Appendix H

Environmental Noise Assessment

Bridle Gate Residential

Brentwood, California

January 26, 2023

Project #211206

Prepared for:

WCHB Development, LLC
4021 Port Chicago Hwy #H
Concord, CA 94520

Prepared by:

Saxelby Acoustics LLC

Luke Saxelby, INCE Bd. Cert.
Principal Consultant
Board Certified, Institute of Noise Control Engineering (INCE)

(916) 760-8821
www.SaxNoise.com | Luke@SaxNoise.com
915 Highland Pointe Drive, Suite 250
Roseville, CA 95678

Table of Contents

Appendices

List of Figures

List of Tables

INTRODUCTION

The Bridle Gate Residential project consists of the development of a 286-lot single-family subdivision on a vacant parcel.[1] The project is located south of Sand Creek Road and west of Highway 4 in the City of Brentwood, California.

Figure 1 shows the project site plan. **Figure 2** shows an aerial photo of the project site.

ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE

Fundamentals of Acoustics

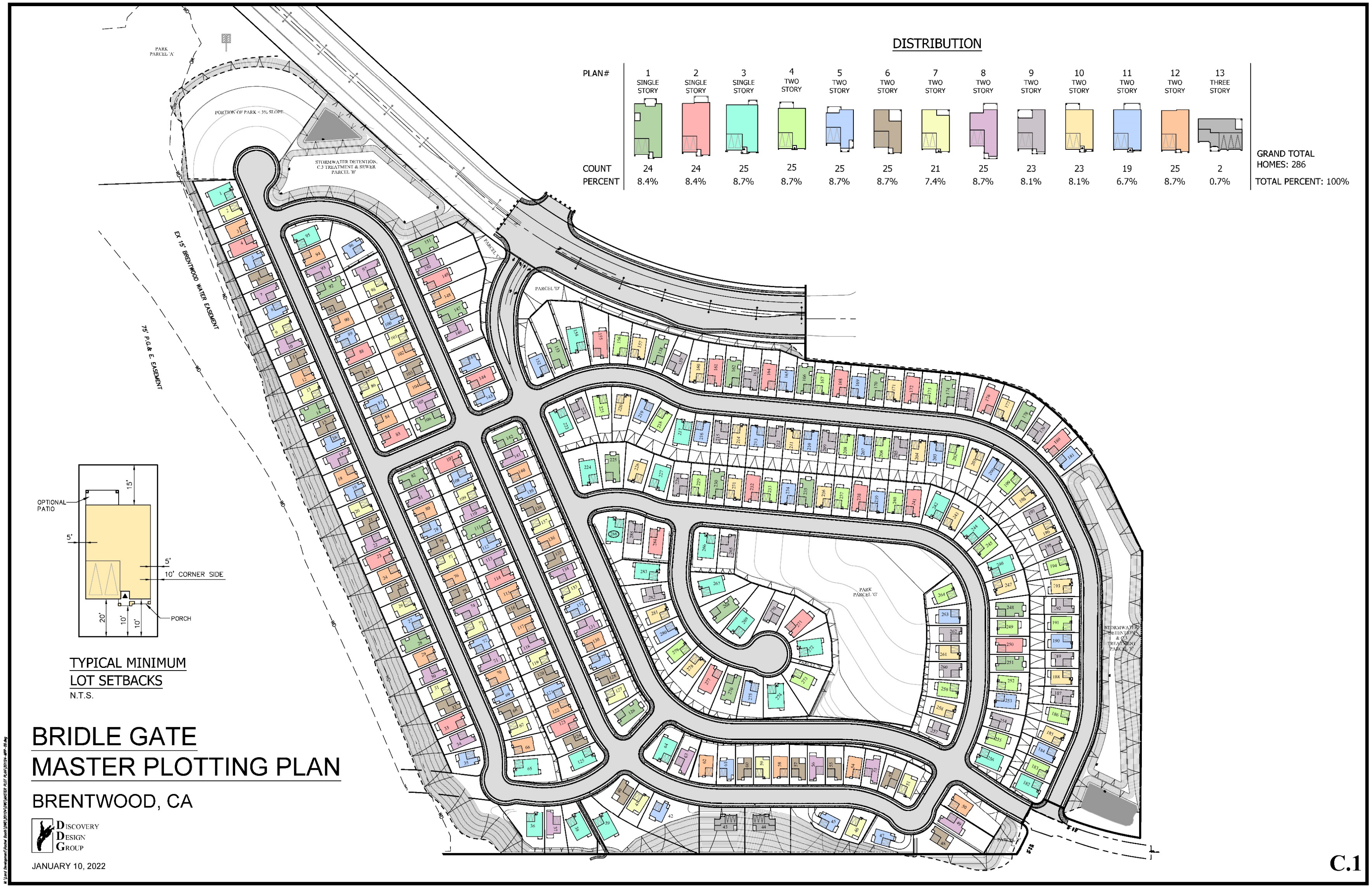
Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment.

[1] The Project was studied at a density of 292 units for the sake of being conservative.



Bridle Gate Residential

City of Brentwood, California

Figure 1

Project Site Plan

SAXELBY ACOUSTICS

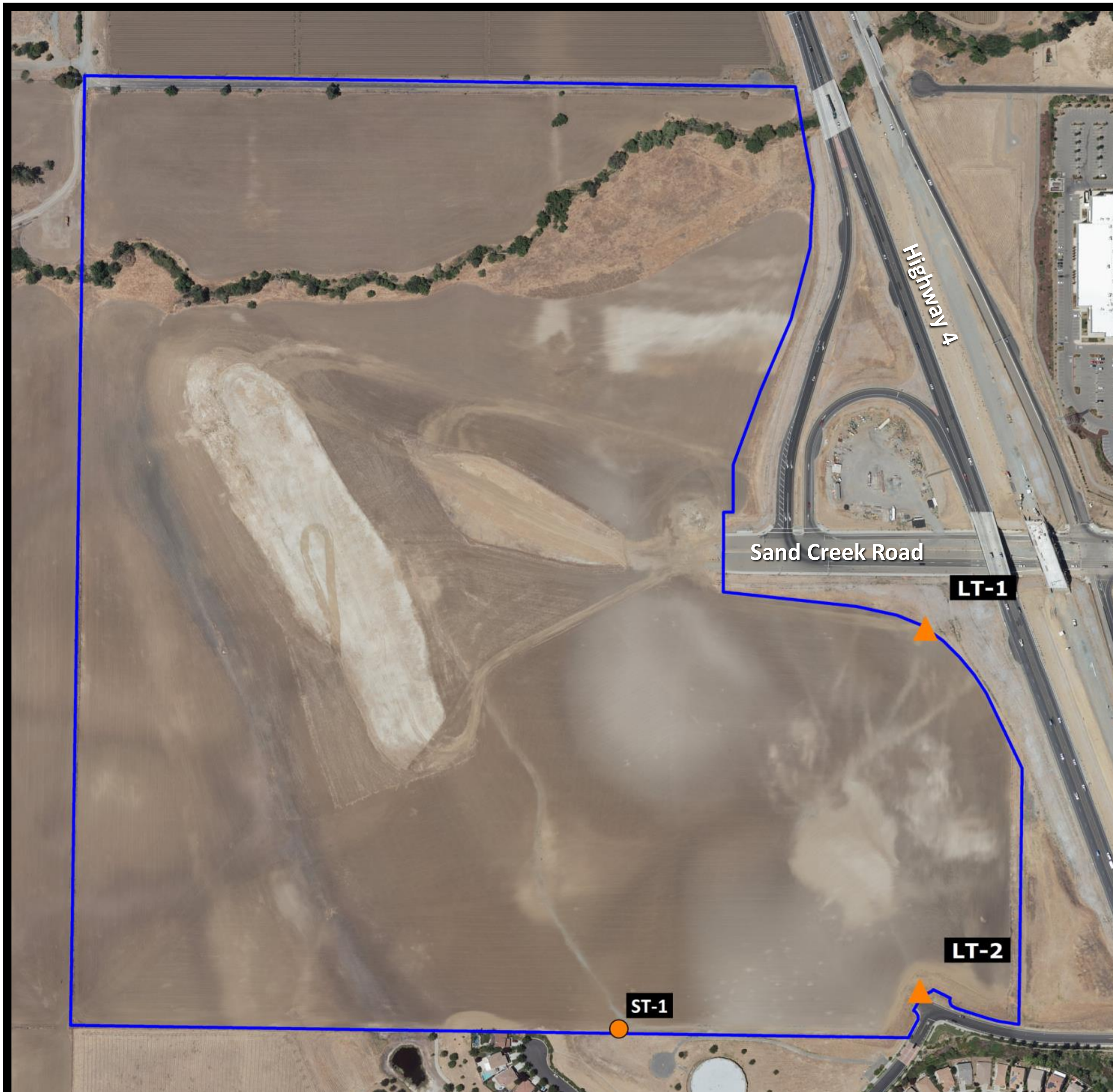
Acoustics • Noise • Vibration

Bridle Gate Residential

City of Brentwood, California

Figure 2

Noise Measurement Sites



Legend

- Project Site
- Noise Measurement - Short Term
- Noise Measurement Site - Long Term

0 ft 1000 ft 2000 ft 3000 ft 4000 ft 5000 ft

Projection: State Plane (California Zone 3) / NAD83 / meters
Rev. Date: 02/03/2022

SAXELBY ACOUSTICS
Acoustics · Noise · Vibration

The decibel scale is logarithmic, not linear. In other words, two sound levels 10-dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10-dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A-weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (DNL or L_{dn}) is based upon the average noise level over a 24-hour day, with a +10-decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Table 1 lists several examples of the noise levels associated with common situations. **Appendix A** provides a summary of acoustical terms used in this report.

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft.)	--100--	
Gas Lawn Mower at 1 m (3 ft.)	--90--	
Diesel Truck at 15 m (50 ft.), at 80 km/hr. (50 mph)	--80--	Food Blender at 1 m (3 ft.) Garbage Disposal at 1 m (3 ft.)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft.)	--70--	Vacuum Cleaner at 3 m (10 ft.)
Commercial Area Heavy Traffic at 90 m (300 ft.)	--60--	Normal Speech at 1 m (3 ft.)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. September, 2013.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1-dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise–including stationary mobile sources such as idling vehicles–attenuate (lessen) at a rate of approximately 6-dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

EXISTING AND FUTURE NOISE AND VIBRATION ENVIRONMENTS

EXISTING NOISE RECEPTORS

Some land uses are considered more sensitive to noise than others. Land uses often associated with sensitive receptors generally include residences, schools, libraries, hospitals, and passive recreational areas. Sensitive noise receptors may also include threatened or endangered noise sensitive biological species, although many jurisdictions have not adopted noise standards for wildlife areas. Noise sensitive land uses are typically given special attention in order to achieve protection from excessive noise.

Sensitivity is a function of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities involved. In the vicinity of the project site, sensitive land uses include existing single-family residential uses located south of the project site.

EXISTING GENERAL AMBIENT NOISE LEVELS

The existing noise environment in the project area is primarily defined by traffic on Highway 4 directly east of the project site.

To quantify the existing ambient noise environment in the project vicinity, Saxelby Acoustics conducted continuous (24-hr.) noise level measurements at two locations on the project site and short-term noise level measurements at one location. Noise measurement locations are shown on **Figure 2**. A summary of the noise level measurement survey results is provided in **Table 2**. **Appendix B** contains the complete results of the noise monitoring.

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

Larson Davis Laboratories (LDL) model 820 and 831 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with a B&K Model 4230 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

TABLE 2: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

Site	Date	L_{dn}	Daytime L_{eq}	Daytime L_{50}	Daytime L_{max}	Nighttime L_{eq}	Nighttime L_{50}	Nighttime L_{max}
LT-1	1/6/2022	70	68	67	81	62	59	74
LT-2	1/6/2022	62	59	57	76	56	50	70
ST-1	1/5/2022	N/A	55	55	66	N/A	N/A	N/A

Notes:

- *All values shown in dBA*
- *Daytime hours: 7:00 a.m. to 10:00 p.m.*
- *Nighttime Hours: 10:00 p.m. to 7:00 a.m.*
- *Source: Saxelby Acoustics 2022*

FUTURE TRAFFIC NOISE ENVIRONMENT AT OFF-SITE RECEPTORS

OFF-SITE TRAFFIC NOISE IMPACT ASSESSMENT METHODOLOGY

To assess noise impacts due to project-related traffic increases on the local roadway network, traffic noise levels are predicted at sensitive receptors for Existing and Existing Plus Project conditions.

Noise levels due to traffic are calculated using the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108). The model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict traffic noise levels in terms of L_{dn}, it is necessary to adjust the input volume to account for the day/night distribution of traffic.

Project trip generation volumes were provided by the project traffic engineer (Kimley Horn 2020), truck usage and vehicle speeds on the local area roadways were estimated from field observations. The predicted increases in traffic noise levels on the local roadway network for Existing and Cumulative conditions which would result from the project are provided in terms of L_{dn}. It should be noted that the current project traffic is predicted to be less than that assumed under the 2020 traffic noise study. Therefore, this analysis of off-site traffic noise increases is considered conservative.

Traffic noise levels are predicted at the sensitive receptors located at the closest typical setback distance along each project-area roadway segment. In some locations sensitive receptors may not receive full shielding from noise barriers or may be located at distances which vary from the assumed calculation distance.

Tables 3 and 4 summarize the modeled traffic noise levels at the nearest sensitive receptors along each roadway segment in the Project area. **Appendix C** provides the complete inputs and results of the FHWA traffic noise modeling.

TABLE 3: EXISTING TRAFFIC NOISE LEVELS AND PROJECT-RELATED TRAFFIC NOISE LEVEL INCREASES

Roadway	Segment	Predicted Exterior Noise Level (dBA L_{dn}) at Closest Sensitive Receptors		
		Existing No Project	Existing + Project	Change
Heidorn Ranch Rd.	South of Lone Tree Way	58.1	59.0	0.9
Lone Tree Way	East of Heidorn Ranch Rd.	67.9	68.0	0.1
Sand Creek Road	East of Shady Willow Ln.	64.2	64.5	0.3
St. Regis Ave.	South of San Jose Ave.	58.1	58.5	0.4
San Jose Ave.	East of St. Regis Ave.	56.4	56.7	0.3
San Jose Ave.	West of Portofino Dr.	55.5	55.9	0.4
San Jose Ave.	East of Portofino Dr.	55.3	55.6	0.3
Balfour Rd.	East of SR-4	63.2	63.2	0.0
W. Country Club Dr.	North of Balfour Rd.	52.8	52.9	0.1
Balfour Rd.	East of W. Country Club Dr.	58.8	59.0	0.2
Balfour Rd.	West of E. Country Club Dr.	59.0	59.1	0.1
E. Country Club Dr.	North of Balfour Rd.	49.1	49.2	0.1
Balfour Rd.	East of E. Country Club Dr.	61.4	61.5	0.1
Foothill Dr.	South of Balfour Rd.	48.8	48.8	0.0
Presidio Dr.	North of W. Country Club Dr.	55.8	55.9	0.1
W. Country Club Dr.	West of Presidio Dr.	54.0	54.1	0.1
W. Country Club Dr.	East of Presidio Dr.	46.5	46.5	0.0
E. Country Club Dr.	West of Roundhill Dr.	50.3	50.3	0.0

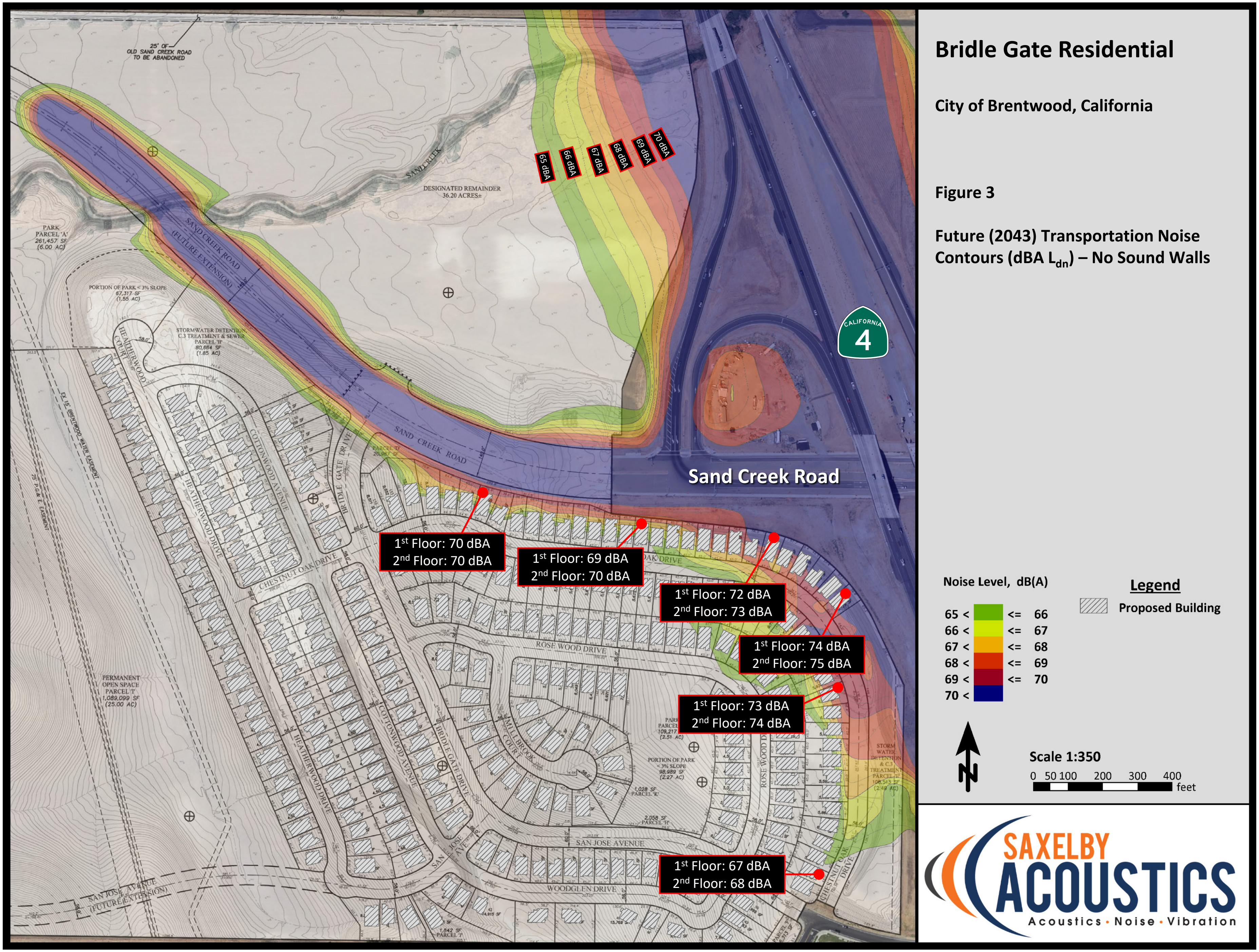
TABLE 4: CUMULATIVE TRAFFIC NOISE LEVELS AND PROJECT-RELATED TRAFFIC NOISE LEVEL INCREASES

Roadway	Segment	Predicted Exterior Noise Level (dBA L_{dn}) at Closest Sensitive Receptors		
		Existing No Project	Existing + Project	Change
Heidorn Ranch Rd.	South of Lone Tree Way	61.6	61.6	0.0
Lone Tree Way	East of Heidorn Ranch Rd.	69.8	69.9	0.1
Sand Creek Road	East of Shady Willow Ln.	65.0	65.2	0.2
St. Regis Ave.	South of San Jose Ave.	58.1	58.4	0.3
San Jose Ave.	East of St. Regis Ave.	56.4	56.7	0.3
San Jose Ave.	West of Portofino Dr.	55.7	56.1	0.4
San Jose Ave.	East of Portofino Dr.	55.5	55.8	0.3
Balfour Rd.	East of SR-4	64.7	64.7	0.0
W. Country Club Dr.	North of Balfour Rd.	56.1	56.1	0.0
Balfour Rd.	East of W. Country Club Dr.	59.2	59.4	0.2
Balfour Rd.	West of E. Country Club Dr.	59.4	59.6	0.2
E. Country Club Dr.	North of Balfour Rd.	50.4	50.5	0.1
Balfour Rd.	East of E. Country Club Dr.	62.2	62.3	0.1
Foothill Dr.	South of Balfour Rd.	49.5	49.5	0.0
Presidio Dr.	North of W. Country Club Dr.	55.9	56.0	0.1
W. Country Club Dr.	West of Presidio Dr.	54.2	54.3	0.1
W. Country Club Dr.	East of Presidio Dr.	47.1	47.1	0.0
E. Country Club Dr.	West of Roundhill Dr.	51.0	51.0	0.0

Based upon the data in **Tables 3 and 4**, the proposed project is predicted to result in an increase in a maximum traffic noise level increase of 0.9 dBA.

EVALUATION OF TRANSPORTATION NOISE ON PROJECT SITE

Saxelby Acoustics used the SoundPLAN noise model to calculate traffic noise levels at the proposed single-family uses due to traffic on Highway 4 and the local roadway network. Traffic noise levels include a +2 dBA adjustment for future conditions. The results of this analysis are shown graphically on **Figure 3**. **Appendix D** contains the complete inputs for the SoundPLAN analysis.


Bridle Gate Residential
City of Brentwood, California
Figure 3
Future (2043) Transportation Noise Contours (dBA L_{dn}) – No Sound Walls
Sand Creek Road
65 dBA
66 dBA
67 dBA
68 dBA
69 dBA
70 dBA
1st Floor: 70 dBA
2nd Floor: 70 dBA
1st Floor: 69 dBA
2nd Floor: 70 dBA
1st Floor: 72 dBA
2nd Floor: 73 dBA
1st Floor: 74 dBA
2nd Floor: 75 dBA
1st Floor: 73 dBA
2nd Floor: 74 dBA
1st Floor: 67 dBA
2nd Floor: 68 dBA
CALIFORNIA 4
Noise Level, dB(A)
65 < <= 66
66 < <= 67
67 < <= 68
68 < <= 69
69 < <= 70
70 <
Legend
Proposed Building
N
Scale 1:350
0 50 100 200 300 400 feet
SAXELBY ACOUSTICS
Acoustics • Noise • Vibration

CONSTRUCTION NOISE ENVIRONMENT

During the construction of the proposed project, including roads, water and sewer lines, and related infrastructure, noise from construction activities would temporarily add to the noise environment in the project vicinity. As shown in **Table 5**, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dB at a distance of 50 feet.

TABLE 5: CONSTRUCTION EQUIPMENT NOISE

Type of Equipment	Maximum Level, dBA at 50 feet
Auger Drill Rig	84
Backhoe	78
Compactor	83
Compressor (air)	78
Concrete Saw	90
Dozer	82
Dump Truck	76
Excavator	81
Generator	81
Jackhammer	89
Pneumatic Tools	85

Source: *Roadway Construction Noise Model User's Guide*. Federal Highway Administration. FHWA-HEP-05-054. January 2006.

CONSTRUCTION VIBRATION ENVIRONMENT

The primary vibration-generating activities associated with the proposed project would occur during construction when activities such as grading, utilities placement, and parking lot construction occur. **Table 6** shows the typical vibration levels produced by construction equipment.

TABLE 6: VIBRATION LEVELS FOR VARIOUS CONSTRUCTION EQUIPMENT

Type of Equipment	Peak Particle Velocity at 25 feet (inches/second)	Peak Particle Velocity at 50 feet (inches/second)	Peak Particle Velocity at 100 feet (inches/second)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210 (Less than 0.20 at 26 feet)	0.074	0.026

Source: *Transit Noise and Vibration Impact Assessment Guidelines.* Federal Transit Administration. May 2006.

REGULATORY CONTEXT

FEDERAL

There are no federal regulations related to noise that apply to the Proposed Project.

STATE

There are no state regulations related to noise that apply to the Proposed Project.

LOCAL

City of Brentwood General Plan

Policies

Policy N 1-1: Ensure the noise compatibility of existing and future development when making land use planning decisions.

Policy N 1-2: Require development and infrastructure projects to be consistent with the Land Use Compatibility for Community Noise Environments standards indicated in Table N-1 to ensure acceptable noise levels for existing and future development.

Policy N 1-3: Require new development to mitigate excessive noise through best practices, including building location and orientation, building design features, placement of noise-generating equipment away from sensitive receptors, shielding of noise-generating equipment, placement of noise-tolerant features between noise sources and sensitive receptors, and use of noise-minimizing materials such as rubberized asphalt.

Policy N 1-7: For projects that are required by the California Environmental Quality Act (CEQA) to analyze noise impacts, the following criteria shall be used to determine the significance of those impacts:

Stationary and Non-Transportation Noise Sources

- A significant impact will occur if the project results in an exceedance of the noise level standards contained in this element, or the project will result in an increase in ambient noise levels by more than 3 dB, whichever is greater.

Transportation Noise Sources

- Where existing traffic noise levels are less than 60 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +5 dB L_{dn} increase in roadway noise levels will be considered significant; and

- Where existing traffic noise levels range between 60 and 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a +3 dB L_{dn} increase in roadway noise levels will be considered significant; and

- Where existing traffic noise levels are greater than 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses, a + 1.5 dB L_{dn} increase in roadway noise levels will be considered significant.

Policy N 1-14: Ensure that new development does not result in indoor noise levels exceeding 45 dBA Ldn for residential uses.

Policy N 1-15: Require construction activities to comply with standard best practices (see Action N 1e).

Policy N 2-1: Recognizing that existing and future traffic noise along the State Route 4 corridor, major arterials within Brentwood, and noise from the UPRR [Union Pacific Railroad] are areas of potential land use conflict for existing and future development, reasonable use of this land will be allowed with an exterior noise exposure level not exceeding 65 dB Ldn. New development that includes noise-sensitive uses (i.e., residential) along the State Route 4 corridor, major arterials, and the UPRR should incorporate appropriate noise attenuation measures in order to maintain interior noise levels of 45 dB Ldn or less. Application of this noise standard is intended to provide for reasonable exterior noise levels while discouraging the use of excessively high and/or unattractive sound walls.

<u>Action N 1e:</u> *During the environmental review process, determine if proposed construction will constitute a significant impact on nearby residents and, if necessary, require mitigation measures in* *addition to the standard best practice controls. Suggested best practices for control of construction noise include:*

1. Construction period shall be less than 12 months.

2. Noise-generating construction activities, including truck traffic coming to and from the construction site for any purpose, shall be limited to between the hours of 7:00 am and 6:00 pm on weekdays, and between 8:00 am and 5:00 pm on Saturdays. No construction shall occur on Sundays or City holidays.

3. All equipment driven by internal combustion engines shall be equipped with mufflers, which are in good condition and appropriate for the equipment.

4. The construction contractor shall utilize "quiet" models of air compressors and other stationary noise sources where technology exists.

5. At all times during project grading and construction, stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from residences.

6. Unnecessary idling of internal combustion engines shall be prohibited.

7. 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 activities, to the extent feasible.

8. The required construction-related noise mitigation plan shall also specify that haul truck deliveries are subject to the same hours specified for construction equipment.

9. Neighbors located adjacent to the construction site shall be notified of the construction schedule in writing.

10. The construction contractor shall designate a "noise disturbance coordinator" who will be responsible for responding to any local complaints about construction noise. The disturbance coordinator shall be responsible for determining the cause of the noise complaint (e.g., starting too early, poor muffler, etc.) and instituting reasonable measures as warranted to correct the problem. A telephone number for the disturbance coordinator shall be conspicuously posted at the construction site.

TABLE N-1 LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENT						
Land Use Category	Exterior Noise Exposure (Ldn)					
	55	60	65	70	75	80
Single-Family Residential						
Multi-Family Residential, Hotels, and Motels						
Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds						
Schools, Libraries, Museums, Hospitals, Personal Care, Meeting Halls, Churches						
Office Buildings, Business Commercial, and Professional						
Industrial						

NORMALLY ACCEPTABLE

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

Based upon Table N-1 of the City of Brentwood General Plan, residential uses are considered normally acceptable in ambient noise environments up to 60 dBA L_{dn}, and conditionally acceptable in noise environments up to 75 dBA L_{dn}. However, policy N-1 limits exterior noise levels to 65 dBA L_{dn} for new residential uses adjacent to State Route 4 corridor, major arterials within Brentwood, and noise from the UPRR. The City of Brentwood also establishes an interior noise level criterion of 45 dBA L_{dn} for residential uses.

Criteria for Acceptable Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception of the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities (p.p.v.) in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. **Table 7**, which was developed by Caltrans, shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of peak particle velocity in inches per second.

Table 7 indicates that the threshold for architectural damage to structures is 0.20 in/sec p.p.v. A threshold of 0.2 in/sec p.p.v. is considered to be a reasonable threshold for short-term construction projects.

TABLE 7: EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS

Peak Particle Velocity		Human Reaction	Effect on Buildings
mm/second	in/second		
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of "architectural" damage to normal dwelling - houses with plastered walls and ceilings. Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize "architectural" damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: *Transportation Related Earthborne Vibrations.* Caltrans. TAV-02-01-R9601. February 20, 2002.

IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Appendix G of the CEQA Guidelines states that a project would normally be considered to result in significant noise impacts if noise levels conflict with adopted environmental standards or plans, or if noise generated by the project would substantially increase existing noise levels at sensitive receivers on a permanent or temporary basis. Significance criteria for noise impacts are drawn from CEQA Guidelines Appendix G (Items XI [a-f]).

Would the project:

a. Generate 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. Generate 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, would the project expose people residing or working in the project area to excessive noise levels?

NOISE LEVEL INCREASE CRITERIA FOR LONG-TERM PROJECT-RELATED NOISE LEVEL INCREASES

The California Environmental Quality Act (CEQA) guidelines define a significant impact of a project if it "increases substantially the ambient noise levels for adjoining areas." Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local project criteria or ordinances, or substantially increase noise levels at noise sensitive land uses. The potential increase in traffic noise from the project is a factor in determining significance. Research into the human perception of changes in sound level indicates the following:

- A 3dB change is barely perceptible,
- A 5dB change is clearly perceptible, and
- A 10dB change is perceived as being twice or half as loud.

A limitation of using a single noise level increase value to evaluate noise impacts is that it fails to account for pre-project-noise conditions. **Table 8** is based upon recommendations made by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it is widely accepted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the L_{dn}.

TABLE 8: SIGNIFICANCE OF CHANGES IN NOISE EXPOSURE

Ambient Noise Level Without Project, Ldn	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the **Table 8** data, an increase in the traffic noise level of 5 dB or more would be significant where the pre-project noise levels are less than 60 dB Ldn, or 3 dB or more where existing noise levels are between 60 to 65 dB Ldn. Extending this concept to higher noise levels, an increase in the traffic noise level of 1.5 dB or more may be significant where the pre-project traffic noise level exceeds 65 dB Ldn. The rationale for the **Table 8** criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance. It is noted that General Plan Policy N 1-7 formally adopts this methodology for evaluating traffic noise increases.

PROJECT-SPECIFIC IMPACTS AND MITIGATION MEASURES

IMPACT 1: WOULD THE PROJECT GENERATE 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?

Traffic Noise Increases

As discussed, the substantial increase criteria range between +1.5 dBA to +5 dBA, depending on the existing noise levels. Under the proposed project, the maximum increase in traffic noise at the nearest sensitive receptor is predicted to be 0.9 dBA as shown in **Tables 3 and 4**. Therefore, impacts resulting from increased traffic noise would be considered ***less-than-significant***.

Operational Noise Increases

The proposed project would include typical residential noise which would be compatible with the existing adjacent residential uses.

Construction Noise

During the construction phases of the project, noise from construction activities would add to the noise environment in the immediate project vicinity. As indicated in **Table 5**, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dBA L_{max} at a distance of 50 feet. The great majority of the building construction would occur at distances of 50 feet or greater from the nearest residences, and at distances where construction noise would not be perceptible. Construction noise associated with streets would be similar to noise that would be associated with public works projects, such as a roadway widening or paving projects.

Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours.

Noise would also be generated during the construction phase by increased truck traffic on area roadways. A project-generated noise source would be truck traffic associated with transport of heavy materials and equipment to and from the construction site. This noise increase would be of short duration and would likely occur primarily during daytime hours.

Construction activities are conditionally exempt from the Noise Ordinance during certain hours. Construction activities are exempt from the noise standard from 8 AM to 5 PM Monday through Friday, and from 9 AM to 4 PM on Saturdays. No construction shall occur on Sundays or City holidays.

Although construction activities are temporary in nature and would likely occur during normal daytime working hours, construction-related noise could result in sleep interference at existing noise-sensitive land uses in the vicinity of the construction if construction activities were to occur outside the normal daytime hours. Therefore, impacts resulting from noise levels temporarily exceeding the threshold of significance due to construction would be considered ***potentially significant***.

Transportation Noise on Project Site (Non-CEQA Issue)

Exterior Transportation Noise

Compliance with City standards on new noise-sensitive receptors is not a CEQA consideration. However, this information is provided here so that a determination can be made regarding the ability of the proposed project to meet the requirements of the City of Brentwood for exterior and interior noise levels at new sensitive uses proposed under the project.

As shown on **Figure 3**, the proposed project would be exposed to exterior noise levels exceeding the City's 65 dBA L_{dn} exterior noise standard for residential uses along State Route 4 or major arterial roadways, as outlined in Policy N 2-1. With construction of the sound wall design show in **Figure 4,** proposed noise-sensitive residential uses would be exposed to exterior noise levels of 65 dBA L_{dn}, or less. This would comply with the City's 65 dBA standard.

Bridle Gate Residential

City of Brentwood, California

Figure 4

Future (2043) Transportation Noise Contours (dBA L_{dn}) – with Sound Walls

Noise Level, dB(A)

65 <		<=	66
66 <		<=	67
67 <		<=	68
68 <		<=	69
69 <		<=	70
70 <			

Legend

- Proposed Building
- 8-Foot Wall
- 10-Foot Wall
- 11-Foot Wall
- 12-Foot Wall

N

Scale 1:200

0 40 80 160 240 320 feet

SAXELBY ACOUSTICS

Acoustics • Noise • Vibration

Interior Transportation Noise

Based upon the exterior noise levels shown on **Figure 4**, the proposed project would be exposed to exterior noise levels of up to 63 dBA at first floors and up to 74 dBA L_{dn} at second floor building facades. As noted by Policy N 2-1, interior noise levels are required to be 45 dB L_{dn}, or less at receptors along the State Route 4, or major arterial corridors. Modern building construction methods typically yield an exterior-to-interior noise level reduction of 25 dBA. Therefore, where exterior noise levels are 70 dBA L_{dn}, or less, no additional interior noise control measures are typically required. For this project, exterior noise levels are predicted to be up to 63 dBA at first floors and 74 dBA L_{dn} at second floors, resulting in an interior noise level of approximately 38 dBA at first floors and 49 dBA L_{dn} at second floors, based on typical building construction. This would exceed the City's 45 dBA L_{dn} interior noise level standard for second floor areas of the proposed residential uses.

In order to meet the City's standard, additional interior noise control measures are needed. This would include the use of sound transmission class (STC) rated windows in the range of STC 34, or higher.

<u>Mitigation Measure(s)</u>
Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

1(a) *Construction activities shall be limited to the hours set forth below:*

Monday-Friday 8:00 AM to 5:00 PM
Saturday 9:00 AM to 4:00 PM

Construction shall be prohibited on Sundays and City holidays. These criteria shall be included in the grading plan submitted by the applicant/developer for review and approval of the Community Development Director prior to issuance of grading permits. Exceptions to allow expanded construction activities shall be reviewed on a case-by-case basis as determined by the Chief Building Official and/or City Engineer.

1(b) *The project contractor shall ensure that the following construction noise BMPs are met on-site during all phases of construction:*

- *All equipment driven by internal combustion engines shall be equipped with mufflers, air-inlet silencers where appropriate, and any other shrouds, shields, or other noise-reducing features in good operating condition that meet or exceed original factory specifications. Mobile or fixed "package" equipment (e.g., arc welders, air compressors) shall be equipped with shrouds and noise- control features that are readily available for that type of equipment.*
- *All mobile or fixed noise-producing equipment used on the project site that are regulated for noise output by a federal, state, or local agency shall comply with such regulations while in the course of project activity.*
- *The construction contractor shall utilize "quiet" models of air compressors and other stationary noise sources where technology exists.*

- *At all times during project grading and construction, stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from residences.*
- *Unnecessary idling of internal combustion engines shall be prohibited.*
- *Construction staging areas shall be established at locations that would create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction activities, to the extent feasible.*
- *Construction site and access road speed limits shall be established and enforced during the construction period.*
- *The use of noise-producing signals, including horns, whistles, alarms, and bells, shall be for safety warning purposes only.*
- *Project-related public address or music systems shall not be audible at any adjacent receptor.*
- *Neighbors located adjacent to the construction site shall be notified of the construction schedule in writing.*
- *The construction contractor shall designate a "noise disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator shall be responsible for determining the cause of the noise complaint (e.g., starting too early, poor muffler, etc.) and instituting reasonable measures as warranted to correct the problem. A telephone number for the disturbance coordinator shall be conspicuously posted at the construction site.*

Construction noise BMPs shall be included in the grading plan submitted by the developer for review and approval by the Community Development Director prior to grading permit issuance.

<u>Recommended Condition of Approval</u>

*Prior to approval of project improvement plans, the plans for the proposed project shall show that the first-row lots shall be shielded from State Route 4 and Sand Creek Road through the use of masonry sound walls per the approval of the City Engineer. The approximate locations of these barriers are shown on **Figure 4**. Other types of barriers may be employed but shall be reviewed by an acoustical engineer prior to being constructed. Sound wall heights are assumed to be relative to building pad elevations and may achieve the required wall height through use of earthen berm and wall combinations to achieve the total height. Additionally, second floor windows of the first row of residences along the State Route 4 corridor and Sand Creek Road, should have a minimum STC rating of 34 for windows with a view of either roadway. Alternatively, an interior noise analysis shall be prepared by a qualified acoustic engineer outlining the measures required to meet the City's 45 dBA L_{dn} interior noise standard, especially at unshielded second floor facades along the State Route 4 corridor or Sand Creek Road.*

IMPACT 2: WOULD THE PROJECT GENERATE EXCESSIVE GROUNDBORNE VIBRATION OR GROUNDBORNE NOISE LEVELS?

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural.

The **Table 6** data indicate that construction vibration levels anticipated for the typical equipment used in residential construction projects are less than the 0.2 in/sec p.p.v. threshold at distances of 26 feet. This represents the most intensive construction vibration that would be expected with the use of vibratory compactors. Use of bulldozer, trucks, etc. would be expected to generate vibration levels of 0.09 in/sec p.p.v. at distances of 25 feet., well below the 0.2 in/sec p.p.v. criteria.

It should be noted that the 0.2 in/sec p.pv. threshold is considered a conservative threshold for temporary construction vibrations. The duration of vibration that would occur in close proximity to existing residential uses would be brief and extremely unlikely to cause even minor damage to modern structures.

Sensitive receptors which could be impacted by construction related vibrations, especially vibratory compactors/rollers, are generally located approximately 26 feet, or further, from typical construction activities. At these distances construction vibrations are not predicted to exceed acceptable levels. Additionally, construction activities would be temporary in nature and would likely occur during normal daytime working hours.

It should be noted that one residence at the end of La Sata Drive could be located closer than 26 feet from project construction. Therefore, this could be a potentially significant impact should use of a vibratory compactor be required at distances of less than 26 feet. Implementation of the following mitigation measure will ensure that these potential impacts are reduced to a **less than significant** level.

Mitigation Measure(s)
Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

(2) *Any compaction required less than 26 feet from any adjacent residential structures shall be accomplished by using static drum rollers which use weight instead of vibrations to achieve soil compaction. As an alternative to this requirement, pre-construction crack documentation and construction vibration monitoring could be conducted to ensure that construction vibrations do not cause damage to any adjacent structures.*

IMPACT 3: 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, WOULD THE PROJECT EXPOSE PEOPLE RESIDING OR WORKING IN THE PROJECT AREA TO EXCESSIVE NOISE LEVELS?

There are no airports within two miles of the project site. Therefore, this impact is not applicable to the proposed project.

REFERENCES

American National Standards Institute. (1998). *[Standard] ANSI S1.43-1997 (R2007): Specifications for integrating-averaging sound level meters*. New York: Acoustical Society of America.

American Standard Testing Methods, *Standard Guide for Measurement of Outdoor A-Weighted Sound Levels, American Standard Testing Methods (ASTM) E1014-08*, 2008.

ASTM E1014-12. *Standard Guide for Measurement of Outdoor A-Weighted Sound Levels*. ASTM International. West Conshohocken, PA. 2012.

ASTM E1780-12. *Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source.* ASTM International. West Conshohocken, PA. 2012.

Barry, T M. (1978). *FHWA highway traffic noise prediction model* (FHWA-RD-77-108). Washington, DC: U.S. Department of transportation, Federal highway administration, Office of research, Office of environmental policy.

California Department of Transportation (Caltrans), *Technical Noise Supplement, Traffic Noise Analysis Protocol*, September 2013.

City of Brentwood General Plan. July 22, 2014. Updated April 2019. https://www.brentwoodca.gov/civicax/filebank/blobdload.aspx?BlobID=52464

Egan, M. D. (1988). Architectural acoustics. United States of America: McGraw-Hill Book Company.

Federal Highway Administration. *FHWA Roadway Construction Noise Model User's Guide.* FHWA-HEP-05-054 DOT-VNTSC-FHWA-05-01. January 2006.

Hanson, Carl E. (Carl Elmer). (2006). *Transit noise and vibration impact assessment*. Washington, DC: U.S. Department of Transportation, Federal Transit Administration, Office of Planning and Environment.

International Electrotechnical Commission. Technical committee 29: Electroacoustics. International Organization of Legal Metrology. (2013). *Electroacoustics: Sound level meters*.

International Organization for Standardization. (1996). *Acoustic - ISO 9613-2: Attenuation of sound during propagation outdoors. Part 2: General methods of calculation*. Ginevra: I.S.O.

Miller, L. N., Bolt, Beranek, & and Newman, Inc. (1981). *Noise control for buildings and manufacturing plants*. Cambridge, MA: Bolt, Beranek and Newman, Inc.

SoundPLAN. SoundPLAN GmbH. Backnang, Germany. http://www.soundplan.eu/english/

Appendix A: Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
ASTC	Apparent Sound Transmission Class. Similar to STC but includes sound from flanking paths and correct for room reverberation. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by +5 dBA and nighttime hours weighted by +10 dBA.
DNL	See definition of Ldn.
IIC	Impact Insulation Class. An integer-number rating of how well a building floor attenuates impact sounds, such as footsteps. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	The highest root-mean-square (RMS) sound level measured over a given period of time.
L(n)	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50% of the time during the one-hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
NIC	Noise Isolation Class. A rating of the noise reduction between two spaces. Similar to STC but includes sound from flanking paths and no correction for room reverberation.
NNIC	Normalized Noise Isolation Class. Similar to NIC but includes a correction for room reverberation.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
RT60	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is a rating, in decibels, of a discrete event, such as an aircraft flyover or train pass by, that compresses the total sound energy into a one-second event.
SPC	Speech Privacy Class. SPC is a method of rating speech privacy in buildings. It is designed to measure the degree of speech privacy provided by a closed room, indicating the degree to which conversations occurring within are kept private from listeners outside the room.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations. The STC rating is typically used to rate the sound transmission of a specific building element when tested in laboratory conditions where flanking paths around the assembly don't exist. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

SAXELBY ACOUSTICS
Acoustics · Noise · Vibration

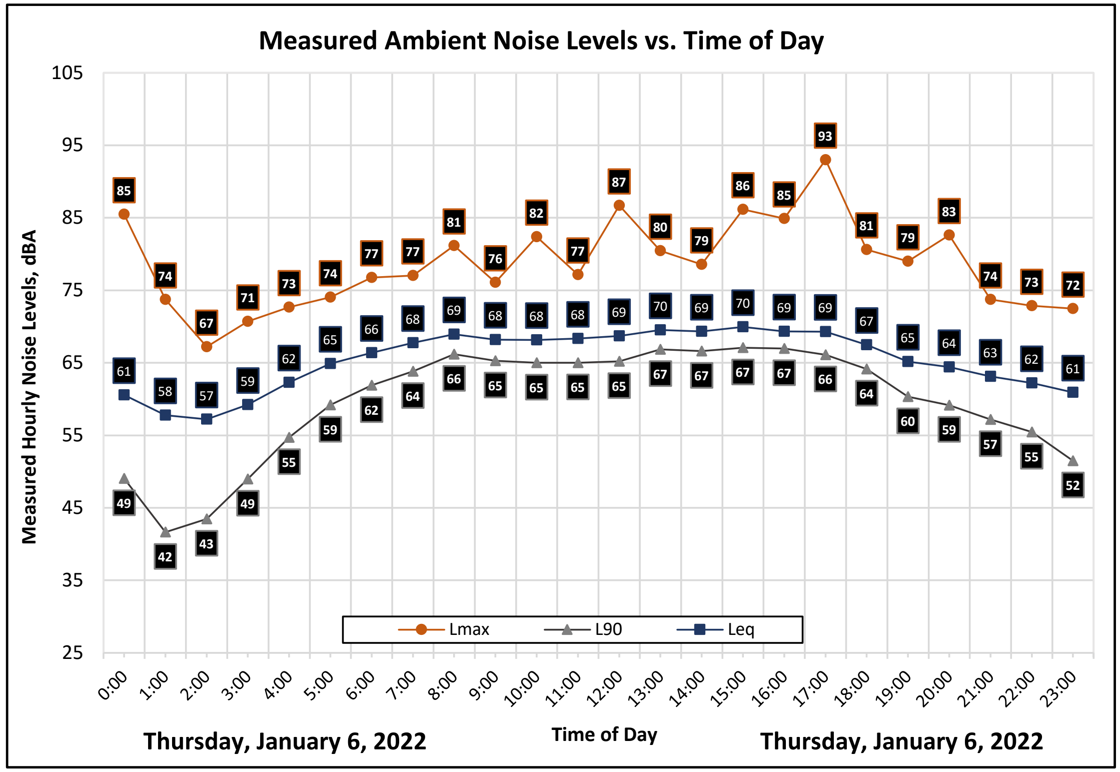
Appendix B: Continuous and Short-Term Ambient Noise Measurement Results

Appendix B1: Continuous Noise Monitoring Results

Site: LT-1
Project: Bridle Gate
Location: Northern Project Boundary
Coordinates: 37.9429929°, -121.7425704°
Meter: LDL 820-5
Calibrator: CAL200

Date	Time	Measured Level, dBA			
		L_{eq}	L_{max}	L_{50}	L_{90}
Thursday, January 6, 2022	0:00	61	85	56	49
Thursday, January 6, 2022	1:00	58	74	53	42
Thursday, January 6, 2022	2:00	57	67	54	43
Thursday, January 6, 2022	3:00	59	71	57	49
Thursday, January 6, 2022	4:00	62	73	61	55
Thursday, January 6, 2022	5:00	65	74	64	59
Thursday, January 6, 2022	6:00	66	77	66	62
Thursday, January 6, 2022	7:00	68	77	67	64
Thursday, January 6, 2022	8:00	69	81	69	66
Thursday, January 6, 2022	9:00	68	76	68	65
Thursday, January 6, 2022	10:00	68	82	68	65
Thursday, January 6, 2022	11:00	68	77	68	65
Thursday, January 6, 2022	12:00	69	87	68	65
Thursday, January 6, 2022	13:00	70	80	69	67
Thursday, January 6, 2022	14:00	69	79	69	67
Thursday, January 6, 2022	15:00	70	86	70	67
Thursday, January 6, 2022	16:00	69	85	69	67
Thursday, January 6, 2022	17:00	69	93	68	66
Thursday, January 6, 2022	18:00	67	81	67	64
Thursday, January 6, 2022	19:00	65	79	64	60
Thursday, January 6, 2022	20:00	64	83	63	59
Thursday, January 6, 2022	21:00	63	74	62	57
Thursday, January 6, 2022	22:00	62	73	61	55
Thursday, January 6, 2022	23:00	61	72	59	52

Statistics	Leq	Lmax	L50	L90
Day Average	68	81	67	64
Night Average	62	74	59	52
Day Low	63	74	62	57
Day High	70	93	70	67
Night Low	57	67	53	42
Night High	66	85	66	62
Ldn	70	Day %		88
CNEL	70	Night %		12

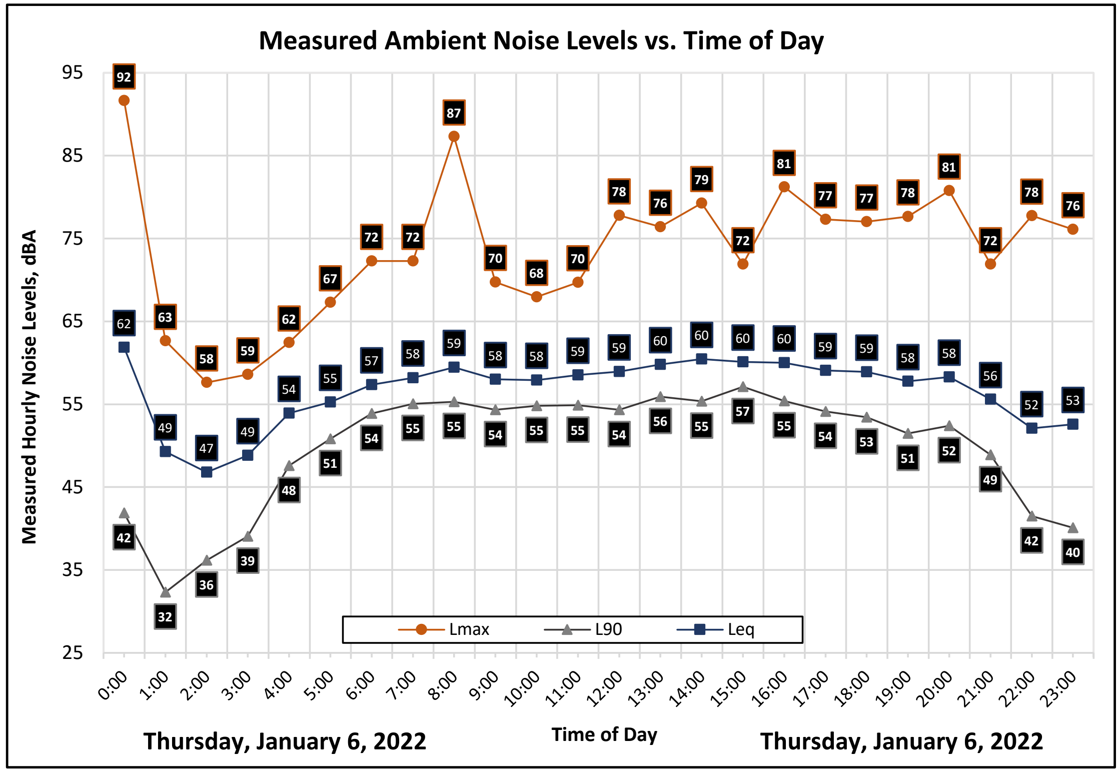


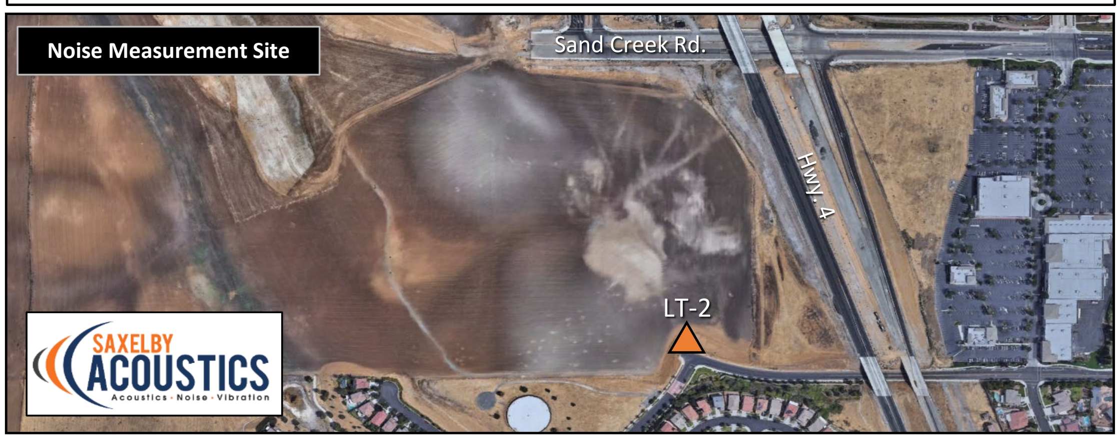
Appendix B2: Continuous Noise Monitoring Results

Site: LT-2
Project: Bridle Gate
Location: Southern Project Boundary
Coordinates: 37.9402057°, -121.7425781°
Meter: LDL 820-3
Calibrator: CAL200

Date	Time	Measured Level, dBA			
		L_{eq}	L_{max}	L_{50}	L_{90}
Thursday, January 6, 2022	0:00	62	92	49	42
Thursday, January 6, 2022	1:00	49	63	46	32
Thursday, January 6, 2022	2:00	47	58	44	36
Thursday, January 6, 2022	3:00	49	59	47	39
Thursday, January 6, 2022	4:00	54	62	53	48
Thursday, January 6, 2022	5:00	55	67	54	51
Thursday, January 6, 2022	6:00	57	72	57	54
Thursday, January 6, 2022	7:00	58	72	58	55
Thursday, January 6, 2022	8:00	59	87	58	55
Thursday, January 6, 2022	9:00	58	70	57	54
Thursday, January 6, 2022	10:00	58	68	58	55
Thursday, January 6, 2022	11:00	59	70	58	55
Thursday, January 6, 2022	12:00	59	78	58	54
Thursday, January 6, 2022	13:00	60	76	59	56
Thursday, January 6, 2022	14:00	60	79	59	55
Thursday, January 6, 2022	15:00	60	72	60	57
Thursday, January 6, 2022	16:00	60	81	58	55
Thursday, January 6, 2022	17:00	59	77	57	54
Thursday, January 6, 2022	18:00	59	77	57	53
Thursday, January 6, 2022	19:00	58	78	56	51
Thursday, January 6, 2022	20:00	58	81	56	52
Thursday, January 6, 2022	21:00	56	72	54	49
Thursday, January 6, 2022	22:00	52	78	47	42
Thursday, January 6, 2022	23:00	53	76	49	40

Statistics	Leq	Lmax	L50	L90
Day Average	59	76	57	54
Night Average	56	70	50	43
Day Low	56	68	54	49
Day High	60	87	60	57
Night Low	47	58	44	32
Night High	62	92	57	54
Ldn	62	Day %		79
CNEL	63	Night %		21





Appendix B3 : Short Term Noise Monitoring Results

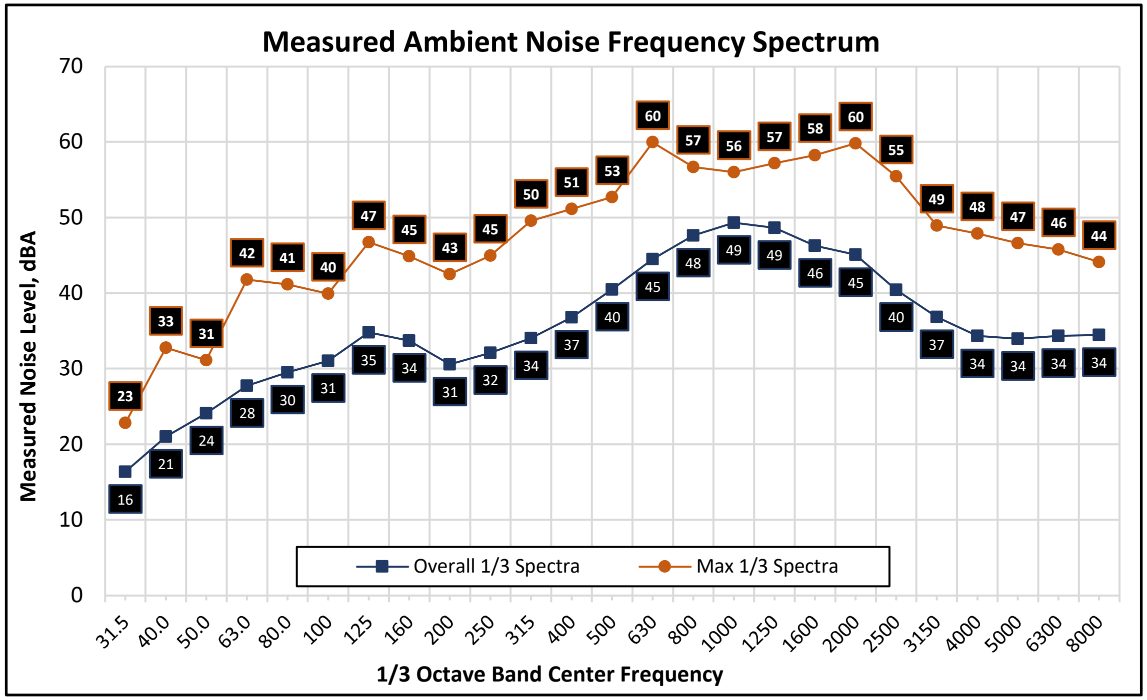
Site: ST-1
Project: Bridle Gate
Location: Southern Project Property Line
Coordinates: 37.9398765°, 121.7453572°
Meter: LDL 831-1
Calibrator: CAL200

Start: 2022-01-05 11:58:58
Stop: 2022-01-05 12:08:58
SLM: Model 831
Serial: 2658

Measurement Results, dBA	
Duration:	0:10
L_{eq}:	55
L_{max}:	66
L_{min}:	51
L_{50}:	55
L_{90}:	53

Notes

[redacted]



Appendix C: Traffic Noise Calculation Inputs and Results

Appendix C-1

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Project #: 211206
Description: Bridle Gate Residential - Existing Traffic
Ldn/CNEL: Ldn
Hard/Soft: Soft

												Contours (ft.) - No Offset			
Segment	Roadway	Segment	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)	60 dBA	65 dBA	70 dBA	Level, dBA
1	Heidorn Ranch Rd.	South of Lone Tree Way	3,520	80	0	20	1.0%	1.0%	45	110	0	83	38	18	58.1
2	Lone Tree Way	East of Heidorn Ranch Rd.	25,800	84	0	16	1.0%	1.0%	45	85	0	284	132	61	67.9
3	Sand Creek Road	East of Shady Willow Ln.	22,360	84	0	16	1.0%	3.0%	45	75	-5	306	142	66	64.2
4	St. Regis Ave.	South of San Jose Ave.	6,190	90	0	10	1.0%	1.0%	25	55	0	41	19	9	58.1
5	San Jose Ave.	East of St. Regis Ave.	6,190	90	0	10	1.0%	1.0%	35	50	-5	62	29	13	56.4
6	San Jose Ave.	West of Portofino Dr.	5,060	90	0	10	1.0%	1.0%	35	50	-5	54	25	12	55.5
7	San Jose Ave.	East of Portofino Dr.	5,600	90	0	10	1.0%	1.0%	35	55	-5	58	27	12	55.3
8	Balfour Rd.	East of SR-4	23,000	84	0	16	1.0%	1.0%	45	75	-5	263	122	57	63.2
9	W. Country Club Dr.	North of Balfour Rd.	4,480	90	0	10	1.0%	1.0%	25	100	0	33	15	7	52.8
10	Balfour Rd.	East of W. Country Club Dr.	11,920	90	0	10	1.0%	1.0%	45	80	-5	144	67	31	58.8
11	Balfour Rd.	West of E. Country Club Dr.	12,280	90	0	10	1.0%	1.0%	45	80	-5	147	68	32	59.0
12	E. Country Club Dr.	North of Balfour Rd.	3,540	90	0	10	1.0%	1.0%	25	70	-5	28	13	6	49.1
13	Balfour Rd.	East of E. Country Club Dr.	15,170	84	0	16	1.0%	1.0%	45	75	-5	200	93	43	61.4
14	Foothill Dr.	South of Balfour Rd.	3,310	90	0	10	1.0%	1.0%	25	70	-5	27	13	6	48.8
15	Presidio Dr.	North of W. Country Club Dr.	3,140	90	0	10	1.0%	1.0%	25	50	0	26	12	6	55.8
16	W. Country Club Dr.	West of Presidio Dr.	3,430	90	0	10	1.0%	1.0%	25	70	0	28	13	6	54.0
17	W. Country Club Dr.	East of Presidio Dr.	620	90	0	10	1.0%	1.0%	25	70	0	9	4	2	46.5
18	E. Country Club Dr.	West of Roundhill Dr.	1,030	90	0	10	1.0%	1.0%	25	55	0	12	6	3	50.3

Appendix C-2

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Project #: 211206
Description: Bridle Gate Residential - Existing Plus Project Traffic
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway	Segment	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)	Contours (ft.) - No Offset 60 dBA	65 dBA	70 dBA	Level, dBA
1	Heidorn Ranch Rd.	South of Lone Tree Way	4,290	80	0	20	1.0%	1.0%	45	110	0	94	44	20	59.0
2	Lone Tree Way	East of Heidorn Ranch Rd.	26,710	84	0	16	1.0%	1.0%	45	85	0	291	135	63	68.0
3	Sand Creek Road	East of Shady Willow Ln.	23,970	84	0	16	1.0%	3.0%	45	75	-5	321	149	69	64.5
4	St. Regis Ave.	South of San Jose Ave.	6,760	90	0	10	1.0%	1.0%	25	55	0	43	20	9	58.5
5	San Jose Ave.	East of St. Regis Ave.	6,700	90	0	10	1.0%	1.0%	35	50	-5	65	30	14	56.7
6	San Jose Ave.	West of Portofino Dr.	5,570	90	0	10	1.0%	1.0%	35	50	-5	58	27	12	55.9
7	San Jose Ave.	East of Portofino Dr.	6,030	90	0	10	1.0%	1.0%	35	55	-5	61	28	13	55.6
8	Balfour Rd.	East of SR-4	23,000	84	0	16	1.0%	1.0%	45	75	-5	263	122	57	63.2
9	W. Country Club Dr.	North of Balfour Rd.	4,560	90	0	10	1.0%	1.0%	25	100	0	33	16	7	52.9
10	Balfour Rd.	East of W. Country Club Dr.	12,430	90	0	10	1.0%	1.0%	45	80	-5	148	69	32	59.0
11	Balfour Rd.	West of E. Country Club Dr.	12,790	90	0	10	1.0%	1.0%	45	80	-5	151	70	32	59.1
12	E. Country Club Dr.	North of Balfour Rd.	3,620	90	0	10	1.0%	1.0%	25	70	-5	29	13	6	49.2
13	Balfour Rd.	East of E. Country Club Dr.	15,600	84	0	16	1.0%	1.0%	45	75	-5	203	94	44	61.5
14	Foothill Dr.	South of Balfour Rd.	3,310	90	0	10	1.0%	1.0%	25	70	-5	27	13	6	48.8
15	Presidio Dr.	North of W. Country Club Dr.	3,270	90	0	10	1.0%	1.0%	25	50	0	27	12	6	55.9
16	W. Country Club Dr.	West of Presidio Dr.	3,560	90	0	10	1.0%	1.0%	25	70	0	28	13	6	54.1
17	W. Country Club Dr.	East of Presidio Dr.	620	90	0	10	1.0%	1.0%	25	70	0	9	4	2	46.5
18	E. Country Club Dr.	West of Roundhill Dr.	1,030	90	0	10	1.0%	1.0%	25	55	0	12	6	3	50.3

Appendix C-3

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Project #: 211206

Description: Bridle Gate Residential - Cumulative

Ldn/CNEL: Ldn

Hard/Soft: Soft

Segment	Roadway	Segment	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)	Contours (ft.) - No Offset 60 dBA	65 dBA	70 dBA	Level, dBA
1	Heidorn Ranch Rd.	South of Lone Tree Way	7,840	80	0	20	1.0%	1.0%	45	110	0	141	65	30	61.6
2	Lone Tree Way	East of Heidorn Ranch Rd.	40,140	84	0	16	1.0%	1.0%	45	85	0	382	177	82	69.8
3	Sand Creek Road	East of Shady Willow Ln.	26,830	84	0	16	1.0%	3.0%	45	75	-5	346	160	74	65.0
4	St. Regis Ave.	South of San Jose Ave.	6,190	90	0	10	1.0%	1.0%	25	55	0	41	19	9	58.1
5	San Jose Ave.	East of St. Regis Ave.	6,190	90	0	10	1.0%	1.0%	35	50	-5	62	29	13	56.4
6	San Jose Ave.	West of Portofino Dr.	5,310	90	0	10	1.0%	1.0%	35	50	-5	56	26	12	55.7
7	San Jose Ave.	East of Portofino Dr.	5,860	90	0	10	1.0%	1.0%	35	55	-5	60	28	13	55.5
8	Balfour Rd.	East of SR-4	32,350	84	0	16	1.0%	1.0%	45	75	-5	331	153	71	64.7
9	W. Country Club Dr.	North of Balfour Rd.	9,510	90	0	10	1.0%	1.0%	25	100	0	55	25	12	56.1
10	Balfour Rd.	East of W. Country Club Dr.	13,090	90	0	10	1.0%	1.0%	45	80	-5	153	71	33	59.2
11	Balfour Rd.	West of E. Country Club Dr.	13,740	90	0	10	1.0%	1.0%	45	80	-5	158	73	34	59.4
12	E. Country Club Dr.	North of Balfour Rd.	4,830	90	0	10	1.0%	1.0%	25	70	-5	35	16	7	50.4
13	Balfour Rd.	East of E. Country Club Dr.	18,430	84	0	16	1.0%	1.0%	45	75	-5	227	105	49	62.2
14	Foothill Dr.	South of Balfour Rd.	3,920	90	0	10	1.0%	1.0%	25	70	-5	30	14	7	49.5
15	Presidio Dr.	North of W. Country Club Dr.	3,270	90	0	10	1.0%	1.0%	25	50	0	27	12	6	55.9
16	W. Country Club Dr.	West of Presidio Dr.	3,650	90	0	10	1.0%	1.0%	25	70	0	29	13	6	54.2
17	W. Country Club Dr.	East of Presidio Dr.	710	90	0	10	1.0%	1.0%	25	70	0	10	4	2	47.1
18	E. Country Club Dr.	West of Roundhill Dr.	1,200	90	0	10	1.0%	1.0%	25	55	0	14	6	3	51.0

SAXELBY ACOUSTICS
Acoustics · Noise · Vibration

Appendix C-4

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Project #: 211206
Description: Bridle Gate Residential - Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

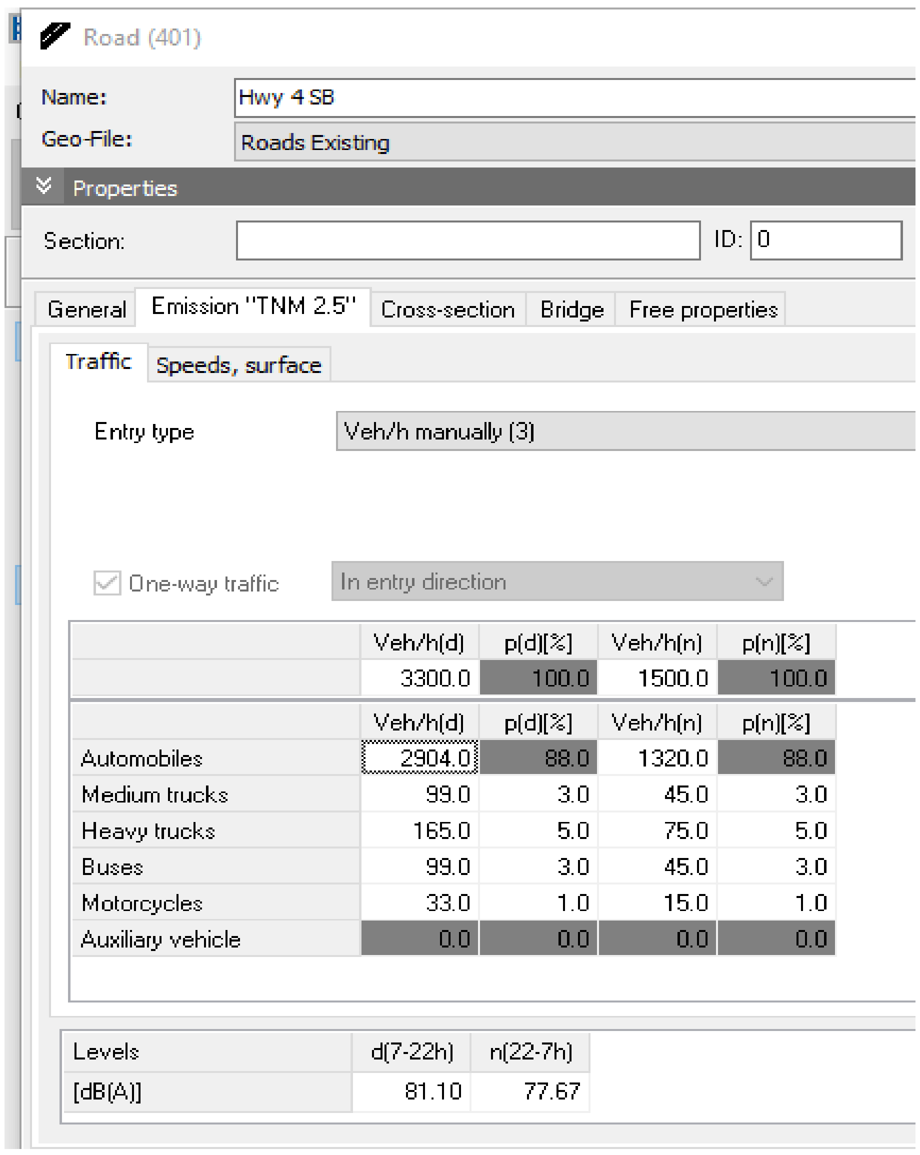
Segment	Roadway	Segment	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)	Contours (ft.) - No Offset 60 dBA	65 dBA	70 dBA	Level, dBA
1	Heidorn Ranch Rd.	South of Lone Tree Way	7,840	80	0	20	1.0%	1.0%	45	110	0	141	65	30	61.6
2	Lone Tree Way	East of Heidorn Ranch Rd.	40,820	84	0	16	1.0%	1.0%	45	85	0	386	179	83	69.9
3	Sand Creek Road	East of Shady Willow Ln.	28,440	84	0	16	1.0%	3.0%	45	75	-5	359	167	77	65.2
4	St. Regis Ave.	South of San Jose Ave.	6,660	90	0	10	1.0%	1.0%	25	55	0	43	20	9	58.4
5	San Jose Ave.	East of St. Regis Ave.	6,620	90	0	10	1.0%	1.0%	35	50	-5	65	30	14	56.7
6	San Jose Ave.	West of Portofino Dr.	5,750	90	0	10	1.0%	1.0%	35	50	-5	59	27	13	56.1
7	San Jose Ave.	East of Portofino Dr.	6,220	90	0	10	1.0%	1.0%	35	55	-5	62	29	13	55.8
8	Balfour Rd.	East of SR-4	32,530	84	0	16	1.0%	1.0%	45	75	-5	332	154	72	64.7
9	W. Country Club Dr.	North of Balfour Rd.	9,590	90	0	10	1.0%	1.0%	25	100	0	55	25	12	56.1
10	Balfour Rd.	East of W. Country Club Dr.	13,600	90	0	10	1.0%	1.0%	45	80	-5	157	73	34	59.4
11	Balfour Rd.	West of E. Country Club Dr.	14,250	90	0	10	1.0%	1.0%	45	80	-5	162	75	35	59.6
12	E. Country Club Dr.	North of Balfour Rd.	4,910	90	0	10	1.0%	1.0%	25	70	-5	35	16	8	50.5
13	Balfour Rd.	East of E. Country Club Dr.	18,860	84	0	16	1.0%	1.0%	45	75	-5	231	107	50	62.3
14	Foothill Dr.	South of Balfour Rd.	3,920	90	0	10	1.0%	1.0%	25	70	-5	30	14	7	49.5
15	Presidio Dr.	North of W. Country Club Dr.	3,350	90	0	10	1.0%	1.0%	25	50	0	27	13	6	56.0
16	W. Country Club Dr.	West of Presidio Dr.	3,730	90	0	10	1.0%	1.0%	25	70	0	29	14	6	54.3
17	W. Country Club Dr.	East of Presidio Dr.	710	90	0	10	1.0%	1.0%	25	70	0	10	4	2	47.1
18	E. Country Club Dr.	West of Roundhill Dr.	1,200	90	0	10	1.0%	1.0%	25	55	0	14	6	3	51.0

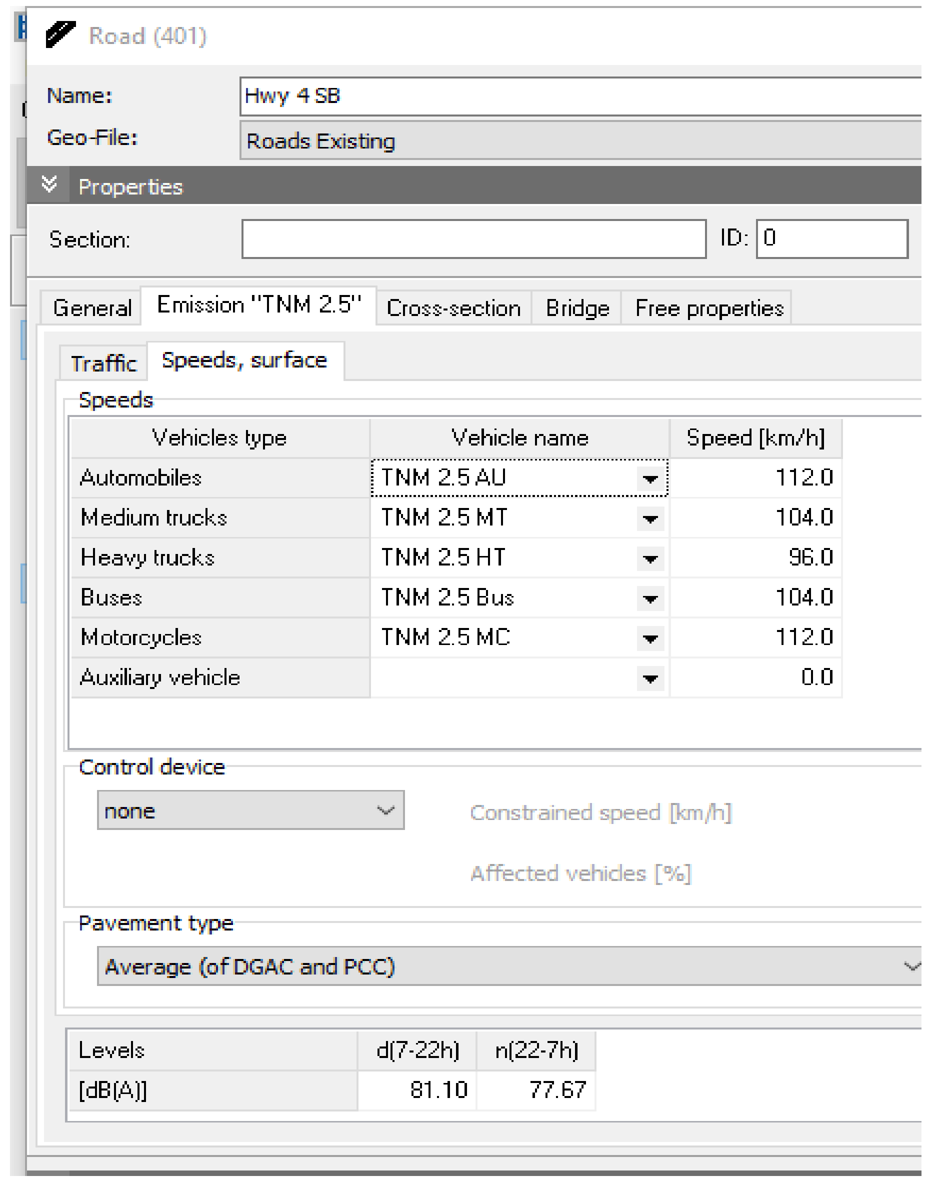
SAXELBY ACOUSTICS
Acoustics · Noise · Vibration

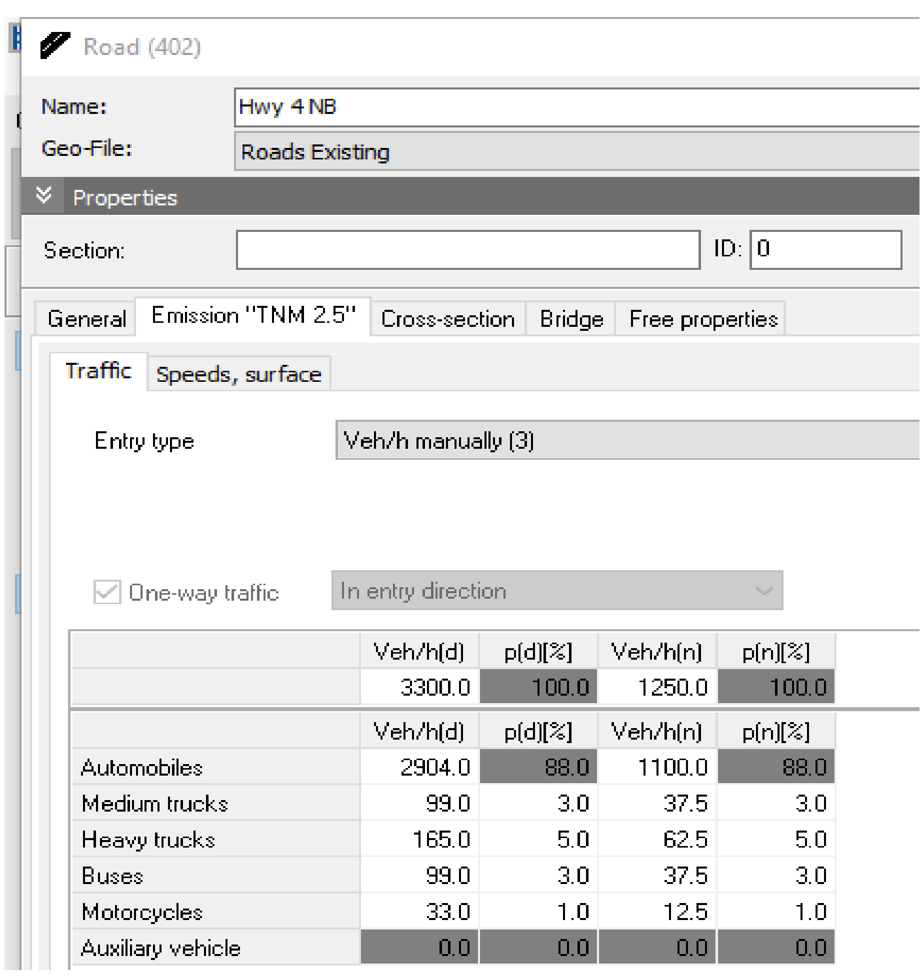
Appendix D: SoundPLAN Modeling Inputs

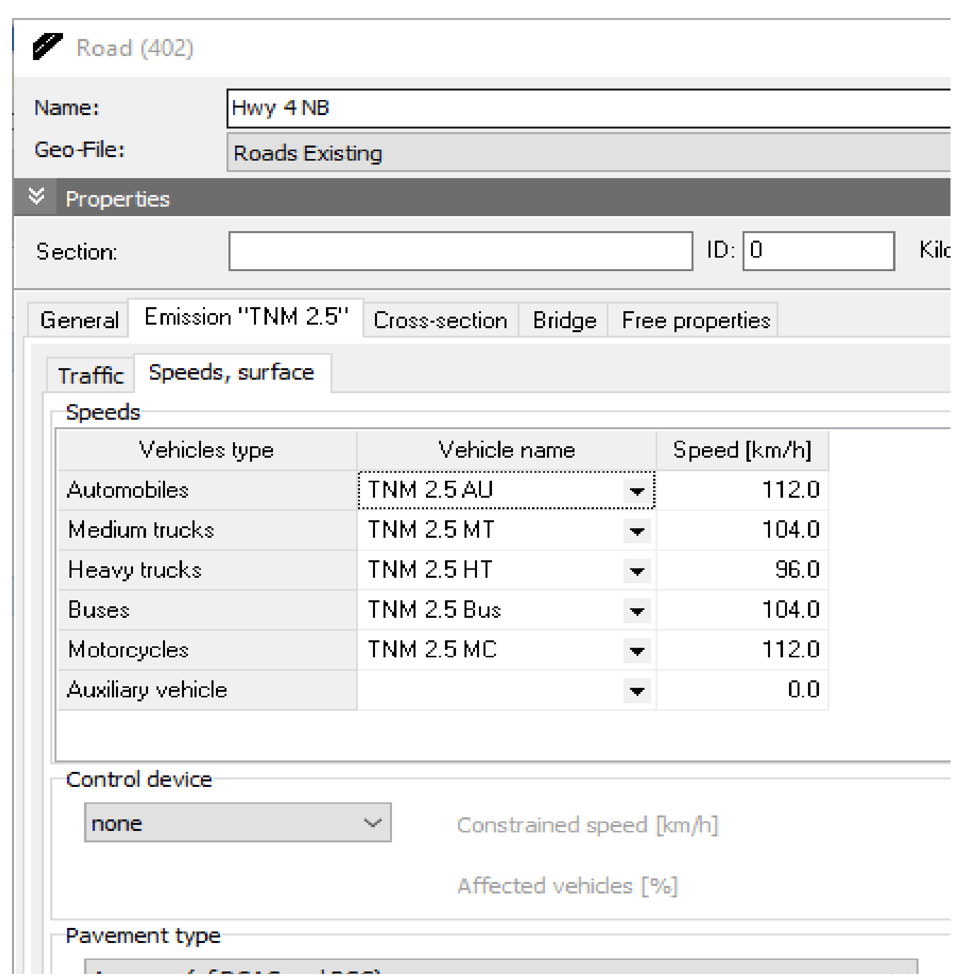
Bridle Gate Residential Project - SoundPLAN Roadway Inputs

Road	KM km	ADT Veh/2	Control dev	Constraine	Affected ve	Pavement type	Gradient %
Hwy 4 SB	0	63000	none			Average (of DGAC and PCC)	0
Hwy 4 SB	0.324	63000	none			Average (of DGAC and PCC)	-5.6
Hwy 4 NB	0	60750	none			Average (of DGAC and PCC)	0
Hwy 4 NB	0.124	63000	none			Average (of DGAC and PCC)	0
Sand Creek Road (Future)	0	41820	none			Average (of DGAC and PCC)	2.4
Sand Creek Road	0	28935	none			Average (of DGAC and PCC)	-2.6
SB Off Ramp	0	27300	On ramp	48	100	Average (of DGAC and PCC)	-1.9
SB On Ramp	0	27300	On ramp	48	100	Average (of DGAC and PCC)	-1.6
SB On Ramp	0.131	27300	On ramp	48	100	Average (of DGAC and PCC)	5.1









Levels	d(7-22h)	n(22-7h)
[dB(A)]	81.10	76.88

Average (of DGAC and PCC)

Levels	d(7-22h)	n(22-7h)
[dB(A)]	81.10	76.88

Road (415)

Name: Sand Creek Road (Future)

Geo-File: Roads Future

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Entry type: Veh/h manually (3)

One-way traffic: In entry direction

	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
	2188.0	100.0	1000.0	100.0
	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
Automobiles	2100.5	96.0	940.0	94.0
Medium trucks	21.9	1.0	20.0	2.0
Heavy trucks	21.9	1.0	20.0	2.0
Buses	21.9	1.0	10.0	1.0
Motorcycles	21.9	1.0	10.0	1.0
Auxiliary vehicle	0.0	0.0	0.0	0.0

Levels	d(7-22h)	n(22-7h)
[dB(A)]	72.58	69.69

Road (415)

Name: Sand Creek Road (Future)

Geo-File: Roads Future

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Speeds

Vehicles type	Vehicle name	Speed [km/h]
Automobiles	TNM 2.5 AU	72.0
Medium trucks	TNM 2.5 MT	72.0
Heavy trucks	TNM 2.5 HT	72.0
Buses	TNM 2.5 Bus	72.0
Motorcycles	TNM 2.5 MC	72.0
Auxiliary vehicle		0.0

Control device: none

Constrained speed [km/h]

Affected vehicles [%]

Pavement type: Average (of DGAC and PCC)

Levels	d(7-22h)	n(22-7h)
[dB(A)]	72.58	69.69

Road (405)

Name: Sand Creek Road

Geo-File: Roads Existing

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Entry type: Veh/h manually (3)

One-way traffic: In entry direction

	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
	1509.0	100.0	700.0	100.0
	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
Automobiles	1418.5	94.0	658.0	94.0
Medium trucks	30.2	2.0	14.0	2.0
Heavy trucks	30.2	2.0	14.0	2.0
Buses	15.1	1.0	7.0	1.0
Motorcycles	15.1	1.0	7.0	1.0
Auxiliary vehicle	0.0	0.0	0.0	0.0

Levels	d(7-22h)	n(22-7h)
[dB(A)]	71.47	68.14

Road (405)

Name: Sand Creek Road

Geo-File: Roads Existing

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Speeds

Vehicles type	Vehicle name	Speed [km/h]
Automobiles	TNM 2.5 AU	72.0
Medium trucks	TNM 2.5 MT	72.0
Heavy trucks	TNM 2.5 HT	72.0
Buses	TNM 2.5 Bus	72.0
Motorcycles	TNM 2.5 MC	72.0
Auxiliary vehicle		0.0

Control device: none

Constrained speed [km/h]

Affected vehicles [%]

Pavement type: Average (of DGAC and PCC)

Levels	d(7-22h)	n(22-7h)
[dB(A)]	71.47	68.14

Geometry

Road (403)

Name: SB Off Ramp

Geo-File: Roads Existing

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Entry type: Veh/h manually (3)

☑ One-way traffic: In entry direction

	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
	1400.0	100.0	700.0	100.0

	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
Automobiles	1316.0	94.0	658.0	94.0
Medium trucks	28.0	2.0	14.0	2.0
Heavy trucks	28.0	2.0	14.0	2.0
Buses	14.0	1.0	7.0	1.0
Motorcycles	14.0	1.0	7.0	1.0
Auxiliary vehicle	0.0	0.0	0.0	0.0

Levels	d(7-22h)	n(22-7h)
[dB(A)]	66.83	63.81

Road (403)

Name: SB Off Ramp

Geo-File: Roads Existing

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Speeds

Vehicles type	Vehicle name	Speed [km/h]
Automobiles	TNM 2.5 AU	48.0
Medium trucks	TNM 2.5 MT	48.0
Heavy trucks	TNM 2.5 HT	48.0
Buses	TNM 2.5 Bus	48.0
Motorcycles	TNM 2.5 MC	48.0
Auxiliary vehicle		0.0

Control device

On ramp — Constrained speed [km/h] — Affected vehicles [%]

Pavement type

Average (of DGAC and PCC)

Levels	d(7-22h)	n(22-7h)
[dB(A)]	66.83	63.81

Road (404)

Name: SB On Ramp

Geo-File: Roads Existing

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Entry type: Veh/h manually (3)

☑ One-way traffic: In entry direction

	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
	1400.0	100.0	700.0	100.0

	Veh/h(d)	p(d)[%]	Veh/h(n)	p(n)[%]
Automobiles	1317.8	94.1	658.9	94.1
Medium trucks	26.9	1.9	13.4	1.9
Heavy trucks	27.4	2.0	13.7	2.0
Buses	13.9	1.0	6.9	1.0
Motorcycles	14.0	1.0	7.0	1.0
Auxiliary vehicle	0.0	0.0	0.0	0.0

Levels	d(7-22h)	n(22-7h)
[dB(A)]	66.78	63.77

Road (404)

Name: SB On Ramp

Geo-File: Roads Existing

Properties

Section: ID: 0

General | Emission "TNM 2.5" | Cross-section | Bridge | Free properties

Traffic | Speeds, surface

Speeds

Vehicles type	Vehicle name	Speed [km/h]
Automobiles	TNM 2.5 AU	48.0
Medium trucks	TNM 2.5 MT	48.0
Heavy trucks	TNM 2.5 HT	48.0
Buses	TNM 2.5 Bus	48.0
Motorcycles	TNM 2.5 MC	48.0
Auxiliary vehicle		0.0

Control device

On ramp — Constrained speed [km/h] — Affected vehicles [%]

Pavement type

Average (of DGAC and PCC)

Levels	d(7-22h)	n(22-7h)
[dB(A)]	66.78	63.77