



# **NOISE ANALYSIS**

## **SAN BERNARDINO COUNTY FIRE STATION 227 PROJECT**

COUNTY OF SAN BERNARDINO

PREPARED BY

WSP USA INC.  
IRVINE, CA  
WSP.COM

MARCH 2025





# TABLE OF CONTENTS

1	INTRODUCTION AND SUMMARY .....	1
2	ACOUSTICS BACKGROUND.....	4
2.1	Noise Descriptors.....	4
2.2	Vibration Impacts.....	6
3	NOISE AND VIBRATION IMPACT CRITERIA AND REGULATIONS .....	8
3.1	Methodology and Significance Thresholds.....	8
3.2	Vibration Impact Criteria .....	1
3.3	Noise Regulations.....	1
4	EXISTING NOISE AND VIBRATION CONDITRIONS	3
4.1	Existing Noise.....	3
4.2	Existing Vibration.....	6
5	IMPACT ASSESSMENT .....	7
5.1	Operational Noise.....	7
5.2	Operational Vibration.....	8
5.3	Construction Noise .....	8
5.4	Construction Vibration .....	2
6	MEASURES TO MINIMIZE POTENTIAL IMPACTS	4
6.1	Operational Noise and Vibration.....	4
6.2	Construction Noise and Vibration .....	4
7	REFERENCES .....	5



---

## **TABLES**

<b>Table 1</b> Noise Standards for Stationary Noise Sources.....	8
<b>Table 2</b> Modeled Existing and Build Traffic Noise Levels.....	5
<b>Table 3</b> Modeled Construction Noise Levels with and without 14-foot Barrier.....	1
<b>Table 4</b> Distance to Construction Vibration Impact Threshold.....	2
<b>Table 5</b> Vibration Guidelines for Potential Damage to Structures.....	2

---

## **FIGURES**

<b>Figure 1.</b> Project Site .....	2
<b>Figure 2.</b> Typical A-Weighted Sound Levels .....	5
<b>Figure 3.</b> Typical Ldn and CNEL Noise Exposure Levels.....	6
<b>Figure 4.</b> Typical Levels of Ground-Borne Vibration .....	7
<b>Figure 5.</b> Noise Measurement Locations.....	4
<b>Figure 6.</b> Noise Modeling Locations .....	5



## **ACRONYMS AND ABBREVIATIONS**

CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	decibel
in/sec	inches per second
dBA	A-weighted sound levels
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
ft	feet
Ldn	Day Night Average Sound Level
Leq	equivalent continuous sound level
Ldn	Day Night Average Sound Level
Lp	Sound Pressure Level
OSHA	Occupational Safety and Health Administration
Project	San Bernardino County Fire Station No. 227
PPV	peak particle velocity
RMS	root mean square
SBCFPD	San Bernardino County Fire Protection District
SBCFS No. 227	San Bernardino County Fire Station No. 227
TNM	Traffic Noise Model
VdB	vibration decibels





# 1 INTRODUCTION AND SUMMARY

The San Bernardino County Fire Protection District (SBCFPD) is proposing a New Fire Station to replace Station No. 227. The new station will be located on the southern portion of the existing Arrowhead Elementary School property, located at 3825 N. Mountain View Avenue, San Bernardino, California, 92405. The new station will be located south of the elementary school, north of 38th Street, East of Mountain View Avenue and east of Genevieve Street (Figure 1). This Noise Technical Memorandum will discuss if there are potential noise and vibration impacts as a result of the Project from construction or operations.

---

## 1.1 PROJECT LOCATION

The Project site is located on a 5.3-acre parcel that is already partially developed with the existing Arrowhead Elementary School. The proposed Project would be located on a vacant 1.21-acre section of the parcel south of the school situated on the northwest corner of 38th Street and Genevieve Street in the City of San Bernardino, California. Figure 1 and Figure 2 show the site in its regional and local contexts, respectively. Regional access to the site is provided by Interstate 215 (I-215), and State Routes (SRs) 210 and 18. West 38th Street and Genevieve Street provide local access. Surrounding land uses include developed civic/public spaces to the north and east, multifamily residential spaces to the south, and a landscaped strip along the west property line, with additional single-family homes just beyond.

Figure 1. Project Site





The results of the noise and vibration impact assessment are summarized as follows.

No noise or vibration impacts are anticipated due to the operation of the new San Bernardino County Fire Station No. 227 (SBCFS No. 227).

Construction noise is expected to comply with San Bernardino County Noise Ordinance and noise impacts from construction activities is not expected to be significant.

Vibration levels from construction activities are predicted to be well below the Federal Transit Administration (FTA) vibration damage thresholds but may exceed the FTA vibration annoyance criteria when, certain types of equipment (for example, vibratory compactors or bulldozers) are used near residences.

It should also be noted that the daytime/nighttime operation and construction of the SBCFS No. 227 will comply with the applicable noise limits set forth within the San Bernardino County Noise Ordinances. In particular, the fire station will be designed to minimize noise in the surrounding neighborhood from internal facility operations and mechanical systems, and construction noise and vibration mitigation measures will be implemented to the extent practical.

Following a discussion of relevant acoustics background information in Section 2 below, Section 3 presents applicable noise and vibration impact criteria and regulations, and Section 4 describes the existing noise and vibration conditions. Next, Section 5 summarizes the impact assessment and Section 6 discusses mitigation measures.



## 2 ACOUSTICS BACKGROUND

This section describes the basic noise and vibration terminology to provide background for the assessment for this noise study.

---

### 2.1 NOISE DESCRIPTORS

Noise is usually defined as sound that is undesirable because it interferes with speech communication and hearing or is otherwise annoying (unwanted sound). Under certain conditions, noise may cause hearing loss, interfere with human activities, and in various ways may affect people's health and wellbeing.

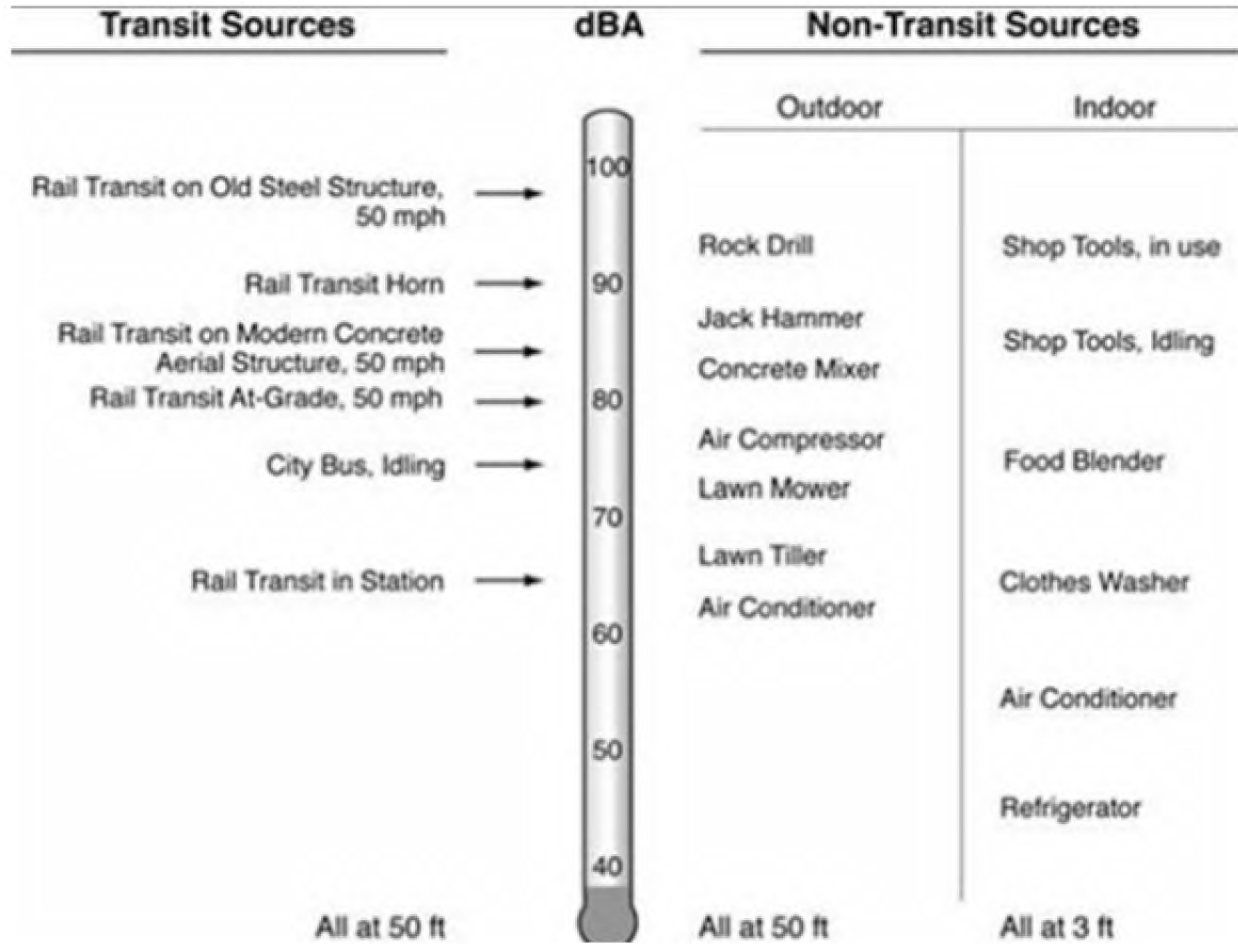
Sound Pressure Level (Lp) can vary over an extremely large range of amplitude. Lp describes the level of noise measured at a receiver at any moment in time and is read directly from a sound-level meter. The decibel (dB) is the accepted standard unit for measuring the amplitude of sound. When describing sound and its effect on a human population, A-weighted (dBA) sound pressure levels are typically used to account for the response of the human ear. The term "A-weighted" refers to a filtering of the noise signal in a manner corresponding to the way that the human ear perceives sound. The A-weighted noise level has been found to correlate well with people's judgments of the noisiness of different sounds, and it has been used for many years as a measure of community noise. Figure 2 illustrates typical A-weighted sound pressure levels for various transit and non-transit noise sources.

Community noise levels usually change continuously during the day. The equivalent continuous A-weighted sound pressure level (Leq) is normally used to describe community noise. The Leq is the equivalent steady-state A-weighted sound pressure level that would contain the same acoustical energy as the time-varying A-weighted sound pressure level during the same time interval.

Another descriptor, the day-night average sound pressure level (Ldn), was developed to evaluate the total daily community noise environment. The Ldn is a 24-hour average sound pressure level with a 10-dB time-of-day weighting added to sound pressure levels in the nine nighttime hours from 10:00 p.m. to 7:00 a.m. This nighttime 10-dB adjustment is an effort to account for the increased sensitivity to nighttime noise events. The FTA uses Ldn and Leq to evaluate bus rapid transit noise impacts at surrounding communities.

While the Community Noise Equivalent Level (CNEL) is similar to the Ldn, except that it has another addition of 5.0 decibels to sound levels during the evening hours between 7:00 p.m. and 10:00 p.m. These additions are made to the sound levels at these time periods because during the evening and nighttime hours, when compared to daytime hours, there is a decrease in the ambient noise levels, which creates an increased sensitivity to sounds. For this reason, the sound appears louder in the evening and nighttime hours and is weighted accordingly. Figure 3 illustrates Ldn noise exposure levels for various transit and background noise sources.

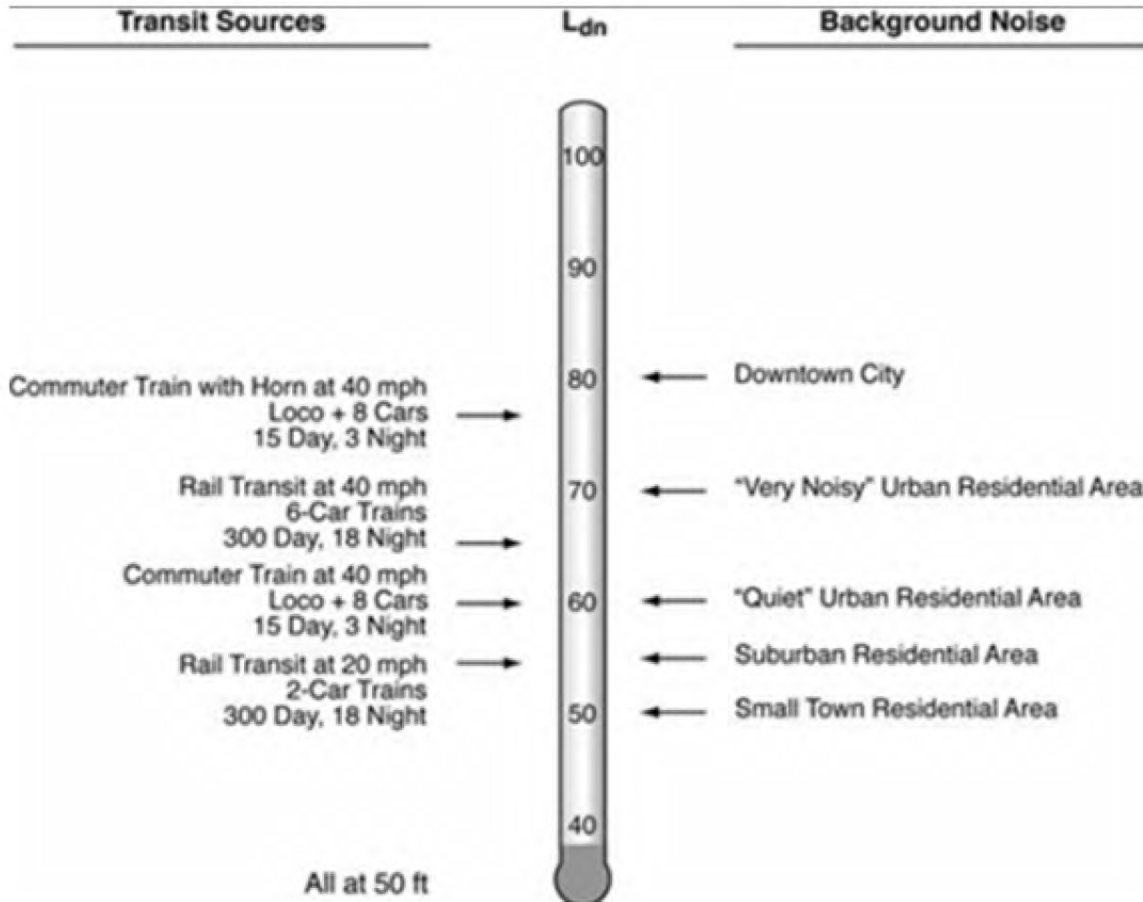
Figure 2. Typical A-Weighted Sound Levels



Source: FTA, 2018

Notes: dBA = decibels A; mph = miles per hour; ft = feet.

**Figure 3. Typical Ldn and CNEL Noise Exposure Levels**



Source: FTA, 2018

Notes: Ldn = day-night average sound pressure level; ft = feet.

## 2.2 VIBRATION IMPACTS

Ground-borne vibration from transit operations refers to the fluctuating or oscillatory motion experienced by persons on the ground and in buildings near transit operations and construction sites. Vibration can be described in terms of displacement, velocity, or acceleration. Displacement is the easiest descriptor to understand. For a vibrating floor, the displacement is simply the distance that a point on the floor moves away from its static position. Velocity represents the instantaneous speed of the floor movement, and acceleration is the rate of change of the speed. Although displacement is easier to understand, the response of humans, buildings, and equipment to vibration is more accurately described using velocity or acceleration.

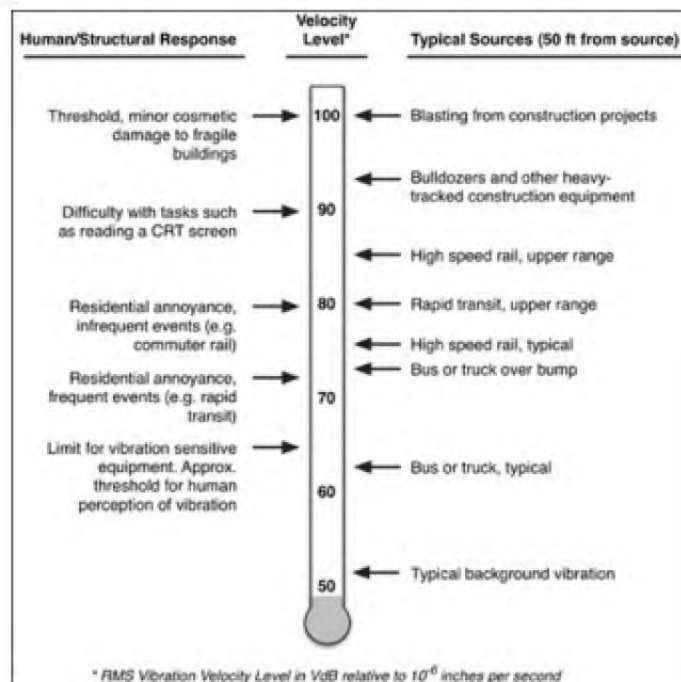
Two methods are used for quantifying vibration. The first method uses peak particle velocity (PPV), which is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is often used in monitoring of blasting vibration, since it is related to the stresses experienced by buildings. Although PPV is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response. It takes some time for the human body to respond to vibration impulses so, in a sense, the human body responds to an average of the vibration amplitude. Because the net average of a vibration signal is zero, the second method for quantifying vibration uses root mean square (RMS) amplitude to describe the "smoothed" vibration amplitude.



PPV and RMS velocities are normally described in inches per second (in/sec) in the United States and in meters per second in the rest of the world. Decibel notation is also commonly used for vibration because it compresses the range of numbers required to describe vibration. In accordance with FTA guidelines, vibration levels in this report are referenced to  $1 \times 10^{-6}$  in/sec and the abbreviation VdB is used for vibration decibels to reduce the potential for confusion with sound decibels.

Common vibration sources as well as human and structural response to ground-borne vibration are illustrated in Figure 4. Typical vibration levels can range from below 50 VdB to 100 VdB (0.000316 in/sec to 0.1 in/sec). The human threshold of perception is approximately 65 VdB.

**Figure 4. Typical Levels of Ground-Borne Vibration**



Source: FTA, 2018

Notes: RMS = root mean square; VdB = vibration decibels.



# 3 NOISE AND VIBRATION IMPACT CRITERIA AND REGULATIONS

## 3.1 METHODOLOGY AND SIGNIFICANCE THRESHOLDS

The San Bernardino County Planning Department evaluates impacts under CEQA in accordance with Chapter 7 of the San Bernardino County Code of Ordinances which directs the department to use regulate noise to promote the public health, comfort and convenience of its inhabitants and visitors. The chapter is not intended to establish thresholds of significance for the purpose of any analysis required by the California Environmental Quality Act (CEQA) and no such thresholds are established. Under CEQA appendix G, the Project must address the following:

- 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
- Generation of excessive ground-borne vibration or ground-borne noise levels

These appendix G checklist questions are the significance criteria used to evaluate a project’s noise and vibration impact.

The county noise ordinance 83.01.08 noise list the noise limits for noise based on the property receiving the noise, shown in Table 1 below. If the existing ambient levels exceed any of the noise limits in the existing ambient levels will be the new noise limit. These limits are at the affected land use property line and apply to for stationary noise, and if any of the following apply the property would be considered to have a noise impact. like chemical plants, utilities, and steel mills.

**Table 1** Noise Standards for Stationary Noise Sources

Affected Land Use (Receiving Noise)	7:00 a.m. to 10:00 p.m. Leq	10:00 p.m. to 7:00 a.m. Leq
<b>Residential</b>	55 dB(A)	45 dB(A)
<b>Professional Services</b>	55 dB(A)	55 dB(A)
<b>Other Commercial</b>	60 dB(A)	60 dB(A)
<b>Industrial</b>	70 dB(A)	70 dB(A)

Leq = (Equivalent Energy Level). The sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period, typically one, eight or 24 hours.

dB(A) = (A-weighted Sound Pressure Level). 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, placing greater emphasis on those frequencies within the sensitivity range of the human ear.

Source: San Bernardino County, California Code of Ordinances, Section 83.01.080 Noise; 2024

Notes: dBA = decibels A; Leq = equivalent continuous sound level.

These limits are at the affected land use property line and apply to stationary noise, and the property would be considered to have a noise impact if any of the following apply:

- The noise standard for the receiving land use as specified in Subdivision (b) (Noise-Impacted Areas) above, for a cumulative period of more than 30 minutes in any hour
- The noise standard plus 5 dB(A) for a cumulative period of more than 15 minutes in any hour
- The noise standard plus 10 dB(A) for a cumulative period of more than five minutes in any hour
- The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour
- The noise standard plus 20 dB(A) for any period

The following sources of noise are exempt from regulations of this section:

- Motor vehicles not under the control of the commercial or industrial use
- Emergency equipment, vehicles, and devices
- Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and federal holidays

With respect to traffic noise increases due to traffic generated by the Project, impacts are considered significant if traffic noise associated with the Project would result in increase in traffic noise levels to sensitive receptors equal or greater than 3 dBA Ldn or/CNEL. The noise impact criteria included in the Caltrans Noise Technical Supplement (2009) were used to determine whether or not increase in roadway noise would be considered significant. In addition, applicable noise regulations are included in the San Bernardino County, Article 29: Regulation of Noise. These criteria and regulations are summarized in the subsections below.

---

## 3.2 VIBRATION IMPACT CRITERIA

The FTA noise and vibration guidance manual include ground-borne vibration impact criteria for both annoyance from Project operations and risk of damage from construction. For annoyance from Project operations, the applicable FTA criterion is an overall RMS vibration velocity level of 72 VdB, based on “frequent events” (that is, more than 70 vibration events per day) affecting residential land use. For damage from construction activities, the applicable FTA criterion is a PPV of 0.2 inches/second (approximately 94 VdB RMS) affecting non-engineered timber and masonry buildings.

---

## 3.3 NOISE REGULATIONS

Chapter 7 of the San Bernardino County Code of Ordinances, 83.01.08 Noise states that temporary construction, maintenance, repair or demolition activities between 7:00 a.m. to 7:00 p.m. is exempt from the noise standards for the fire station noise sources.

If the Project were to proposed construction outside the hours of 7:00 a.m. to 7:00 p.m., a variance to the noise ordinances would need to be granted by the county.

A criterion of 10 dB above the ambient noise level is also used by the planning department to assess substantial temporary ambient noise level increases from construction. A 10 dB increase in ambient noise levels corresponds to a perceived doubling of loudness. This criterion applies at the property lines of the nearest sensitive receivers.

In addition, the planning department supplements the construction noise analysis with guidance provided in the Construction Noise Assessment of the FTA Transit Noise and Vibration Assessment Manual. Specifically, the planning department uses the general assessment daytime residential noise limit of 90 dBA at residential receptors as developed by FTA. This assessment results in a reasonable worst-case scenario because it assumes that the two noisiest pieces of equipment will operate simultaneously.



Lastly, the planning department also evaluates whether nighttime construction activities have the potential to result in substantial sleep disturbance, with sleep disturbance defined as nighttime construction activities that result in interior residential noise levels of 45 dBA (assuming windows closed).

If any of the above three quantitative criteria are exceeded (10 dB increase in ambient noise levels, 90 dBA at noise-sensitive receptors, or sleep disturbance), the planning department evaluates the temporal frequency, duration, and intensity of the exceedance when determining whether construction noise could result in a substantial temporary increase in ambient noise levels.

# 4 EXISTING NOISE AND VIBRATION CONDITIONS

---

## 4.1 EXISTING NOISE

The San Bernardino County Fire Department (SBCFD) proposed New Fire Station No. 227 is located on two city blocks bounded by Mountain View Avenue, 38th Street, Genevieve Street and 39th Street. The land uses in the area are as follows:

- **North of Project Site** – Arrowhead Elementary School, with single located to the east of the school and multifamily located north of 39th street
- **East of Project Site** – The San Bernardino Fire Station Headquarters and the California Department of Forestry and Fire Protection lots and offices and Cal Fire Museum
- **South of Project Site** – Residential apartment complex (Avalon Court Apartments) south of 38th street. The Avalon Court is the closest residential units to the Project site. There are additional apartments located east of Genevieve Street and south of 38th Street
- **West of the Project Site** – Immediately west is a strip of ornamental landscaping along Mountain View Avenue. West of Mountain View Avenue, the land uses is single-family residential

The nearest residential use (receptor) is an apartment complex (Avalon Court Apartments) and the property line is approximately 45-feet south of the proposed facility. Noise generated by the local streets are the main noise source in the area.

In accordance with the FTA impact assessment, existing noise in the vicinity of the proposed SBCFS No. 227 must be quantified and compared to future Project-related noise to determine the potential noise impact of the Project. Existing noise measurements were conducted on February 12, 2025, at two sites on the north property line of the Avalon Court Apartments the closest to the SBCFS No. 227 site:

- **Measurement Site F1:** Southwest corner of Genevieve Street and 38th Street
- **Measurement Site F2:** Southeast of the intersection of Mountain View Avenue and 38th

**Figure 5. Noise Measurement Locations**



The measurements taken on February 12, were used to validate the FHWA Traffic Noise Model (TNM) 3.2 model for the roadway noise in the area. The validated noise model was used to calculate the peak hour Leq. In addition to the two measurement sites, 28 additional modeling sites were included in the model (Figure 6). The existing and build peak traffic noise levels at the along local roadways is shown in Table 2.

**Figure 6. Noise Modeling Locations**



**Table 2 Modeled Existing and Build Traffic Noise Levels**

Site	Location	Existing Traffic Leq dBA	Build Traffic Leq dBA	Change in Traffic Leq dBA
1	3660 N Mountain View Avenue	62.0	62.1	0.1
2	3702 N Mountain View Avenue	63.8	63.9	0.1
3	3780 N Mountain View Avenue	61.3	61.4	0.1
4	228 Edgerton Drive	62.7	62.8	0.1
5	3850 Electric Avenue	56.8	56.8	0.0
6	3883 Electric Avenue	55.1	55.1	0.0
7	264 West 39th Street	55.2	55.2	0.0
8	3693 N Mountain View Avenue	63.9	64.0	0.1
9	3728 Genevieve Street (northwest corner of Avalon Court Apartments)	59.2	59.4	0.2



Site	Location	Existing Traffic Leq dBA	Build Traffic Leq dBA	Change in Traffic Leq dBA
10	3874 N Mountain View Avenue	56.3	56.3	0.0
11	3898 N Mountain View Avenue	55.6	55.6	0.0
12	3932 N Mountain View Avenue	54.8	54.8	0.0
13	3902 Genevieve Street	48.0	48.0	0.1
14	3936 Genevieve Street	57.2	57.4	0.2
15	3694 Genevieve Street	56.8	57.2	0.4
16	3728 Genevieve Street (Southern Building of Avalon Court Apartments)	54.8	55.3	0.5
17	3728 Genevieve Street (NE corner of Avalon Court Apartments)	54.7	55.2	0.4
18	3693 Genevieve Street	56.4	56.8	0.4
19	3787 Genevieve Street	52.0	52.4	0.4
20	102-122 W 38th Street (California Department of Forestry and Fire Protection Museum)	46.3	46.4	0.1
21	130 W 39th Street	53.8	54.1	0.3
22	3904 N Seirra Way	62.4	62.5	0.1
23	102 W Parkside Drive	64.1	64.1	0.1
24	3792 N Seirra Way	62.3	62.3	0.1
25	3800-3870 N Seirra Way	62.8	62.8	0.1
26	3863 N Seirra Way	59.7	59.7	0.0
27	3811 N Seirra Way	64.9	65.0	0.0
28	3863 N Seirra Way	63.7	63.8	0.1
29	3917 N Seirra Way	62.7	62.8	0.0
30	Arrowhead Elementary School Playground	48.0	48.1	0.1

Notes: dBA = decibels A; Leq = equivalent continuous sound level.

## 4.2 EXISTING VIBRATION

Ground-borne vibration from roadway traffic is not generally perceptible unless there are bumps due to frequent potholes in the road. The FTA vibration impact criteria levels are used as thresholds to determine the potential effects of a project.

# 5 IMPACT ASSESSMENT

---

## 5.1 OPERATIONAL NOISE

### 5.1.1 TRAFFIC NOISE

The major noise sources associated with the SBCFS No. 227 are local streets. The traffic noise generated by the SBCFS No. 227 has been evaluated using FHWA TNM 3.2. Traffic noise levels were calculated using both existing and future peak hour traffic volumes. The proposed Project would not increase ambient and future traffic noise levels. The proposed Project would not result in an increase of daily operational travel demand. The Project would result in 10 daily vehicular trips. Table 1 shows the change in traffic noise levels due to the Project, per the TNM modeling. The increase in traffic noise level would be less than 1 dBA and would not be noticeable.

The operation and construction of the SBCFS No. 227 will comply with the applicable noise limits of the San Bernardino County Noise Ordinances. In particular, the training center will be designed to minimize noise in the surrounding neighborhood from internal facility operations and mechanical systems, and construction noise mitigation measures will be implemented to the extent practical.

### 5.1.2 MECHANICAL EQUIPMENT

No noise impacts are anticipated due to the operation of the SBCFS No. 227. Measures will be taken during the design of the facility to minimize noise to the surrounding neighborhood. In particular, any stationary equipment such as ventilation systems will be designed to meet the San Bernardino County Noise Ordinance nighttime noise limit at the property lines.

### 5.1.3 SIRENS

The use of sirens on-site would be limited to emergency responses. The noise levels generated by the sirens is estimated to be 100 dBA at 100 feet. Since the sirens would only sound as the fire trucks leave the station for approximately 10 seconds as they leave the station and accelerate rapidly away. In 2024, the current Station 227 has a total of 3,260 responses, this averages to 9 responses a day, or 1.14 per hour. Because call out would be limited to one or two per hour, they would not contribute to an increase of more than 1 dB in either the peak hour noise levels or the CNEL noise levels in the area.

Operation of the Project would also involve the use of an interior address (loudspeaker) system that would create new nuisance noise. Use of a loudspeaker system would be used during emergency call out activities. Typical sound levels from public address loudspeakers are 90 dBA at 50 feet. With the interior address system, the noise levels outside the station house would increase noise levels to the nearby residential receivers.

### 5.1.4 LOADING

No noise impacts are anticipated from the result of delivery, service or passenger vehicle loading.

The Project is estimated to generate a total of five delivery and service vehicles per week, on average, one delivery/service vehicle trip per day. This corresponds to a demand for one loading space during the peak hour of loading activities (generally between 10 a.m. and 11 a.m.).

Passenger loading demand is based on the number of trips that are projected to occur via taxis/other ride hailing services. The Project would generate less than three vehicle trips by taxis/other ride hailing services during the PM peak hour, which would result in a passenger loading space demand of one space during the peak 15 minutes of the PM peak hour.

As noted in the traffic noise section, the increase in traffic noise level would be less than 2 dBA and would not be noticeable, due to other noise sources in the area.



### **5.1.5 ON-SITE VEHICULAR ACTIVITY**

No noise impacts are anticipated from on-site vehicular activities. The on-site vehicular activities would take place primarily during daytime hours.

---

## **5.2 OPERATIONAL VIBRATION**

Ground-borne vibration from bus and automobile traffic is not generally perceptible unless the vehicles are operating on irregular surfaces very close to sensitive receptors, no vibration impact is anticipated from operation of the proposed San Bernardino County Fire Station No. 227.

---

## **5.3 CONSTRUCTION NOISE**

The construction work was modeled for site preparation and Building Construction, using the FHWA Road Construction Noise Model, to model the noisiest pieces of equipment as follows:

- One Crane – usage 20%
- Two Excavators – usage 40%
- Two Generators – usage 50%
- One Grader, – usage 40%
- One Backhoe – usage 40%
- One Dump trucks – usage 40%

Construction noise levels would be the highest at the south of the Project at the Avalon Court Apartments. Table 3 shows the modeled noise levels at the modeling sites around the Project area. The highest levels are at the Avalon Court Apartments, Site 9 and 17 south of the Project. And Site 3 and 4 west of the Project and Mountain View Road have the second highest noise levels. Site 9 has a modeled peak hour noise level of 78 dBA without a barrier around the construction activity and a noise level of 71 dBA with a 14-foot-high barrier. Sites 3, 4, 17, 19, 20, and 30 noise levels are also above 70 dBA without a barrier. While construction is exempt from the San Bernardino County Code of Ordinances, 83.01.08, because the work will be done during daytime hours, a temporary noise barrier around the Project area (at least 14 feet high) is still recommended to minimize the noise levels at the adjacent parcels.

Notably, the closest sites (Sites 9 and 17) are at the property line closest to construction. The closest building is 20 feet further south of the property line and there are no outdoor uses on this side of the property. The noise levels inside the Avalon Court Apartments (with windows closed) would be at least 20 dBA lower than the modeling outdoor noise levels, so the indoor noise levels from construction would be 52 dBA at Site 9 and 49 dBA at Site 17.

Construction traffic would consist of two loaded trucks and two unloaded trucks per hour. These trucks would not cause an increase in the ambient noise levels.

**Table 3 Modeled Construction Noise Levels with and without 14-foot Barrier**

Site	Location	Construction Noise Levels (without Barrier)	Construction Noise Levels (with 14-foot-high Barrier)	Reduction in Construction Leq dBA with 14-foot-high barrier
1	3660 N Mountain View Avenue	55.61	49.27	6.34
2	3702 N Mountain View Avenue	62.21	55.65	6.56
3	3780 N Mountain View Avenue	72.01	62.33	9.68
4	228 Edgerton Drive	71.02	61.63	9.39
5	3850 Electric Avenue	65.5	58.35	7.15
6	3883 Electric Avenue	57.83	52.28	5.55
7	264 West 39th Street	50.66	44.54	6.12
8	3693 N Mountain View Avenue	58.93	53.46	5.47
9	3728 Genevive Street (northwest corner of Avalon Court Apartments)	79.6	71.77	7.83
10	3874 N Mountain View Avenue	64.15	57.37	6.78
11	3898 N Mountain View Avenue	57.16	52.03	5.13
12	3932 N Mountain View Avenue	43.86	43.86	0
13	3902 Genevieve Street	46.56	46.56	0
14	3936 Genevieve Street	40.56	40.56	0
15	3694 Genevieve Street	49.52	48.75	0.77
16	3728 Genevive Street (Southern Building of Avalon Court Apartments)	52.73	52.66	0.07
17	3728 Genevive Street (NE corner of Avalon Court Apartments)	79.02	69.3	9.72
18	3693 Genevive Street	58.62	52.11	6.51
19	3787 Genevive Street	79.34	66.94	12.4
20	102-122 W 38th Street (California Department of Forestry and Fire Protection Museum)	73.24	64.16	9.08
21	130 W 39th Street	55	51.21	3.79
22	3904 N Seirra Way	44.64	44.64	0
23	102 W Parkside Drive	59.27	59.27	0
24	3792 N Seirra Way	72.31	63.71	8.6
25	3800-3870 N Seirra Way	66.02	62.65	3.37
26	3863 N Seirra Way	57.55	57.55	0
27	3811 N Seirra Way	58.99	55.66	3.33
28	3863 N Seirra Way	48.5	48.5	0
29	3917 N Seirra Way	44.4	44.4	0
30	Arrowhead Elementary School Playground	70.65	63.7	6.95

Notes: dBA = decibels A; Leq = equivalent continuous sound level.



## 5.4 CONSTRUCTION VIBRATION

### 5.4.1 STRUCTURE DAMAGE

The major vibration generating equipment and activities expected to be used during the demolition, excavation, and restoration of the Project site are presented in Table 3 along with the distance beyond which the damage risk criteria of 0.2 in/sec PPV would not be exceeded. Since none of the receivers within 200 feet of the Project site are historic structure a damage risk criterion of 0.12 PPV in/sec is not considered for this assessment. Equipment vibration reference emission levels used for the predictions were gathered from measurements performed and published by FTA. Equipment that may require noise modeling and assessment, such as generators and compressors, are not assessed for vibration impact.

All of the equipment presented in Table 3 can be operated without risk of exceeding the building damage threshold of 0.2 PPV in/sec at 80 feet or more, the closest building to the Project boundary.

Vibration levels from construction activities are predicted to be well below the FTA vibration damage thresholds (Table 4) if and when, certain types of equipment are used in close proximity to residences and other buildings. In particular, vibration annoyance could occur at residences within about 75 feet from the operation of large bulldozers. The nearest residential use is approximately 80 feet south of the Project area.

**Table 4 Distance to Construction Vibration Impact Threshold**

Equipment	PPV Ref Level at <sup>a</sup>						
	5 Feet	10 Feet	15 Feet	25 Feet	50 Feet	75 Feet	100 Feet
Large Bulldozer/Grader	0.995	0.352	0.191	0.089	0.031	0.017	0.011
Small Bulldozer/Excavator	0.034	0.012	0.003	0.003	0.001	0.001	0.000
Load Truck	0.850	0.300	0.164	0.076	0.027	0.015	0.010
Jack Hammer	0.391	0.138	0.075	0.035	0.012	0.007	0.004

Notes: PPV = peak particle velocity.

**Table 5 Vibration Guidelines for Potential Damage to Structures**

Structure Type and Condition	Maximum Peak Particle Velocity (PPV, in/sec)	
	Transient sources	Continuous/Frequent Intermittent sources
Extremely fragile historic buildings	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: California Department of Transportation. Transportation and Construction Vibration Guidance Manual, Table 19. April 2020 Available: <https://dot.ca.gov/programs/environmental-analysis/noise-vibration/guidance-manuals>. Accessed March 18, 2021

Notes: PPV = peak particle velocity; transient sources create a single, isolated vibration event (for example, blasting or drop balls). Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

### 5.4.2 UTILITY DAMAGE

Underground utilities are generally considered to be less susceptible to damage than surface structures because vibration under the ground surface is lower than at the ground surface, due to the dampening effects of the substrate.

The American Association of State Highway and Transportation Officials notes that at least one utility has established a standard maximum vibration of 4.0 in/sec PPV for buried utilities, noting that underground or restrained concrete structures can withstand vibration of 10.0 in/sec PPV before threshold cracks appear.

Construction would not include impact pile-driving, and vibration from other construction equipment would be similar to the vibration from the construction staging activities that occurred on the site for several years.

Therefore, the vibration impacts to buildings/structures would be less than significant.

#### ***5.4.3 INTERFERENCE WITH VIBRATION-SENSITIVE EQUIPMENT***

There are no special buildings (for example, hospitals, medical research facilities, or medical offices facilities) that have vibration-sensitive equipment within 1,000 feet of the Project site.

#### ***5.4.4 SLEEP DISTURBANCE***

It is not anticipated that night-time construction would occur. Regardless, activities would not include the use of vibratory equipment; therefore, nighttime construction would not result in vibration-related sleep disturbance as no vibration generating equipment would be used during nighttime construction and impacts would be less than significant and no mitigation would be required.



## 6 MEASURES TO MINIMIZE POTENTIAL IMPACTS

---

### 6.1 OPERATIONAL NOISE AND VIBRATION

Although no noise or vibration impacts are anticipated due to the operation of the SBCFS No. 227, measures will be taken during the design of the facility to minimize noise in the surrounding neighborhood. In particular, any stationary equipment such as ventilation systems will be designed to meet the San Bernardino County Noise Ordinance nighttime noise limit of 65 dBA or the ambient levels at the nearest residential property lines.

---

### 6.2 CONSTRUCTION NOISE AND VIBRATION

All construction activities will be carried out in compliance with the applicable noise limits of the City of San Bernardino County Noise Ordinances. In addition, a more detailed assessment of construction noise and vibration impact will be carried out prior to construction when more information is available about construction processes, and the following construction noise and vibration mitigation measures will be implemented to the extent practical:

- Construct noise barriers, such as temporary walls or piles of excavated material, between noisy activities and noise-sensitive receivers
- Locate stationary equipment on the construction site as far away from noise sensitive sites as possible
- Attach noise-deadening material to the inside of hoppers, conveyor transfer points or chutes
- Limit the number and duration of equipment idling on the site, the use of annunciators of public address systems, and the use of air or gasoline-driven hand tools
- Minimize noise from the use of backup alarms using measures that meet OSHA regulations (for example, using self-adjusting ambient-sensitive backup alarms, using manually adjustable alarms on a low setting, using observers and configuring construction sites, or scheduling activities to minimize alarm use)
- Operate earth-moving equipment on the construction site as far away from vibration-sensitive sites as possible
- Avoid the use of vibratory rollers and packers near sensitive areas

# 7 REFERENCES

## Caltrans (California Department of Transportation)

- 2009 Noise Technical Supplement. 2009. Available: [https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/Soitec-Documents/Final-EIR-Files/references/rtcref/ais/2014-12-19\\_Caltrans2009\\_OPT\\_Part2.pdf](https://www.sandiegocounty.gov/content/dam/sdc/pds/ceqa/Soitec-Documents/Final-EIR-Files/references/rtcref/ais/2014-12-19_Caltrans2009_OPT_Part2.pdf). Accessed February 2025
- 2020 Transportation and Construction Vibration Guidance Manual, Table 19. April 2020 Available: <https://dot.ca.gov/programs/environmental-analysis/noise-vibration/guidance-manuals>. Accessed February 2025