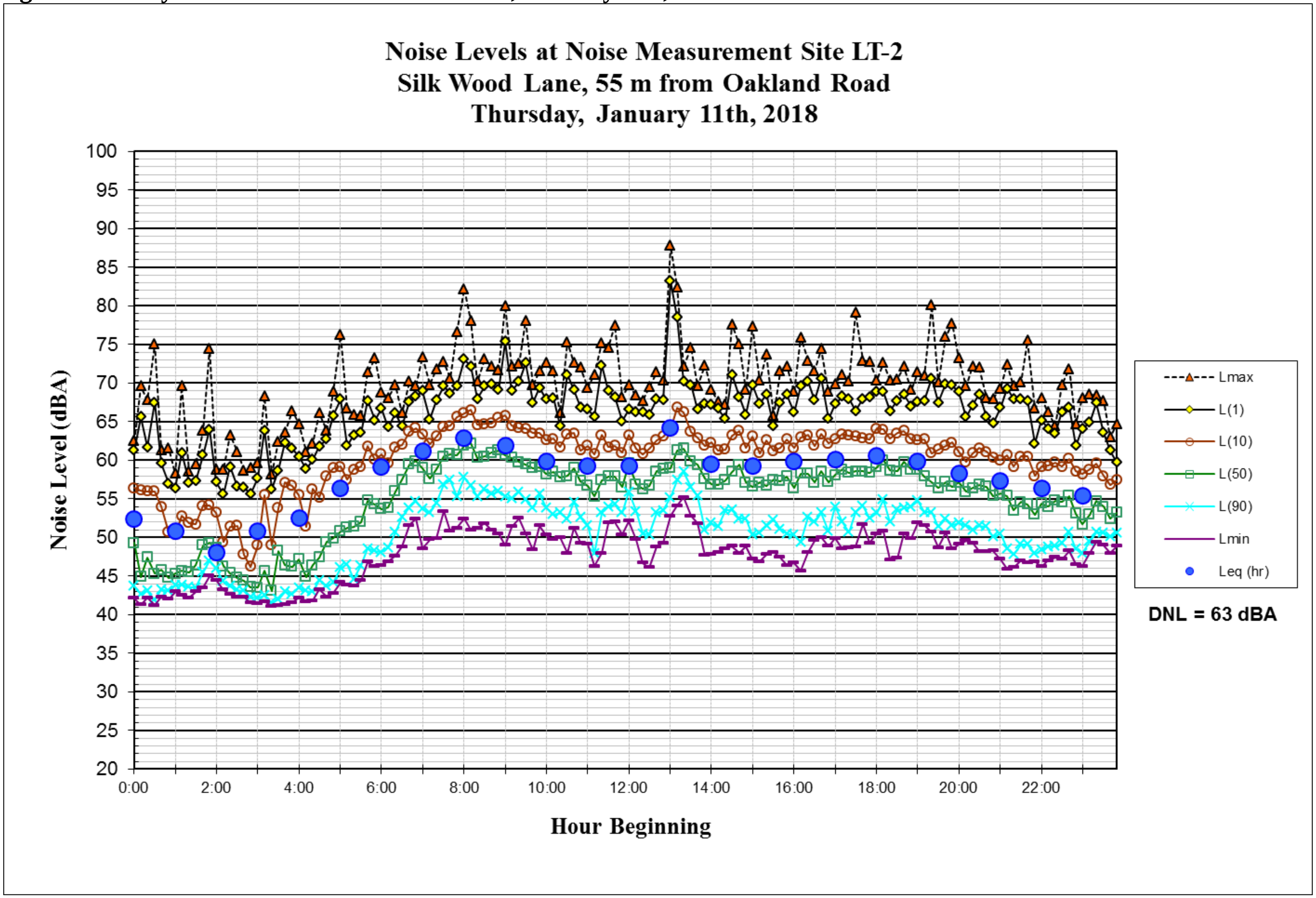
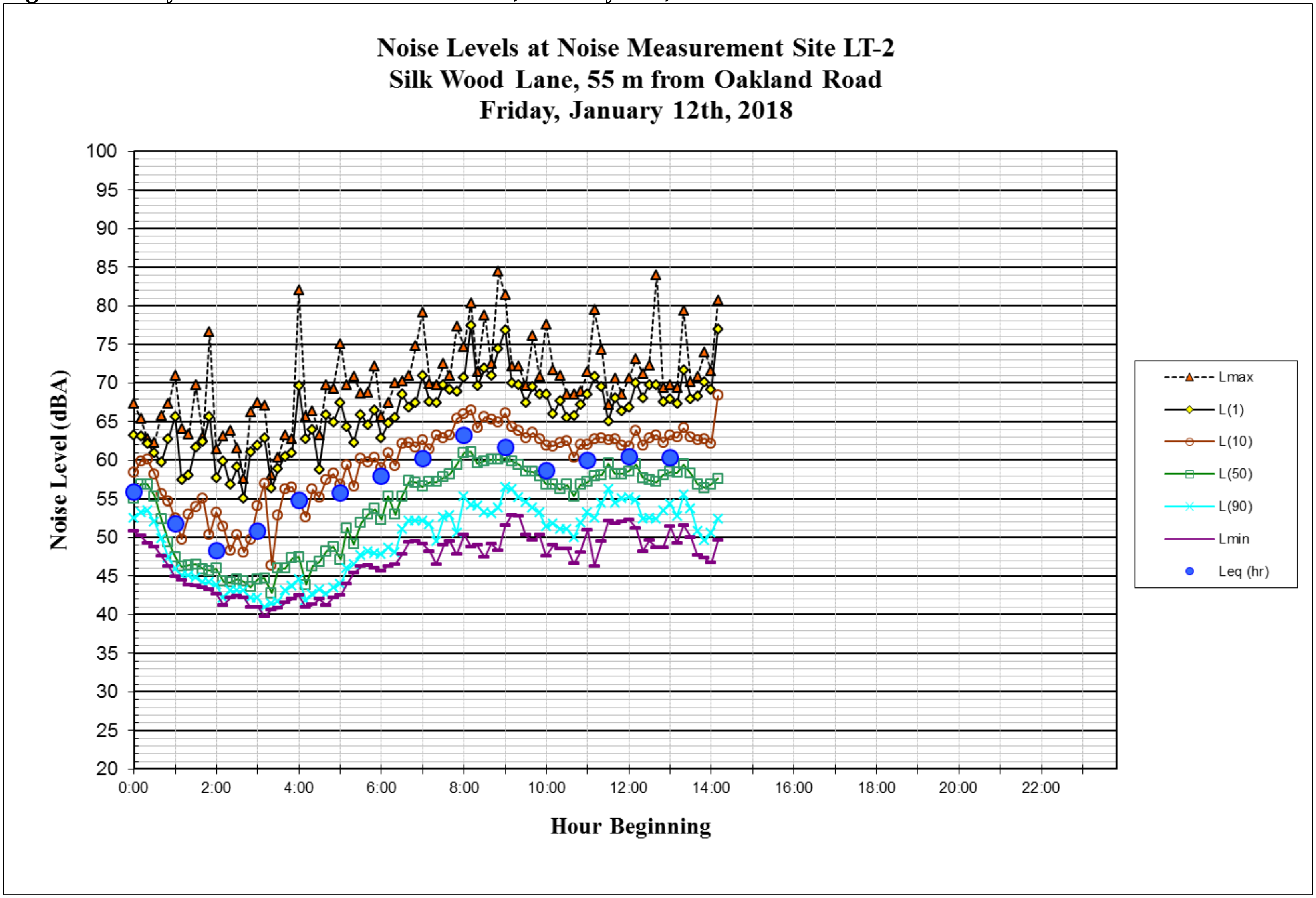


Figure 7 – Daily Trend in Noise Levels at LT-2, January 12th, 2018



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 quantitatively evaluate noise and vibration impacts resulting from the project:

1. **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 San José General Plan or Municipal Code, as follows:

    - *Permanent Noise Increases from Project Traffic:* A significant noise impact would be identified if traffic generated by the project resulted in an increase of 3 dBA DNL or greater at noise-sensitive land uses where existing or projected noise levels would exceed the noise level considered satisfactory for the affected land use (60 dBA DNL for single-family residential areas) and/or an increase of 5 dBA DNL or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use. (General Plan Policy EC-1.2)

    - *Temporary Noise Increase due to Construction:* 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. Further, 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.

- **Generation of Excessive Groundborne Vibration:** The City of San José specifies a vibration limit of 0.2 in/sec PPV at adjacent structures during demolition and construction to minimize the potential for cosmetic damage at buildings of normal conventional construction. (General Plan Policy EC-2.3).

Impact 1: **Temporary or Permanent Noise Increases in Excess of Established Standards.** The project would not conflict with local noise standards or expose off-site noise-sensitive land uses to a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. However, project generated traffic and changes to the roadway alignment would result in a substantial increase traffic-related noise levels in the area. This is a **potentially significant impact**.

<u>Permanent Noise Increases from Project Operations</u>

A significant permanent noise impact would be identified if the project:

- Would result in an increase of 3 dBA DNL or greater at land uses where existing or projected noise levels would equal or exceed the noise level considered satisfactory for the affected land use (i.e., 60 dBA DNL for single-family residential areas and schools, 65 dBA DNL for playground and 70 dBA DNL for commercial use areas); or

- Would result in an increase of 5 dBA DNL or greater at land uses where noise levels would continue to be below those considered satisfactory for the affected land use.

Traffic noise modeling was conducted using FHWA's Traffic Noise Model (TNM v. 2.5). Roadway/site geometries were input into the model based on digital project plans, field observations, and a review of available mapping software such as Google Earth. The traffic noise model was calibrated to measured noise levels using traffic conditions occurring during the noise monitoring survey. Once the noise model was calibrated to measured conditions, traffic noise levels under AM and PM peak hour traffic conditions were modeled for Existing, Existing Plus Project, 2040 Future No Build, and 2040 Future Build conditions at the measured and modeled receptor locations indicated in Figure 8. The inland image in Figure 8 indicates the overall project area and the main image shows the east side of Highway I-880, where the proposed bridge would connect to Silk Wood Lane.

Traffic volumes for the four scenarios were provided by Hexagon Transportation Consultants, Inc[2]. Based on a review of measured and modeled data, the DNL at each location was calculated to be 1 dBA higher than the peak-hour traffic noise level (AM or PM) at locations east of Highway I-880 (ST-1, ST-2, ST-3, ST-4, R1, R2, R3, R4, S1, S2, S3, S4, and S5) and 2 dBA higher than the peak-hour traffic noise level at locations west of Highway I-880 (ST-5 and ST-6).

[2] CEQA Traffic Analysis for Charcot Avenue Extension Over I-880; Robert Del Rio, *Hexagon Transportation Consultants, Inc.*, November 12, 2018.

Figure 8: Modeled Receiver Locations

ST-3* relocated position of measurement location ST-3

Noise Level Increases due to Project Traffic

Table 5 summarizes the results of traffic noise modeling for Existing and Existing Plus Project conditions. Note that locations R2 and ST-1 are behind an existing 5-foot high sound barrier and locations R3 and R4 are behind an existing 10-foot high sound barrier. The receptor ST-3 was relocated to the backyard of 1813 Silkwood Lane residence to accurately represent an outdoor residential receptor.

As shown in Table 5, traffic noise increases resulting from the project would be 3 to 10 dBA DNL at first row residences along Silk Wood Lane, represented by ST-1, ST-3, and R2, and at exterior use areas associated with the Orchard School, represented by S1 and S5. Residences represented by ST-1, ST-3, and R2 would have future noise environments equal to or exceeding 60 dBA DNL under Existing + Project conditions and would experience traffic noise increases of 3 dBA DNL or greater. Noise levels at exterior school uses located adjacent to the proposed alignment, including the outdoor field area and the playground (S1 and S5) would exceed the ‘normally acceptable’ criteria of 65 dBA DNL under Existing + Project conditions and the traffic noise increase would exceed 3 dBA DNL. These would be considered **potentially significant** impacts, as identified in bold in Table 5.

TABLE 5 Calculated Traffic Noise Increases due to Charcot Avenue Extension

Receiver	'Normally Acceptable' Noise Level, dBA DNL	Calculated DNL[3], dBA		Project Traffic Increase over Existing
		Existing	Existing Plus Project	
ST-1 (behind 5' barrier)	60	56	**65**	**9**
ST-2	60	52	53	1
ST-3* (backyard of res.)	60	60	**67**	**7**
ST-4	60	71	72	1
ST-5	70	65	66	1
ST-6	70	68	70	2
R1	60	60	62	2
R2 (behind 5' barrier)	60	55	**65**	**10**
R3 (behind 10' barrier)	60	56	59	3
R4 (behind 10' barrier)	60	59	59	0
S1	65	63	**69**	**6**
S2	45 Interior	50	61[a]	11
S3	45 Interior	50	56 [a]	6
S4	45 Interior	51	54 [a]	3
S5	65	58	**67**	**9**

[a] All school classrooms have been constructed with double-paned windows, insulation, and forced-air mechanical ventilation (Thorburn Associates, 1996), resulting in interior levels that are 25 dBA or more below exterior levels.
Note: Numbers in **bold type** = significant impact

The noise environment at residential locations setback from Charcot Avenue and/or adjacent to Oakland Road (ST-2, ST-4, R1, R3, and R4) would continue to be dominated by local noise sources and/or Oakland Road traffic noise. Project generated noise increases at these locations are calculated to be 0 to 2 dBA DNL. The Orchard School classroom and multi-purpose room façades (receptors S2, S3, and S4) were constructed with double-paned windows, insulation, and forced-air mechanical ventilation (Thorburn Associates, 1996) and would continue to achieve 45 dBA DNL and the CalGreen criteria of 50 dBA $L_{eq(1\text{-}hr)}$ with the project. Interior levels attributable to exterior noise sources would also meet the CHPS Prerequisite Goal of 45 dBA L_{eq} for core learning spaces. These increases would not be considered significant. This is a **less-than-significant** impact.

The noise environment at commercial land uses located on the western side of I-880 (ST-5 and ST-6) is dominated by existing traffic on I-880 and the existing roadway network. Traffic noise increases at these locations due to proposed project would be 1 to 2 dBA DNL and would not be considered significant. This is a **less-than-significant** impact.

[3] Calculated DNL based on the output from FHWA's Traffic Noise Model (TNM) model.

Noise Level Increase due to Project's Contribution to Cumulative Traffic

A significant cumulative traffic noise increase would be identified if Project traffic were calculated to contribute 1 dBA DNL or more under 2040 Build conditions to a significant traffic noise increase over Existing conditions, as defined above. Table 6 summarizes the traffic noise modeling results for 2040 Future No Build and 2040 Future Build conditions and compares the results to the Existing traffic conditions.

TABLE 6 Cumulative Traffic Noise Levels for Charcot Avenue Extension

Receiver	'Normally Acceptable' Noise Level, dBA DNL	Calculated DNL, dBA			Increase Over Existing		2040 Build Increase over 2040 No Build
		Existing	2040 No Build	2040 Build	2040 No Build	2040 Build	
ST-1 (behind 5' barrier)	60	56	59	68	3	**12**	**9**
ST-2	60	52	53	54	1	2	1
ST-3* (backyard of res.)	60	60	60	69	1	**9**	**8**
ST-4	60	71	75	75	4	4	0
ST-5	70	65	65	66	0	1	1
ST-6	70	68	72	72	4	4	0
R1	60	60	60	64	0	**4**	**4**
R2 (behind 5' barrier)	60	55	56	67	1	**12**	**11**
R3 (behind 10' barrier)	60	56	60	62	4	**6**	**2**
R4 (behind 10' barrier)	60	59	62	62	3	3	0
S1	65	63	66	71	3	**8**	**5**
S2	45 Interior	50	53	63 [a]	3	13	10
S3	45 Interior	50	53	58 [a]	3	8	5
S4	45 Interior	51	54	57 [a]	3	6	3
S5	65	58	59	69	1	**11**	**10**

[a] All school classrooms have been constructed with double-paned windows, insulation, and forced-air mechanical ventilation (Thorburn Associates, 1996) , resulting in interior levels that are 25 dBA or more below exterior levels.
Note: Numbers in **bold type** = significant impact

As indicated in Table 6, traffic noise levels under 2040 No Build conditions are anticipated to increase by 0 to 4 dBA DNL over Existing conditions. With construction of the project (2040 Build), traffic noise levels are anticipated to increase by 1 to 12 dBA DNL above existing conditions, with 0 to 11 dBA DNL due to project traffic contributions.

The project contribution to the significant increase in cumulative traffic noise levels under 2040 Build conditions at residential receptors ST-1, ST-3, R1, R2, and R3 and at the exterior receptors on Orchard School exterior use areas (S1, and S5), would be 1 dBA DNL or greater and the resulting 2040 Build noise level would exceed 60 dBA DNL at residences, and 65 dBA DNL at the school playground/ball field. This is a **significant cumulative impact**.

As shown in Table 6, cumulative noise increases at receptors ST-2 and ST-5 would be below 3 dBA DNL. At residences along Oakland Road (ST-4 and R4) and at locations along the existing portion of Charcot Avenue, west of I-880 (ST-6), the cumulative increase in traffic noise is primarily attributable to the increase in traffic along the existing roadway network (i.e., Existing vs. 2040 No Build) and project operations are not anticipated to contribute 1 dBA DNL or more to the overall traffic noise increase. As described above, the school classrooms (receptors S2, S3, and S4) were constructed with double-paned windows, insulation, and forced-air mechanical ventilation and would continue to achieve acceptable interior noise levels with the project. This is a **less-than-significant** impact.

Noise Barrier Analysis

As described above, increases in traffic-generated noise levels along Silk Wood Lane would be significant. This is true for both Existing + Project and cumulative conditions. Therefore, as required under CEQA, noise barriers were analyzed to reduce noise levels in backyards of homes along Silk Wood Lane and on the Orchard School property, which would be exposed to potentially significant noise increases as a result of the Project. Barriers located along the northern edge of shoulder of the proposed Charcot Avenue extension, as indicated in Figure 9, would reduce noise levels in the residential area to acceptable levels. Based on preliminary noise modeling, the existing 10-foot sound wall along the eastern side of residences facing Oakland Road, would be required to be increased to a barrier height of 12 feet and a 10-foot high barrier would be required along southern side of residences to reduce noise levels in backyards to 60 dBA DNL or less under 2040 Build conditions. An 8-foot high barrier would be required along the backyard of the residences at 1813 and 1819 Silk Wood Lane.

A barrier located along the southern edge of the proposed Charcot Avenue Extension, as shown on Figure 9, would reduce noise levels in the outdoor recreational area. Preliminary noise modeling indicates that a 6-foot high barrier would reduce noise levels in exterior use areas of Orchard School to 65 dBA DNL under 2040 Build conditions. This barrier would also reduce the exterior noise exposure at the Orchard School building façades to 60 dBA DNL or less. Table 7 summarizes future traffic levels after considering the attenuation provided by recommended noise barriers shown in Figure 9.

TABLE 7 Modeled Traffic Noise Levels for Charcot Avenue Extension due to Cumulative Traffic with Barriers

Receiver	'Normally Acceptable' Noise Level, dBA DNL	Calculated DNL, dBA			Calculated DNL with Recommended Barriers, (see Figure 9)
		Existing	2040 No Build	2040 Build	
ST-1	60	56	59	68	59
ST-3* (backyard of res.)	60	60	60	69	60
R1	60	60	60	64	57
R2	60	55	56	67	60
R3	60	56	60	62	59
R4 (backyard facing Oakland Road)	60	59	62	62	60
S1	65	63	66	71	65
S5	65	58	59	69	64

Note: Numbers in **bold type** = significant impact

Figure 9: Measured and Modeled Receiver Locations

Temporary Noise Increases from Project Construction

Policy EC-1.7 of the City's General Plan requires that all construction operations within the City use best available noise suppression devices and techniques and to limit construction hours near residential uses per the Municipal Code allowable hours, which are between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday and none on weekends when construction occurs within 500 feet of a residential land use. Further, 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.

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), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

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. Typical hourly average construction-generated noise levels for public works roads are about 79 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 8. The typical range of maximum instantaneous noise levels would be 78 to 90 dBA L_{max} at a distance of 50 feet, as shown in Table 9.

TABLE 8 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 9 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

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

The anticipated construction equipment to be used on the project includes backhoes/tractors, cranes, drill rigs, generator sets, welders, air compressors, areal lift, trucks, concrete pumpers and concrete mixer trucks, excavators, graders, rubber-tired dozers, fork lifts, pavers and rollers. Table 10 shows the calculated construction noise levels for each phase of construction, based on the equipment specified, at a distance of 50 feet from the edge of construction site to the nearest residence for grading, paving and trenching phases and 500 feet from the foot of the proposed bridge to closest residence on Silk Wood Lane for the bridge construction phase.

TABLE 10 Calculated Construction Noise Levels

Phase	Construction Equipment (Quantity)	Noise Level at 50 ft	
		L_{eq}, dBA	L_{max}, dBA
Grading/Excavation	Graders (2) Excavators (2) Rubber-tired Dozers (4) Tractors/Loaders/Backhoes (4)	85	84
Trenching/Foundation	Tractors/Loaders/Backhoes (4) Excavators (4) Forklifts (2) Cement & Mortar Mixers (2)	85	85
Paving	Cement & Mortar Mixers (2) Pavers (2) Paving equipment (2) Rollers (2) Tractors/Loaders/Backhoes (4) Trucks: Hauling & Equipment (10)	85	85
Bridge Construction (500 feet from nearest residence)	Tractors/Loaders/Backhoes (1) Cranes (1) Bore/Drill Rigs (1) Generator Sets (2) Welders (1) Air Compressors (2) Aerial Lift (1) Trucks: Hauling & Equipment (2) Concrete Pumper (2) Concrete Mixer Trucks (2)	67	67

As indicated in Table 10, unshielded noise levels at 50 feet from the center of construction activities would generally range from 84 to 85 dBA L_{eq} during peak periods. The existing noise barrier located north of Silk Wood Lane would be anticipated to provide a noise reduction of about 5 dBA to locations behind the barrier. Noise levels during bridge construction would be about 67 dBA L_{eq} at the nearest residences, about 500 feet away. Noise produced by construction equipment typically attenuates over distance at a rate of about 6 dB per doubling of distance.

Construction would be located within 500 feet of residential land uses and 200 feet of commercial and office uses. Construction is anticipated to occur over a total period of 130 days, with the duration of noise generating activities at individual locations along the project alignment being significantly shorter as construction moves along the alignment as progress occurs. Since project construction would occur over a period of less than 12 months, this would be considered a **less-than-significant** impact, assuming that the following best neighbor practices are implemented to reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance at adjacent noise sensitive uses:

- Construction activities shall be limited between hours of operation specified in City of San José's Municipal Code as 7:00 a.m. to 7:00 p.m. from Monday to Saturday with no construction activities on Sunday and legal holidays.

- Limit noise-producing signals, including horns, whistles, alarms, and bells, to safety warning purposes only.

- 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 reduce noise levels at the adjacent sensitive receptors. 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.

- 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.

Mitigation Measure 1: Construct noise barriers to reduce noise levels in backyards of residences adjacent to Silk Wood Lane and at Orchard School to meet the City's 60 dBA DNL exterior noise level objective for residential land uses and 65 dBA DNL standard for the school playground and recreational uses. Based on preliminary calculations, 6-foot to 12-foot high barriers would be needed along the residential and school property lines, respectively, to meet the 'normally acceptable' noise criteria (see Figure 9).

To be effective, barriers must be constructed with a solid material and without any gaps in the face of the wall or at its base. Openings or gaps between noise barrier materials or the ground substantially decrease the acoustical effectiveness of the barrier. Suitable materials for noise barrier construction should have a minimum surface weight of 3 pounds per square foot (such as 1-inch-thick wood, ½-inch laminated glass, masonry block, concrete, or metal one-inch).

Inclusion of Mitigation Measure 1 would reduce this impact to a **less-than-significant** level.

Impact 2: **Groundborne Vibration.** The proposed project will not result in excessive groundborne vibration at structures in the vicinity. **This is a less-than-significant impact.**

A significant impact would be identified if project construction activity or project-related vehicle traffic would result in vibration levels of 0.2 in/sec PPV or greater at nearby structures. Project-related vehicle traffic is not anticipated to generate perceptible levels of groundborne vibration at nearby structures (vibration levels are anticipated to be below 0.01 in/sec PPV). Project construction equipment to be used on the project is anticipated to include backhoes/tractors, cranes, drill rigs, generator sets, welders, air compressors, areal lift, trucks, concrete pumpers and concrete mixer trucks, excavators, graders, rubber tired dozers, fork lifts, pavers and rollers. Pile driving is not anticipated as part of the construction of the project.

Construction activities with the greatest potential of generating perceptible vibration levels would include the removal of pavement and soil, the movement of heavy tracked equipment, and vibratory compacting of roadway base materials by use of a roller. Table 11 summarizes typical vibration levels associated with varying pieces of construction equipment at a distance of 50 feet.

TABLE 11 Vibration Source Levels for Construction Equipment

Equipment		**PPV at 50 ft. (in/sec)**
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.074
Hoe Ram		0.031
Large bulldozer		0.089
Loaded trucks		0.027
Jackhammer		0.012
Small bulldozer		0.001

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, October 2018.

The nearest structures are located as close as about 30 feet from construction activities. A review of the anticipated construction equipment and the vibration level data provided in Table 11 indicates that vibration levels generated by proposed activities and equipment would be below the 0.2 in/sec PPV criteria when construction occurs at distances of 30 feet or greater from sensitive structures. Vibration levels generated by construction activities would be perceptible indoors when construction is located adjacent to structures and secondary vibration, such as a slight rattling of windows or doors, may be considered annoying at times. However, architectural damage to normal residential structures would not be anticipated and vibration levels would be below those anticipated to cause structural damage. In addition, construction would occur during daytime hours only, thus reducing the potential for residential annoyance during typical periods of rest or sleep, and the duration of vibration generating construction activities at individual locations along the project alignment would be limited as construction moves along the roadway alignment as progress occurs. This is a **less-than-significant** impact.

Mitigation Measure 2: None Required.

Discussion of Noise Impact of Project Alternatives

In addition to the proposed project analyzed above, this section discusses the results of the noise analysis for three project alternatives contemplated for the Charcot Avenue Extension Project to reduce the number of turning lanes at the intersection of Charcot Avenue extension and Oakland Road. Alternative 1 proposes to eliminate the second northbound left lane from Oakland Road to Charcot Avenue and subsequently eliminate the need for a receiving lane along westbound Charcot Avenue. Alternative 1 would have one westbound and two eastbound lanes at the intersection of Charcot Avenue and Oakland Road. Alternative 2 proposes to eliminate eastbound Charcot Avenue left-turn lane to northbound Oakland Road and will have two westbound and one eastbound lane at the intersection of Charcot Avenue and Oakland Road. Alternative 3 would construct a single lane in each direction within the existing right-of-way.

Traffic was evenly distributed across EB/WB and NB/SB lanes on each side of intersections since turning lane volumes at intersections were not available. As a result, Alternatives 1 and 2 are identical from a noise analysis perspective. [Note: It is recognized that the 3-lane cross-sections for Charcot Avenue just west of Oakland Road under Alternatives 1 and 2 are slightly smaller than the 4-lane cross-section under the proposed project. This means that the distances between the traffic lanes and the noise receptors at Orchard School would be slightly greater under Alternatives 1 and 2 than under the proposed project. However, such increases in distance are too small to result in measurable differences in noise levels.]

Noise Level Increases due to Project Traffic for Alternatives 1 & 2

Table 12 summarizes the results of traffic noise modeling for the Existing and Existing Plus Project conditions for project Alternatives 1 and 2.

TABLE 12 Calculated Traffic Noise Increases due to Charcot Avenue Extension for Alternatives 1 & 2

Receiver	'Normally Acceptable' Noise Level, dBA DNL	Calculated DNL, dBA		Project Traffic Increase over Existing
		Existing	Existing Plus Project Alternative plan	
ST-1 (behind 5' barrier)	60	56	**64**	**8**
ST-2	60	52	53	1
ST-3* (backyard of res.)	60	60	67	**7**
ST-4	60	71	72	1
ST-5	70	65	66	1
ST-6	70	68	70	2
R1	60	60	**63**	**3**
R2 (behind 5' barrier)	60	55	64	**9**
R3 (behind 10' barrier)	60	56	59	3
R4 (behind 10' barrier)	60	59	59	0
S1	65	63	67	**4**
S2	45 Interior	50	60 [a]	10
S3	45 Interior	50	55 [a]	5
S4	45 Interior	51	54 [a]	3
S5	65	58	67	**9**

[a] All school classrooms have been constructed with double-paned windows, insulation, and forced-air mechanical ventilation (Thorburn Associates, 1996), resulting in interior levels that are 25 dBA or more below exterior levels.

Note: Numbers in **bold type** = significant impact

As shown in Table 12, traffic noise increases resulting from the project would be 3 to 9 dBA DNL at first row residences along Silk Wood Lane, represented by ST-1, ST-3, R1, and R2, and at the exterior use areas of Orchard School, represented by S1 and S5. These receptors would be subjected to **potentially significant** impacts. The results and impacts are similar to the results discussed for the Project in Impact 3.

Noise Level Increase due to Project's Contribution to Cumulative Traffic for Alternatives 1 & 2

A significant cumulative traffic noise increase would be identified if Project traffic were calculated to contribute 1 dBA DNL or more under 2040 Build conditions to a significant traffic noise increase over Existing conditions. Table 13 summarizes the traffic noise modeling results for 2040 Future No Build and 2040 Future Build conditions and compares the results to the Existing traffic conditions for project Alternatives 1 and 2.

TABLE 13 Modeled Traffic Noise Levels for Alternatives 1 and 2 due to Cumulative Traffic

Receiver	'Normally Acceptable' Noise Level, dBA DNL	Calculated DNL, dBA			Increase Over Existing		2040 Build Increase over 2040 No Build
		Existing	2040 No Build	2040 Build	2040 No Build	2040 Build	
ST-1 (behind 5' barrier)	60	56	59	68	3	**12**	**9**
ST-2	60	52	53	54	1	2	1
ST-3* (backyard of res.)	60	60	60	70	0	**10**	**10**
ST-4	60	71	75	75	4	4	0
ST-5	70	65	65	66	0	1	1
ST-6	70	68	72	72	4	4	0
R1	60	60	60	64	0	**4**	**4**
R2 (behind 5' barrier)	60	55	56	68	1	**13**	**12**
R3 (behind 10' barrier)	60	56	60	62	4	**6**	**2**
R4 (behind 10' barrier)	60	59	62	62	3	3	0
S1	65	63	66	71	3	**8**	**5**
S2	45 Interior	50	53	63 [a]	3	13	10
S3	45 Interior	50	53	58 [a]	3	8	5
S4	45 Interior	51	54	57 [a]	3	6	3
S5	65	58	59	69	1	**11**	**10**

[a] All school classrooms have been constructed with double-paned windows, insulation, and forced-air mechanical ventilation (Thorburn Associates, 1996) , resulting in interior levels that are 25 dBA or more below exterior levels.
Note: Numbers in **bold type** = significant impact

As indicated in Table 13, traffic noise levels under 2040 No Build conditions are anticipated to increase by 0 to 4 dBA DNL over Existing conditions. With construction of the project (2040 Build), traffic noise levels are anticipated to increase by 1 to 13 dBA DNL above existing conditions, with 0 to 12 dBA DNL due to project traffic contributions.

The project contribution to the significant increase in traffic noise levels under 2040 Build conditions at residential receptors ST-1, ST-3, R1, R2, and R3 and at the receptors on Orchard School playground (S1, and S5), would be 1 dBA DNL or greater and the resulting 2040 Build noise level would exceed 60 dBA DNL at residences, and 65 dBA DNL at the school playground/ball field. This is a **significant cumulative impact**.

The impacts at receptors due to cumulative traffic noise increases for Alternatives 1 and 2 are similar to the impacts at receptors for the Project.

Mitigation Measure: Implementation of Mitigation Measure 1 would reduce the traffic noise impacts for Alternatives 1 and 2 impacts to a **less-than-significant** level.

Noise Level Increases due to Project Traffic for Alternative 3

Table 14 summarizes the results of traffic noise modeling for the Existing and Existing Plus Project conditions for project Alternative 3.

TABLE 14 Calculated Traffic Noise Increases due to Charcot Avenue Extension for Alternative 3

Receiver	'Normally Acceptable' Noise Level, dBA DNL	Calculated DNL[4], dBA		Project Traffic Increase over Existing
		Existing	Existing Plus Project	
ST-1 (behind 5' barrier)	60	56	**66**	**10**
ST-2	60	52	53	1
ST-3* (backyard of res.)	60	60	**67**	**7**
ST-4	60	71	72	1
ST-5	70	65	66	1
ST-6	70	68	70	2
R1	60	60	62	2
R2 (behind 5' barrier)	60	55	**66**	**11**
R3 (behind 10' barrier)	60	56	59	3
R4 (behind 10' barrier)	60	59	59	0
S1	65	63	**68**	**5**
S2	45 Interior	50	61[a]	11
S3	45 Interior	50	55[a]	5
S4	45 Interior	51	54[a]	3
S5	65	58	**67**	**8**

[a] All school classrooms have been constructed with double-paned windows, insulation, and forced-air mechanical ventilation (Thorburn Associates, 1996), resulting in interior levels that are 25 dBA or more below exterior levels.
Note: Numbers in **bold type** = significant impact

As shown in Table 14, traffic noise increases resulting from the project would be 5 to 11 dBA DNL at first row residences along Silk Wood Lane, represented by ST-1, ST-3, and R2, and at the exterior use areas of Orchard School, represented by S1 and S5. These receptors would be subjected to **potentially significant** impacts. The results and impacts are similar to the results discussed for the Project in Impact 3.

Noise Level Increase due to Project's Contribution to Cumulative Traffic for Alternative 3

Table 15 summarizes the traffic noise modeling results for 2040 Future No Build and 2040 Future Build conditions and compares the results to the Existing traffic conditions for project Alternative 3.

[4] Calculated DNL based on the output from FHWA's Traffic Noise Model (TNM) model.

As indicated in Table 15, traffic noise levels under 2040 No Build conditions are anticipated to increase by 0 to 4 dBA DNL over Existing conditions. With construction of the project (2040 Build), traffic noise levels are anticipated to increase by 1 to 13 dBA DNL above existing conditions, with 0 to 12 dBA DNL due to project traffic contributions.

The project contribution to the significant increase in traffic noise levels under 2040 Build conditions at residential receptors ST-1, ST-3, R1, R2, and R3 and at the receptors on Orchard School playground (S1, and S5), would be 1 dBA DNL or greater and the resulting 2040 Build noise level would exceed 60 dBA DNL at residences, and 65 dBA DNL at the school playground/ball field. This is a **significant cumulative impact**.

The impacts at receptors due to cumulative traffic noise increases for Alternative 3 is similar to the impacts at receptors for the Project.

Mitigation Measure: Implementation of Mitigation Measure 1 would reduce the traffic noise impacts for Alternative 3 impacts to a **less-than-significant** level.

TABLE 15 Modeled Traffic Noise Levels for Alternative 3 due to Cumulative Traffic

Receiver	'Normally Acceptable' Noise Level, dBA DNL	Calculated DNL, dBA			Increase Over Existing		2040 Build Increase over 2040 No Build
		Existing	2040 No Build	2040 Build	2040 No Build	2040 Build	
ST-1 (behind 5' barrier)	60	56	59	68	3	**12**	**9**
ST-2	60	52	53	54	1	2	1
ST-3* (backyard of res.)	60	60	60	69	0	**9**	**9**
ST-4	60	71	75	75	4	4	0
ST-5	70	65	65	66	0	1	1
ST-6	70	68	72	72	4	4	0
R1	60	60	60	64	0	**4**	**4**
R2 (behind 5' barrier)	60	55	56	68	1	**13**	**12**
R3 (behind 10' barrier)	60	56	60	62	4	**6**	**2**
R4 (behind 10' barrier)	60	59	62	62	3	3	0
S1	65	63	66	69	3	**6**	**3**
S2	45 Interior	50	53	62 [a]	3	12	**9**
S3	45 Interior	50	53	57 [a]	3	7	**4**
S4	45 Interior	51	54	55[a]	3	4	**1**
S5	65	58	59	68	1	**10**	**9**

[a] All school classrooms have been constructed with double-paned windows, insulation, and forced-air mechanical ventilation (Thorburn Associates, 1996) , resulting in interior levels that are 25 dBA or more below exterior levels.
Note: Numbers in **bold type** = significant impact