Cruz Hotel
Santa Cruz, California

Construction Noise Control & Operational Assessment
SM&W Project #24078

Prepared for:

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1. INTRODUCTION

This report assesses possible future construction and operational noise generated by the proposed Cruz Hotel development, located at 310-328 Front Street in Santa Cruz, California. All results and recommendations are based on the 12/22/22 plan set, and coordination with the applicant team. The purpose of this report is to supplement the CEQA Categorial Exemption Review authored by Dudek.

2. PROJECT OVERVIEW AND EXISTING CONDITIONS

The Cruz Hotel will be comprised of 6 occupiable stories and include up to 232 hotel rooms, amenity spaces, common open space, and an occupied rooftop area. The project will include demolition of the existing structure at the project site. No nighttime construction work is anticipated to be required to construct the project (10PM to 8AM).

The area surrounding the project on the west side of the San Lorenzo River currently includes many commercial properties, as well as the Santa Cruz Metro Center bus station. These uses contribute to the local noise environment as part of a vibrant mixed-use area. Additional traffic noise from the adjacent roads also contributes to the existing noise environment. For example, Laurel Street is located immediately south of the project and has 5 vehicle lanes.

The area in the vicinity of the project is expected to become more vibrant due to recently approved and foreseeable future development in accordance with the Downtown Plan. As a result, it is likely that there will be more foot traffic for shopping, new commercial businesses will open, and more general activity will be introduced in the project area.

A survey of existing noise levels at the project site was conducted in 2022 and found that 24-hour average noise levels ranged from 64 to 71 dBA[1] on the project site depending on the setback from the road. The Land Use Compatibility guidelines in the Santa Cruz General Plan acknowledge this level of noise as elevated and require noise exposure to be studied and appropriately reduced to protect interior spaces[2]. This further confirms that the project area currently experiences noise levels commensurate with an active mixed-use corridor.

3. NOISE SENSITIVE RECEPTORS

Noise associated with the project was analyzed in terms of the noise increases from the project at the nearest noise-sensitive receptors. The most noise sensitive receptors in terms of project-related noise would be residential and hotel land uses because these are places where people will normally sleep.

Sensitive receptors within 500 feet of the project boundary, associated land use type, and approximate distances to the closest property line are listed in Table 1 and shown graphically in Figure 1 below. For the purposes of this assessment, noise levels are estimated at the nearest receiver (800 to 818 Pacific Ave, 313 Front St.) as noise levels at other locations would be lower due to increased distance attenuation. Other non-noise sensitive uses in the project radius include commercial and public properties including, for example, 408 Front St., 333 Front St., and 201 Front St.

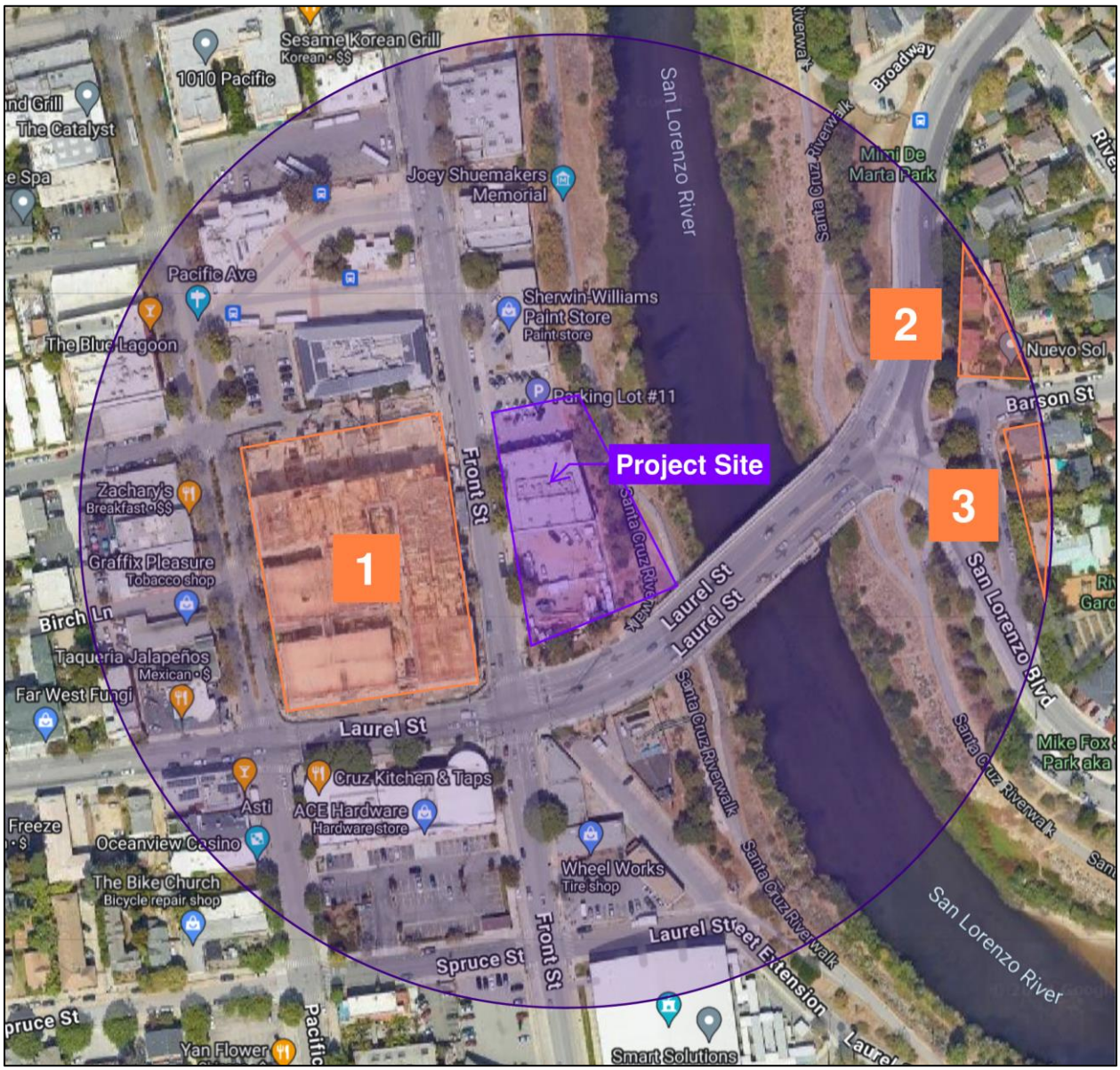
[1] See table on Page 3 of the noise study *The Cruz Hotel* by Salter Inc. dated 11/30/2022.

[2] Examples: the Land Use Compatibility Guidelines consider noise levels near 65 dBA Ldn to be “conditionally acceptable” for residential, hotel, schools, churches and similar uses provided noise insulation and other features are provided as part of the project. Additionally, this noise level is considered normally acceptable for most office, commercial and similar uses.

Table 1: Noise Sensitive Receptors

#	Direction to Project Site	Sensitive Receptor Address	Land Use Type	Example Properties	Minimum Setback from Project Site (ft)
1	West	800 to 818 Pacific Ave, 313 Front St.	Mixed-Use	Pacific Place Apartments	60
2	East	111 Barson St.	Residential	Nuevo Sol Housing Complex	490
3	East	114 Barson St, 268 to 280 San Lorenzo Blvd	Residential	-	490

Figure 1: Sensitive Receptors within 500 feet



4. ACOUSTICAL CRITERIA

4.1. CONSTRUCTION NOISE

SANTA CRUZ NOISE ORDINANCE

The City of Santa Cruz Municipal Code does not include quantitative noise limits for construction. Chapter 9.36.010 subsection (a) generally prohibits “offensive noise” during nighttime hours (defined from 10PM to 8AM), which is understood to include construction given the exemptions allowed under subsection (e).

SANTA CRUZ GENERAL PLAN

The City of Santa Cruz General Plan does not include quantitative noise limits for construction but includes general policy goals to reduce the impact of construction noise on the surrounding community.

FTA GUIDELINES

The latest Federal Transit Administration (FTA) Guidance Manual “Transit Noise and Vibration Impact Assessment” (dated September 2018) recommends the following thresholds for construction noise screening depending on the receiving land use. Residential receivers would determine the need for mitigation given they are the nearest receiver and receive the most stringent noise limits compared to commercial or industrial receivers. Only daytime thresholds are considered since construction during nighttime hours is not anticipated for this project.

Since the City Municipal Code and General Plan do not have descriptive requirements in regard to construction noise, the FTA assessment is considered to be the most relevant guideline to the project and is commonly used by jurisdictions as a threshold of significance.

- Residential: 90 dBA
- Commercial: 100 dBA
- Industrial: 100 dBA

4.2. OPERATIONAL NOISE

SANTA CRUZ MUNICIPAL CODE

The Santa Cruz Municipal Code, Chapter 24.14.260 states the following limits for operational noise (i.e., as distinct from temporary construction) dependent on the receiving property type.

- Residential: 5 dBA above the local ambient
- Commercial & Industrial: 6 dBA above the local ambient

As described in Chapter 24.22.488 of the Santa Cruz Municipal Code, the ambient noise level is the mean or middle sound level over a six-minute period, with a minimum ambient noise level of 40 dBA. Therefore, the most conservative noise limit (i.e., for any part of the City with very quiet ambient noise levels) would be 45 dBA[3].

Chapter 9.36 of the Santa Cruz Municipal Code does not provide quantitative noise limits therefore, Chapter 24 will be used as a guideline for operational noise limits.

[3] 40 dBA minimum ambient noise level + 5 dBA over ambient

SANTA CRUZ GENERAL PLAN

The Santa Cruz General Plan provides the general land use acceptability limits as stated above. There are no other known criteria to abide by.

5. QUANTITATIVE ASSESSMENT

5.1. CONSTRUCTION NOISE

A quantitative analysis of construction noise throughout the various construction phases was conducted. A list of likely construction equipment for each phase was provided by the Applicant Team as shown in Table 3 below. The amount of construction noise generated by the project would depend on the following elements:

a) The potential construction schedule and expected hours of work.

b) The specific pieces of construction equipment planned for each phase of the project and the duration of use. The typical daily and hourly use as well as when the equipment would operate over the entire project is of interest.

c) The location of each piece of equipment on the construction site, relative to applicable measurement distances.

FTA construction noise limits relevant to this project would be the residential limit of 90 dBA and commercial noise limit of 100 dBA at the receiving property line. Section 7.1 of the FTA Transit Noise and Vibration Impact Report[4], considers the combined maximum noise of the two loudest pieces of equipment in each project phase at the neighboring uses, if the equipment were operating simultaneously in the center of the project site. At the time of this report, the need for construction during nighttime hours (10PM to 8AM the following morning) is not anticipated and therefore this assessment only considers construction during daytime hours.

Anticipated construction noise levels were estimated using industry standard methodology from the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) computer software. This model combines noise reference levels for various equipment items and estimates the project-level combined noise levels out to set receptor distances. Where applicable, average noise (L_{EQ}) calculations consider the usage factor (UF), therefore accounting typical expected operational time for each type of equipment. The FHWA does not provide reference noise levels for all equipment types provided – in these cases, equipment items from the FHWA were substituted for similar items on the equipment list (e.g. drum mixer substituted for concrete mixer). For this assessment, no acoustic shielding from fencing or other intervening structures is included to provide a "worst-case" analysis.

None of the construction phases would exceed the FTA criteria of 90 dBA as shown in the following table. The closest noise sensitive receptor with the most restrictive noise limit is the mixed-use development located about 60 feet west from the center of the project site, which would easily meet the 90 dBA noise limit. It should be noted that this analysis is based on both pieces of equipment operating simultaneously at the nearest property line, which is considered very conservative as construction noise would be lower as equipment moves around the site and operates on an "as needed" basis. Since the conservative residential construction noise limit would be met, the commercial limit of 100 dBA would be easily met since

[4] Step 3, Option A

it is relatively similar distance away from the project site[5] and the commercial limit is 10 dB above the residential limit.

Table 3: Estimated Construction Equipment Noise at Residential (60-ft setback)

Project Phase	Project Equipment	Substituted Equipment (FHWA)	FHWA Ref. Noise Level, dBA Lmax @ 50 ft.	Est. Noise at Receiver
Shoring	1. Drilling Rig	Auger Drill Rig	85	81
	2. Backhoe	Backhoe	80	
	3. Front Loader	Front End Loader	80	
	4. Concrete mixers	Drum Mixer	80	
	5. Trucks	Dump Truck	84	
Demolition	1. Excavators	Excavator	85	83
	2. Front Loaders	Front End Loader	80	
	3. Dump Trucks	Dump Truck	84	
	4. Compressor chipping machine	Pneumatic Tools	85	
Grading and Site Prep	1. Scraper	Scraper	85	82
	2. Front Loaders	Front End Loader	80	
	3. Wheel Tractor	Tractor	84	
	4. Dump Trucks	Dump Truck	84	
Foundations & Structure	1. Boom Pump	Pumps	77	81
	2. Concrete Mixer Trucks	Concrete Mixer Truck	85	
Building Construction	1. Pneumatic Nail Guns	Pneumatic Tools	85	82
	2. Compressors	Compressor (air)	80	
	3. Forklifts	Man Lift	85	

It should be noted that the area surrounding the proposed project is currently experiencing noise from construction at multiple sites nearby, including the adjacent site across Front Street (Pacific Place Apartments). Since the project does not require unusually loud construction activities (pile driving, etc.), noise levels are anticipated to be similar to what is already experienced in the area from the current construction projects.

As discussed in Sections 2 and 3 above, the nearest residential receiver is the new development across Front Street (Pacific Place Apartments). We understand that the City of Santa Cruz required this project to include noise insulation features such as sound-rated windows and façade elements that would reduce exterior to interior noise transmission, consistent with the General Plan. As a result, the building is better equipped to reduce construction noise more effectively than older structures with only single pane windows and poor acoustic seals, further reducing the temporary effects associated with construction noise.

5.2. OPERATIONAL NOISE FROM ROOFTOP TERRACE

Operational noise from guest activities and outdoor AV systems at the occupied roof are assessed in the sections below.

The estimations conservatively assume no acoustic shielding provided by the project building itself, or any surrounding buildings to provide a “worst-case” assessment. In reality, receiver locations without line

[5] 40 feet, approximately 9 dB difference from 115 feet.

of sight to the majority of the occupied rooftop area would experience lower noise levels due to acoustic shielding provided by the building itself, and any other intervening structures.

Additionally, ambient noise levels in the local area are higher than the worst-case assumption of 40 dBA. For reference, noise measurements at the project site show that 24-hour average noise levels away from the road are as low as 64 dBA Ldn[6], as expected for this active mixed-use corridor. As noted for construction noise in the section above, the modern construction and noise insulation features required for new residential buildings, such as the one across Front Street, would further reduce discernible noise levels from the occupied roof area.

CROWD NOISE

An occupied rooftop terrace is planned above the 6th floor of the project and spans approximately 6,200 sq. ft. of the roof. The project includes outdoor common spaces on the rooftop for common hotel guest use only and will not be open to the public. Hotel guest activity noise in these common areas is not expected to substantially contribute to the total noise environment at the nearest sensitive receptors.

The steady state crowd noise from multiple occupants competing to be heard can be estimated using the occupancy of the space and the properties of nearby sound-reflective surfaces. A maximum capacity of 285 people is planned for the roof deck and conservatively assuming that only one of every three occupants would be actively talking simultaneously (95 people), the average crowd noise level on the roof is estimated to be approximately 65 dBA. Considering that the center of the occupied roof is located 115 feet away from the residential property located west, the crowd noise level experienced at the neighboring property is estimated to be approximately 38 dBA, which meets the conservatively assumed noise limit of 45 dBA.

AMPLIFIED LOUDSPEAKER NOISE

Noise from outdoor TV displays (and associated loudspeakers) proposed on the roof deck may vary in loudness and is dependent on the operational levels decided by the user, but expected to be temporary and intermittent. However, loudspeaker noise is not expected to be elevated above raised conversation levels at a given time in order to preserve speech intelligibility of rooftop conversations and avoid disrupting hotel guests. Noise levels of loudspeakers are assumed to range between 60 to 65 dBA when 3 feet away from the speaker. Therefore, noise levels from this equipment is expected to be similar to crowd noise and would not exceed the noise limit of 45 dBA at the neighboring properties.

6. CONSTRUCTION NOISE MANAGEMENT

While the assessment above shows that noise from construction is anticipated to meet the guidelines published by the FTA, the project proposes the following additional standard practices to manage noise from construction activities in response to General Plan Policy HZ3.1.3:

- Require all construction equipment to be equipped with mufflers and sound control devices (e.g., intake silencers and noise shrouds) that are in good condition and appropriate for the equipment.
- Locate construction equipment as far as feasible from adjacent or nearby noise-sensitive receptors.
- When possible, locate stationary equipment in pit areas or excavated areas.

[6] Measurement location S-1 from noise study *The Cruz Hotel* by Salter Inc. dated 11/30/2022.

- Require stationary noise sources associated with construction (e.g., generators and compressors) in proximity to noise-sensitive land uses to be muffled and/or enclosed within temporary enclosures and shielded by barriers, to the extent feasible and practical.
- Prohibit the idling of inactive construction equipment for prolonged periods (i.e., more than 10 minutes).
- Provide written notification of loud construction activities and equipment (listed below) for nearby buildings prior to the start of such activities.
    - Jackhammers
    - Drilling Rig
    - Concrete Saws
- Use electric motors rather than gasoline- or diesel-powered engines to avoid noise associated with compressed air exhaust from pneumatically powered tools, to the extent feasible and practical.

7. APPENDIX A: DEFINITIONS OF ACOUSTICAL TERMS

A WEIGHTING is the decibel scale for sound level measurements using the "A" weighted network of a sound level meter and is denoted as "dBA." The A-weighted network is shaped to correspond to the response of the human ear so that the results correlate approximately with human perception. It is the accepted standard for environmental noise measurements.

AMBIENT NOISE (see also Background Noise) is the sound pressure level associated with a given environment. It is a composite of sounds from near and far. For the purpose of measuring a specific noise source, it is the sound pressure level of all sources excluding the specific sound source being measured.

BACKGROUND NOISE (also Ambient Noise) is the sound pressure level associated with given environment. For the purpose of measuring indoor ambient noise, the dominant component of the noise is caused by the HVAC system.

DAY-NIGHT LEVEL (L_{dn} OR DNL) is the A-weighted equivalent continuous sound exposure level for a 24-hour period with a 10 dB adjustment added to the sound levels occurring during nighttime hours (10 PM to 7 AM). Ldn is typically used by regulating agencies to report general environmental noise.

$$L_{dn} = [(L_d + 10\ Log_{10}\ 15)\ \&\ (L_n + 10 + 10\ Log_{10}\ 9)] - 10\ log_{10}24$$

Where L_d = Leq for the daytime

L_n = Leq for the nighttime

& = decibel addition

DECIBEL or properly DECIBEL SCALE is the scale that measures sound level pressure (or other quality of interest) defined as 20 times the logarithm of the ratio of the sound level pressure (or other quality) to a standard reference level that by convention has been selected to approximate the threshold of human hearing. The standard reference in the U.S. is 0 decibel equals a pressure of 0.0002 Micro bar. The abbreviation for decibel is dB.

ENVIRONMENTAL NOISE, contrary to its original meaning referring to natural noise, has become known as the noise in the outdoor environment from transportation systems, machinery or other manmade sources.

FREQUENCY is the pitch of sound and refers to the cyclical variations per unit time. Noise can be composed of sound from the entire spectrum of frequencies. Frequency is expressed in cycles per second or Hertz. This is abbreviated Hz.

INTEGRATED OR EQUIVALENT SOUND LEVEL is the A-weighted equivalent continuous sound exposure level for a defined time. This is abbreviated $L_{eq\ (time)}$.

OCTAVE BAND is the range of sound frequencies whose lower limit frequency is half the upper limit frequency (one octave). Octave bands are identified by the geometric mean frequency or center between the lower limit and the upper limit.

OUTDOOR INDOOR TRANSMISSION CLASS (OITC) is the single number rating system to classify the transmission loss of materials used for environmental noise isolation rather than reporting the levels at separate frequency bands. For environmental noise, this rating system is preferred over STC because it was specifically designed to address transportation noise using an average transportation noise spectrum. OITC ratings are calculated from measured values of transmission loss in 1/3 octave bands, according to ASTM Standard E 1332.

SOUND LEVEL METER is an instrument to measure sound pressure levels in dB. Various features are incorporated into an instrument to select specific sound frequency bands, integrate pressure over time and display minimum, mean, and peak levels.

SOUND PRESSURE LEVEL (SPL) is the ratio, expressed in decibels, of the mean-square sound pressure level to a reference mean-square sound pressure level that by convention has been selected to approximate the threshold of human hearing (0.0002 Microbar in the U.S.).

SOUND TRANSMISSION CLASS (STC) is the established single number rating system to classify the transmission loss of materials rather than reporting the levels at separate frequency bands. The rating system was originally designed to address speech isolation and is derived from measured values of transmission loss, according to ASTM E 413. It is not appropriate for use in environmental noise isolation applications because the STC rating does not sufficiently take into account the low frequencies that predominate in transportation noise. Two materials with the same STC rating may achieve very different levels of transportation noise isolation.

TRANSMISSION LOSS is a measure of the sound insulation of a material stated in decibels. Generally, the transmission losses of materials are given in standard 1/3 octave band intervals.