**Environmental Noise Assessment** 

# 2240 Nord Avenue Apartments

Chico, California

BAC Job # 2023-132

Prepared For:

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# Introduction

The 2240 Nord Avenue Apartments (project) is located in the City of Chico, California. The project proposes the development of approximately 208 apartment units within 21 buildings with a common outdoor area and clubhouse on a 11.7-acre parcel. The project site is bordered by railroad tracks to the north, Nord Avenue to the south, West Lindo Avenue to the west, and an existing residential development to the east. The Ranchaero Airport is located approximately 1.25 miles to the south of the project site. The project area and site plan are provided as Figures 1 and 2, respectively.

Due to the noise-sensitivity of the proposed residential project, the proximity of the project site to Nord Avenue and the Union Pacific Railroad tracks, and the potential for aircraft noise exposure at the project site related to Ranchaero Airport operations, Bollard Acoustical Consultants, Inc. (BAC) was retained by the project applicant to prepare this noise assessment. Specifically, the purposes of this assessment are to quantify noise levels at the project site associated with traffic, railroad, and aircraft operations, to compare those levels against the applicable City of Chico noise standards for acceptable noise exposure, and to recommend noise mitigation measures where needed to achieve satisfaction with those standards. This report contains BAC's evaluation.

# Noise Fundamentals and Terminology

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard, and thus are called sound. 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 allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness. Appendix A contains definitions of Acoustical Terminology. Figure 3 shows common noise levels associated with various sources.

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 weighing the frequency response of a sound level meter by means of the standardized A-weighing network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels in decibels.

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 noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L<sub>eq</sub>) over a given time period (usually one hour). The L<sub>eq</sub> is the foundation of the Day-Night Average Level noise descriptor, L<sub>dn</sub> or DNL, and shows very good correlation with community response to noise.







Figure 3 Typical A-Weighted Sound Levels of Common Noise Sources

The Day-Night Average Level (DNL) is based upon the average noise level over a 24-hour day, with a +10-decibel weighting 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 DNL represents a 24-hour average, it tends to disguise short-term variations in the noise environment. DNL-based noise standards are commonly used to assess noise impacts associated with traffic, railroad, and aircraft noise sources.

# Criteria for Acceptable Noise Exposure

#### **Chico General Plan Noise Element**

The Noise Element of the City of Chico General Plan contains goals, policies and actions to ensure that City residents are not subjected to noise beyond acceptable levels. Noise impacts associated with this project would occur if projected future traffic noise levels exceed City noise standards at proposed residences within the project site, or if the project would result in a substantial increase in traffic noise levels at existing residences in the immediate project vicinity. The City General Plan policies and actions which are applicable to these to potential impacts are reproduced below:

- **Policy N-1.1** (New Development and Transportation Noise) New development of noisesensitive land uses will not be permitted in areas exposed to existing or planned transportation noise sources that exceed the levels specified in Table N-1 [Table 1 of this report], unless the project design includes measures to reduce exterior and interior noise levels to those specified in Table N-1 [Table 1 of this report].
- **Policy N-1.3** (Acoustical Analysis) Where proposed projects are likely to expose noisesensitive land uses to noise levels exceeding the City's standards, require an acoustical analysis as part of environmental review so that noise mitigation measures may be identified and included in the project design. The requirements for the content of an acoustical analysis are outlined in Table N-3 [Table 2 of this report].
- **Policy N-1.6** (Construction Activity) Maintain special standards in the Municipal Code to allow temporary construction activity to exceed the noise standards established in this element, with limits on the time of disturbance to nearby noise-sensitive uses.
- **Policy N-2.1** (Well-Designed Noise Mitigation) Utilize effective noise attenuation measures that complement the Community Design Element's Goals.
- Action N-2.1.1 (Noise Control Measures) Limit noise exposure through the use of insulation, building design and orientation, staggered operating hours, and other techniques. Utilize physical barriers such as landscaped sound walls only when other solutions are unable to achieve the desired level of mitigation.

	Outdoor Activity Areas <sup>1</sup>	Interior Spaces				
Land Use	Ldn/CNEL [dB]	Ldn/CNEL [dB]	Leq [dB] <sup>2</sup>			
Residential	65 <sup>3</sup>	45				
Transient Lodging		45				
Hospitals, Nursing Homes	65 <sup>3</sup>	45				
Theaters, Auditoriums, Music Halls			35			
Churches, Meeting Halls	65 <sup>3</sup>		40			
Office Buildings			45			
Schools, Libraries, Museums	65 <sup>3</sup>		45			
Playgrounds, Neighborhood Parks	70					

 Table 1

 Maximum Allowable Noise Levels from Transportation Noise Sources

Notes:

Noise standards are to be applied at outdoor activity areas with the greatest exposure to the noise source. When it is
not practical to mitigate exterior noise levels at the patios or balconies of multi-family dwellings, a common area or
onsite park may be designated as the outdoor activity area. For noise-sensitive land uses that do not include outdoor
activity areas, only the interior noise standard shall apply.

2. As determined for a typical worst-case hour during periods of use.

3. Where it is not possible to reduce noise in outdoor activity areas to 65 dB Ldn/CNEL or less using all feasible noise reduction measures, an exterior noise level of up to 70 dB Ldn/CNEL may be allowed provided that interior noise levels are in compliance with this table.

Source: Chico General Plan Noise Element, Table N-1

# Table 2Requirements for an Acoustical Analysis

#### An acoustical analysis prepared pursuant to the Noise Element shall:

A. Be the financial responsibility of the applicant.

B. Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.

C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and the predominant noise sources.

D. Estimate existing and projected cumulative (20 years) noise levels in terms of Ldn, CNEL, and the standards of Table N-1 [Table 1 in this report] or Table N-2, as applicable, and compare those levels to the adopted policies of the Noise Element. Where the noise source consists of intermittent single events, address the impact on sleep disturbance

E. Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element, giving preference to site planning and design over mitigation measures which require the construction of noise barriers or structural modifications to buildings which

F. Estimate noise exposure after the prescribed mitigation measures have been implemented.

G. Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation measures.

Source: Chico General Plan Noise Element, Table N-3

#### City of Chico Municipal Code

Policy N-1.6 of the City of Chico General Plan references maintaining special standards in the Municipal Code applicable to temporary construction activities. Specifically, Section 9.38.060 of the City of Chico Municipal Code (Categorical Exemptions) identifies noise exemptions and special standards for certain activities and noise sources. The following noise criteria is applicable to the project:

#### 9.38.060 Categorical exemptions.

- B. Construction and Alteration of Structures.
  - 1. Notwithstanding any other provision of this chapter, between the hours of 10:00 a.m. and 6:00 p.m. on Sundays and holidays, and 7:00 a.m. and 9:00 p.m. on other days, construction, alteration or repair of structures shall be subject to one of the following limits:
    - a. No individual device or piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet from the source. If the device or equipment is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close as possible to 25 feet from the equipment.
    - b. The noise level at any point outside of the property plane of the project shall not exceed 86 dBA.
  - 2. Notwithstanding any other provision of this chapter, including but not limited to subsection B.1 of this section, for new residential development projects, or construction, alteration or repairs taking place in commercial or industrial zones between June 15-September 15, of each calendar year, and 6:00 a.m. and 9:00 p.m. on other days. Construction, alteration or repairs of structures shall be subject to one of the following limits:
    - a. No individual device or piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet from the source. If the device or equipment is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close as possible to 25 feet from the equipment.
    - b. The noise level at any point outside the property plane of the project shall not exceed 86 dBA.

## Existing Ambient Noise Environment within the Project Vicinity

The existing ambient noise environment at the project site is defined primarily by traffic on Nord Avenue, by intermittent train passbys to the north, and railroad crossings operations. To quantify the existing ambient noise level environment at the project site, BAC conducted a long-term (72-hour) noise level survey from October 13 through October 15, 2023 at the locations shown on Figure 1. Long-term noise measurement site LT-1 was selected to quantify noise generated by Nord Avenue traffic. LT-2 was selected to quantify noise generated by railroad operations. Photographs of the noise survey locations are provided in Appendix B.

Larson-Davis Laboratories (LDL) Model 831 and Model LxT precision integrating sound level meters were used to complete the ambient noise level survey. The meters were calibrated immediately before and after use with an LDL Model CAL200 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).

The long-term ambient noise level survey results are summarized in Table 3. The detailed results of the ambient noise survey are contained in Appendix C in tabular format and graphically in Appendix D.

				Avera	Average Hourly Noise Levels [dBA]		
				Day	time <sup>3</sup>	Nigh	ttime⁴
Site <sup>2</sup>	Description	Date	DNL [dBA]	Leq	Lmax	Leq	Lmax
LT-1	45 ft to Nord Ave Centerline	10/13/2023	73	71	85	65	84
		10/14/2023	72	70	87	64	82
		10/15/2023	71	69	86	64	83
		Average	72	70	86	64	83
LT-2	70 ft to Railroad Centerline at	10/13/2023	78	71	82	71	93
	Crossing	10/14/2023	75	70	88	69	83
		10/15/2023	79	71	89	73	85
		Average	77	70	86	71	87
Notes							

#### Table 3 Summary of Long-Term Noise Survey Measurement Results<sup>1</sup>

5. Long-term noise survey locations are identified on Figure 1.

6. Daytime hours: 7:00 a.m. to 10:00 p.m.

7. Nighttime hours: 10:00 p.m. to 7:00 a.m.

Source: Bollard Acoustical Consultants, Inc. (2023)

Table 3 indicates that the measured day-night average noise levels (DNL) at LT-1 averaged 72 dB—above the City's 65 dB DNL exterior noise level standard. The measured DNL at LT-2 averaged 77 dB—above the City's exterior noise level standard. The graphical noise level data, shown in Appendix D, indicates that an average of approximately 16 heavy rail train passbys occurred during a 24-hour period. Furthermore, the Appendix D data indicates that the maximum noise levels measured at Site LT-1 were also driven by the heavy rail train passbys.

# Evaluation of Future Traffic Noise Environment at the Project Site **Methodology**

To predict future traffic noise level exposure at the project site, BAC utilized the long-term ambient data collected at measurement site LT-1. Specifically, the noise measurement data were projected to the nearest noise-sensitive locations on the project site. In addition, future traffic volumes on Nord Avenue were conservatively assumed to double in the future, resulting in a 3 dB increase in traffic noise levels relative to measured existing noise levels. Future traffic noise levels were projected to the nearest proposed outdoor activity areas and building facades of the development based on a 4.5 dB decrease per doubling of distance from the noise source. The predicted future noise levels are summarized in Table 4.

				=		
Roadway	Buildings <sup>a</sup>	Location	Offsets [dBA]	Predicted DNL [dBA]	Noise Standard [dBA]	Additional Mitigation Required?
Nord Ave	1, 2, 3	1st-floor interior	-25 <sup>b</sup>	48	45	Yes
		upper floors interior	-23 <sup>b,c</sup>	50	45	Yes
Nord Ave	4, 5	1st-floor interior	-25 <sup>b</sup>	47	45	Yes
		upper floors interior	-23 <sup>b,c</sup>	49	45	Yes
Nord Ave	NA	Common Outdoor Area	-10 <sup>d</sup>	52	65	No
Notes						
a. Buildir b. A -25 constr	ng locations are sho dB offset was as ap ruction.	wn on Figure 2. plied for exterior-to-interior noise d at all upper-floor building facar	e level attenua	ation provided by	new standard r	esidential

 Table 4

 Predicted Future Traffic Noise Levels at the Project

c. A +2 dB offset was applied at all upper-floor building facades to account for reduced ground absorption of sound at elevated positions.

d. A -10 dB offset was applied for shielding provided by proposed intervening buildings.

Source: Bollard Acoustical Consultants, Inc (2023)

#### Analysis of Future Exterior Traffic Noise Exposure at Outdoor Activity Areas

The development features a shared outdoor space (common outdoor activity area) approximately 330 feet to the center of Nord Avenue. As indicated in Table 4, future traffic noise levels at the proposed outdoor activity area are predicted to be satisfactory relative to the City of Chico General Plan exterior noise level standard of 65 dB DNL. As a result, no further consideration of exterior traffic noise mitigation measures would be warranted for the project.

#### Analysis of Future Interior Traffic Noise Exposure within Residences

Standard residential construction (stucco siding, STC-27 windows, door weather-stripping, exterior wall insulation, composition plywood roof) typically attenuates exterior noise levels by 25 dB. Table 5 shows that future interior traffic noise levels are predicted to range from 47 to 48 dB DNL at the first-floor building interiors proposed nearest to the roadway. Due to reduced ground absorption of sound at elevated positions, exterior noise exposure is estimated to be approximately 2 dB higher at second-floor facades than at first-floor facades. Table 4 shows that the resulting noise levels at the second-floor interiors of the residences nearest to the noise sources are calculated to range from 49 to 50 dB DNL with standard residential construction.

	Predicted Future Tranic Interior Noise Levels with Window Opgrades						
Source	Lots <sup>1</sup>	Receiver Location	Total Offsets <sup>2</sup> [dBA]	Predicted DNL w/ Std Construction <sup>3</sup> [dBA]	Recommended STC Rating⁴ [dBA]	Resulting Interior DNL [dBA]	
Nord Ave	1, 2, 3	1st-floor	0	48	32	43	
		Upper floors	2	50	32	45	
Nord Ave	4, 5	1st-floor	0	47	32	42	
		Upper Floors	2	49	32	44	
Notos							

 Table 5

 Predicted Future Traffic Interior Noise Levels with Window Upgrades

Notes

1. Lots are shown on Figure 2.

2. Total offsets include offset shown in Table 4 (due to elevated receiver position) and offset due to shielding provided by the proposed barrier(s).

3. A -25 dB offset was as applied for exterior-to-interior noise levels due to standard residential construction (STC 27 with 2 dB margin).

4. Recommended STC Rating is provided with a 2 dB margin.

Source: Bollard Acoustical Consultants, Inc (2023)

Because future exterior traffic noise levels are predicted to exceed 45 dB DNL, upgrades to window and door assemblies would be required to ensure compliance with the City's 45 dB DNL interior noise level standard. Table 5 summarizes the recommended STC rating glazing upgrades and the resulting interior sound level with those upgrades. The recommended window and door assembly upgrades is STC 32 for all floors with Nord Avenue noise exposure.

The specific recommendations for window and door assembly Sound Transmission Class (STC) ratings are illustrated on Figure 2. At the first-floor building facades, and at second-floor building facades further removed from roadway without an annotated STC rating recommendation on Figure 2, standard STC 27 window and door assemblies would provide the necessary exterior to interior noise reduction to achieve satisfaction with the City's 45 dB DNL standard.

It should be noted that mechanical ventilation (air conditioning) will be provided for all residences in this development to allow the occupants to close doors and windows as desired to achieve additional acoustical isolation.

# Evaluation of Future Railroad Noise Levels at the Project Site

As mentioned previously, noise measurement site LT-2 was specifically selected to be representative of the existing ambient noise level environment associated with heavy rail operations at the development. According to the 72-hour ambient noise monitoring effort, railroad activity adjacent to the project site consists of approximately 16 daily railroad passbys (evenly distributed between daytime and nighttime hours).

The noise generation for individual train passbys varies depending on train length, speed, warning horn usage, track condition and number of locomotives. The measured noise levels at site LT-2 included noise generated from locomotives, rail cars, warning horns, and bells from a crossing located north of the project site.

The degree by which rail activity will increase on the track located east of the project site is difficult to predict. Ultimately, daily rail activity is limited by the capacity of the track. As such, it is unlikely that rail activity adjacent to the project site would increase by more than 50% along this track in the future. A 50% increase in activity corresponds to a 2 dB increase in noise exposure. Conservatively assuming a 2 dB increase over existing levels, future railroad noise levels were projected to the nearest proposed outdoor activity areas and building interiors of the development based on a 4.5 dB decrease per doubling of distance from the noise source. The predicted future noise levels are summarized in Table 6.

The project proposes a 10-foot-tall CMU noise barrier between the railroad tracks and the development. As a result, BAC evaluated the effectiveness of noise barriers constructed adjacent to the railroad track. The noise attenuation provided by the barrier is summarized in Table 6.

Predicted Future Railroad Noise Levels at the Project						
Buildings <sup>a</sup>	Location	Barrier Offset [dBA]	Other Offsets [dBA]	Predicted DNL [dBA]	Noise Standard [dBA]	Additional Mitigation Required?
7	1st-floor interior	-5	1 <sup>b,e</sup>	49	45	Yes
	upper-floors interior	-1	2 <sup>b,c</sup>	54	45	Yes
8 - 11	1st-floor interior	-6	1 <sup>b,e</sup>	50	45	Yes
	upper-floors interior	-1	2 <sup>b,c</sup>	57	45	Yes
NA	Common Outdoor Area	-5	-10 <sup>d</sup>	55	65	No
Notes						
a. Buildir	ngs are identified on Figure 2.					
b. A -25	dB offset was as applied for exterior	r-to-interior noise	e levels due to	o standard reside	ntial construction	on.
c. A +2 d elevat	IB offset was applied at all upper-flo ed positions.	or building facad	tes to accoun	t for reduced gro	und absorption	of sound at
d. A-10	dB offset was applied for shielding p	provided by prop	osed interven	ing buildings.		
e. A+1 d	B offset was applied at all first-floor	building facade	s to account f	or elevated railro	oad tracks.	

Table 6

Source: Bollard Acoustical Consultants, Inc (2023)

#### Analysis of Future Exterior Railroad Noise Exposure at Outdoor Activity Areas

The development features a shared outdoor space (common outdoor activity area) approximately 330 feet to the railroad tracks. The proposed intervening buildings are estimated to provide a conservative 10 dB of noise reduction at the outdoor activity area. As indicated in Table 4, future railroad noise levels at the proposed outdoor activity area are predicted to be satisfactory relative to the City of Chico General Plan exterior noise level standard of 65 dB DNL. As a result, no further consideration of exterior traffic noise mitigation measures would be warranted for the project.

#### Analysis of Future Interior Railroad Noise Exposure within Residences

As noted previously, standard residential construction (stucco siding, STC-27 windows, door weather-stripping, exterior wall insulation, composition plywood roof) typically attenuates exterior noise levels by 25 dB.

At the first-floor building interiors, the proposed sound wall would break-line-of sight to the main noise source of a heavy locomotive. Table 7 shows that future interior railroad noise levels are predicted to range from 49 to 50 dB DNL at the first-floor building interiors proposed nearest to the roadway including consideration of the noise attenuation provided by the proposed sound wall.

Due to reduced ground absorption of sound at elevated positions and less noise attenuation provided by the proposed sound wall, exterior noise exposure is estimated to be higher at second-floor and third-floor facades than at first-floor facades. Table 7 shows that the resulting noise levels at the upper-floor interiors of the building facades nearest to the railroad tracks are calculated to range from 54 to 57 dB DNL with standard residential construction.

Table 7

Pre	Predicted Future Traffic & Railroad Interior Noise Levels with Window Upgrades						
Source	Building <sup>1</sup>	Receiver Location	Total Offsets <sup>2</sup> [dBA]	Predicted DNL w/ Std Construction <sup>3</sup> [dBA]	Recommended STC Rating [dBA]	Resulting Interior DNL [dBA]	
Heavy Rail	7	1st-floor	-4	49	32	44	
		upper floors	-1	52	36	45	
Heavy Rail	8 - 11	1st-floor	-5	49	32	44	
		upper floors	2	56	40	44	

Notes

1. Buildings are shown on Figure 2.

2. Total offsets include offset shown in Table 2 (due to relative elevation, noise barrier).

3. A -25 dB offset was as applied for exterior-to-interior noise levels due to standard residential construction (STC 27 with 2 dB margin).

Source: Bollard Acoustical Consultants, Inc (2023)

Because future exterior traffic noise levels are predicted to exceed 45 dB DNL, upgrades to window and door assemblies would be required to ensure compliance with the City's 45 dB DNL interior noise level standard. Table 7 summarizes the recommended STC rating glazing upgrades and the resulting interior sound level with those upgrades. The recommended window and door assembly upgrades is STC 32 for the first-floors. The recommended window and door assembly upgrades is STC 36 for Building 7 and STC 40 for Buildings 8 - 11. The assembly upgrades are recommended for windows and doors facing the railroad tracks. The locations of the buildings having window construction upgrades are illustrated on Figure 2.

Although these recommendations should result in compliance with the City's interior noise levels standards, BAC recommends an additional 2 dB margin of safety due to the maximum noise levels associated with heavy rail operations at a crossing. To increase the margin of safety, higher STC rated windows may be used and careful workmanship should be required during window installation to ensure the windows fit correctly within the frames with no gaps or acoustic leaks.

It should be noted that mechanical ventilation (air conditioning) will be provided for all residences in this development to allow the occupants to close doors and windows as desired to achieve additional acoustical isolation. It is further recommended that disclosure statements be provided to all prospective residents of this development notifying of elevated noise levels during railroad passages, particularly during nighttime operations and periods of warning horn usage.

# Evaluation of Ranchaero Airport Noise Affecting the Project Site

The Ranchaero Airport is located approximately 1.25 miles south of the project site. Figure 4 shows the relationship of the project site to the airport. Figure 4 also shows the noise contours for Ranchaero Airport. As indicated on Figure 4, the 50 dB DNL noise contour for the airport is located well south of the project site (approximately 5,000 feet from the project site), indicating that aircraft noise exposure at the project site would be below 50 dB DNL. Because aircraft noise exposure at the project site is well below the City of Chico 65 dBA DNL noise standard applicable to new residential uses, no aircraft noise mitigation measures would be warranted for this project.

# Conclusions

Future traffic and railroad noise levels are predicted to satisfy the City of Chico exterior noise level standard but will exceed the City of Chico interior noise level standard at some locations within this development. In order to satisfy the City of Chico 45 dB DNL interior noise level criteria, the following noise mitigation is recommended for the project:

- 1. Upgraded windows with STC ratings would be required as indicated on Figure 2 of this report. This applies only to window and doors from which the railroad tracks would be visible, including those that will ultimately be shielded by the proposed sound wall.
- 2. A suitable form of forced-air mechanical ventilation or air-conditioning shall be provided so that windows can be kept closed as desired for additional acoustical isolation.
- 3. A minimum 10-foot-tall noise barrier should be constructed as shown on Figure 2. The noise barrier height shown is relative to the building pad elevation.

These conclusions are based on the measured traffic and railroad noise levels, and on noise reduction data for standard residential dwellings. Deviations from the project site plan shown in Figure 2 could cause future traffic or railroad noise levels to differ from those predicted in this analysis. In addition, BAC is not responsible for degradation in acoustic performance of the residential construction due to poor construction practices, failure to comply with applicable building code requirements, or for failure to adhere to the minimum building practices cited in this report.

This concludes BAC's noise evaluation for the 2240 Nord Avenue Apartments project in Chico, California. Please contact BAC at (530) 537-2328 or paulb@bacnoise.com with any questions regarding this assessment.



# Appendix A Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise source audible at that location. In many cases, the term ambient is used to describe an existin or pre-project condition such as the setting in an environmental noise study.
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 a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
IIC	Impact Insulation Class (IIC): A single-number representation of a floor/ceiling partition impact generated noise insulation performance. The field-measured version of this number is the FIIC.
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 tim
Loudness	A subjective term for the sensation of the magnitude of sound.
Masking	The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.
Noise	Unwanted sound.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is th highest RMS level.
RT <sub>60</sub>	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
STC	Sound Transmission Class (STC): A single-number representation of a partition's nois insulation performance. This number is based on laboratory-measured, 16-band (1/3-octave) transmission loss (TL) data of the subject partition. The field-measured version of this number is the FSTC.





A Site LT-1 Facing South

B Site LT-2 Facing Southwest

2240 Nord Avenue Apartments Chico, California

Appendix B



#### Appendix C-1 Long-Term Ambient Noise Monitoring Results, LT-1 2240 Nord Avenue Apartments - Chico, California Friday, October 13, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	64	83	50	36
1:00 AM	62	83	46	34
2:00 AM	60	79	42	32
3:00 AM	61	85	39	32
4:00 AM	65	91	50	39
5:00 AM	66	80	54	45
6:00 AM	69	81	65	51
7:00 AM	72	98	70	55
8:00 AM	72	86	71	60
9:00 AM	70	83	68	56
10:00 AM	70	84	68	56
11:00 AM	71	81	70	60
12:00 PM	71	84	70	58
1:00 PM	71	87	70	61
2:00 PM	72	86	71	62
3:00 PM	72	82	71	59
4:00 PM	71	85	71	60
5:00 PM	72	91	71	62
6:00 PM	70	84	69	56
7:00 PM	70	81	68	54
8:00 PM	70	94	67	54
9:00 PM	68	79	64	50
10:00 PM	67	86	62	47
11:00 PM	66	89	56	42

	Statistical Summary					
	Daytime (7 a.m 10 p.m.)			Nighttim	ne (10 p.m.	- 7 a.m.)
	High	Low	Average	High	Low	Average
Leq (Average)	72	68	71	69	60	65
Lmax (Maximum)	98	79	85	91	79	84
L50 (Median)	71	64	69	65	39	51
L90 (Background)	62	50	58	51	32	40

Computed DNL, dB	73
% Daytime Energy	86%
% Nighttime Energy	14%

GPS Coordinates
39°44'24.09"N
121°52'41.49"W



#### Appendix C-2 Long-Term Ambient Noise Monitoring Results, LT-1 2240 Nord Avenue Apartments - Chico, California Saturday, October 14, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	64	86	49	39
1:00 AM	62	80	49	36
2:00 AM	62	77	47	36
3:00 AM	59	77	39	33
4:00 AM	61	82	42	34
5:00 AM	63	88	45	35
6:00 AM	67	87	55	42
7:00 AM	68	84	61	48
8:00 AM	69	88	65	51
9:00 AM	69	83	66	53
10:00 AM	70	86	68	54
11:00 AM	71	93	69	57
12:00 PM	70	83	69	56
1:00 PM	70	82	69	56
2:00 PM	70	81	68	54
3:00 PM	71	89	69	56
4:00 PM	72	100	69	55
5:00 PM	71	94	68	55
6:00 PM	69	85	67	54
7:00 PM	69	87	67	54
8:00 PM	68	80	66	52
9:00 PM	69	94	62	50
10:00 PM	66	81	59	48
11:00 PM	65	78	54	43

		Statistical Summary					
		Daytime (7 a.m 10 p.m.)			Nighttime (10 p.m 7 a.m.)		
		High Low Average			High	Low	Average
Leq	(Average)	72	68	70	67	59	64
Lmax	k (Maximum)	100	80	87	88	77	82
L50	(Median)	69	61	67	59	39	49
L90	(Background)	57	48	54	48	33	39

Computed DNL, dB	72
% Daytime Energy	87%
% Nighttime Energy	13%

GPS Coordinates
39°44'24.09"N
121°52'41.49"W



#### Appendix C-3 Long-Term Ambient Noise Monitoring Results, LT-1 2240 Nord Avenue Apartments - Chico, California Sunday, October 15, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	63	79	48	41
1:00 AM	62	82	46	38
2:00 AM	64	81	47	36
3:00 AM	59	77	40	33
4:00 AM	63	91	38	33
5:00 AM	60	79	41	34
6:00 AM	64	82	48	41
7:00 AM	66	85	55	45
8:00 AM	68	89	59	46
9:00 AM	69	84	66	50
10:00 AM	69	83	66	51
11:00 AM	70	83	66	51
12:00 PM	70	80	67	53
1:00 PM	70	88	67	54
2:00 PM	70	88	67	53
3:00 PM	70	83	67	51
4:00 PM	70	85	68	53
5:00 PM	70	90	67	54
6:00 PM	70	95	66	52
7:00 PM	69	85	65	54
8:00 PM	67	82	62	51
9:00 PM	67	87	58	46
10:00 PM	68	92	57	45
11:00 PM	64	86	52	38

		Statistical Summary					
		Daytime (7 a.m 10 p.m.)			Nighttime (10 p.m 7 a.m.)		
		High Low Average			High	Low	Average
Leq	(Average)	70	66	69	68	59	64
Lmax	k (Maximum)	95	80	86	92	77	83
L50	(Median)	68	55	64	57	38	46
L90	(Background)	54	45	51	45	33	38

Computed DNL, dB	71
% Daytime Energy	85%
% Nighttime Energy	15%

GPS Coordinates
39°44'24.09"N
121°52'41.49"W



#### Appendix C-4 Long-Term Ambient Noise Monitoring Results, LT-2 2240 Nord Avenue Apartments - Chico, California Friday, October 13, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	76	105	43	35
1:00 AM	70	103	40	33
2:00 AM	44	64	37	33
3:00 AM	76	107	36	33
4:00 AM	62	92	44	36
5:00 AM	49	71	46	42
6:00 AM	67	96	50	47
7:00 AM	57	75	52	49
8:00 AM	76	106	50	46
9:00 AM	54	72	46	43
10:00 AM	53	70	46	42
11:00 AM	54	71	48	45
12:00 PM	55	72	48	45
1:00 PM	55	77	48	45
2:00 PM	74	103	49	46
3:00 PM	56	78	49	46
4:00 PM	71	102	50	47
5:00 PM	81	113	50	47
6:00 PM	53	72	46	44
7:00 PM	53	69	49	46
8:00 PM	53	70	47	45
9:00 PM	55	80	46	44
10:00 PM	69	100	47	43
11:00 PM	72	98	43	39

		Statistical Summary					
		Daytime (7 a.m 10 p.m.)			Nighttime (10 p.m 7 a.m.)		
		High Low Average			High	Low	Average
Leq	(Average)	81	53	71	76	44	71
Lmax	(Maximum)	113	69	82	107	64	93
L50	(Median)	52	46	48	50	36	43
L90	(Background)	49	42	45	47	33	38

Computed DNL, dB	78
% Daytime Energy	61%
% Nighttime Energy	39%

GPS Coordinates
39°44'33.00"N
121°52'42.93"W



#### Appendix C-5 Long-Term Ambient Noise Monitoring Results, LT-2 2240 Nord Avenue Apartments - Chico, California Saturday, October 14, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	71	101	41	38
1:00 AM	68	100	43	37
2:00 AM	47	66	42	35
3:00 AM	44	66	36	33
4:00 AM	60	92	37	33
5:00 AM	44	69	38	33
6:00 AM	77	106	45	38
7:00 AM	55	81	46	42
8:00 AM	69	100	47	44
9:00 AM	57	81	50	46
10:00 AM	75	106	48	44
11:00 AM	75	106	50	46
12:00 PM	54	72	50	45
1:00 PM	72	103	48	44
2:00 PM	55	74	47	43
3:00 PM	75	105	47	43
4:00 PM	72	101	48	44
5:00 PM	54	70	47	44
6:00 PM	56	83	50	46
7:00 PM	55	83	51	48
8:00 PM	52	67	50	47
9:00 PM	60	89	49	45
10:00 PM	51	76	47	44
11:00 PM	49	67	45	40

		Statistical Summary					
		Daytime (7 a.m 10 p.m.)		Nighttime (10 p.m 7 a.m.)			
High		High	Low	Average	High	Low	Average
Leq	(Average)	75	52	70	77	44	69
Lmax	(Maximum)	106	67	88	106	66	83
L50	(Median)	51	46	48	47	36	42
L90	(Background)	48	42	45	44	33	37

Computed DNL, dB	75
% Daytime Energy	67%
% Nighttime Energy	33%

GPS Coordinates
39°44'33.00"N
121°52'42.93"W



#### Appendix C-6 Long-Term Ambient Noise Monitoring Results, LT-2 2240 Nord Avenue Apartments - Chico, California Sunday, October 15, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	46	68	42	38
1:00 AM	66	99	41	37
2:00 AM	76	106	40	35
3:00 AM	40	65	36	33
4:00 AM	63	94	36	33
5:00 AM	50	79	38	34
6:00 AM	47	75	41	37
7:00 AM	72	104	44	41
8:00 AM	53	76	44	41
9:00 AM	77	107	45	42
10:00 AM	69	100	47	42
11:00 AM	54	70	47	41
12:00 PM	56	87	44	40
1:00 PM	75	105	46	42
2:00 PM	71	103	46	42
3:00 PM	55	74	47	43
4:00 PM	55	75	46	42
5:00 PM	76	107	47	44
6:00 PM	74	106	50	46
7:00 PM	55	75	52	48
8:00 PM	54	71	51	46
9:00 PM	53	73	48	43
10:00 PM	81	112	47	42
11:00 PM	48	67	44	39

		Statistical Summary					
		Daytime (7 a.m 10 p.m.)		Nighttime (10 p.m 7 a.m.)			
High Low Average		High	Low	Average			
Leq	(Average)	77	53	71	81	40	73
Lmax	(Maximum)	107	70	89	112	65	85
L50	(Median)	52	44	47	47	36	40
L90	(Background)	48	40	43	42	33	37

Computed DNL, dB	79
% Daytime Energy	53%
% Nighttime Energy	47%

GPS Coordinates
39°44'33.00"N
121°52'42.93"W













