ATTACHMENT H
NOISE ANALYSIS
PREPARED BY DUDEK

NOISE ASSESSMENT TECHNICAL REPORT
for the
233 North Hudson Avenue Project
Pasadena, California

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
ADT	average daily traffic
CEQA	California Environmental Quality Act
City	City of Pasadena
CNEL	community noise equivalent level
dB	decibel
dBA	A-weighted decibel
FTA	Federal Transit Administration
HVAC	heating, ventilation, and air conditioning
L_{dn}	day–night sound level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
L_{min}	minimum sound level
L_{xx}	percentile-exceeded sound levels
N/A	not applicable
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
VdB	vibration dB

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EXECUTIVE SUMMARY

The purpose of this noise assessment technical report is to evaluate the potential noise impacts associated with implementation of the proposed 233 North Hudson Avenue Project (project). This assessment uses the significance thresholds in Appendix G of the California Environmental Quality Act (CEQA) Guidelines (14 CCR 15000 et seq.). The project proposes to construct a mixed-use development at 233 North Hudson Avenue, in the City of Pasadena (City) in Los Angeles County, California. A mixture of commercial- and residential-use buildings surrounds the project site.

The project would consist of residential and commercial land uses and parking. The project would be built as one structure with three levels of subterranean parking. The first floor (ground floor) of the proposed structure would be a mixture of commercial space and a lobby area to service the residential component of the project. The next four floors would consist of 42 residential units.

Operational Noise Impacts

Operation of the project would generate noise from added traffic generation on vicinity roads and mechanical noise from project equipment. Traffic noise levels were calculated based on existing and existing plus project average daily traffic (ADT) data provided by the City (City of Pasadena 2017a). Noise levels did not significantly increase because of the project. Existing and existing plus project noise levels in the project vicinity are in the "normally acceptable" range of the Guidelines for Noise Compatible Land Use Table in the City's *Revised Noise Element of the General Plan: Existing and Future Conditions* (Noise Element) (City of Pasadena 2002). Thus, the traffic noise impact is considered less than significant. Mechanical noise from the heating, ventilation, and air conditioning (HVAC) system and elevator equipment was shown to be less than significant as well.

Temporary Construction Noise and Vibration Impacts

Construction of the project would result in the temporary increases in noise in the project vicinity. The City's Noise Ordinance provides a limit on equipment noise emission levels and hours of operation. It states that it is unlawful for construction equipment to emit noise levels exceeding 85 A-weighted decibel (dBA) when measured at 100 feet from the equipment (City of Pasadena 2002). The expected equipment list does not include equipment that would exceed this sound level at 100 feet. Construction hours are expected to be limited to those allowed under the Noise Ordinance. Based on the local regulations, the expected noise impact due to construction activities would be less than significant.

A brief study of the construction noise levels for the whole site is provided based on Federal Highway Administration method (Roadway Construction Noise Model (RCNM)). Because of the proximity of noise-sensitive receptors to the project site, calculated construction noise levels based on RCNM were shown to be high. Based on this result, recommended construction practices are described.

Vibration levels from construction equipment at the adjacent sensitive receptors were calculated. A review conducted by the City's Design and Historic Preservation Section staff showed no known historic resources on the properties adjacent to the project site. Construction vibration analysis shows the impact is expected to be less than significant.

Noise Assessment Technical Report for the 233 North Hudson Avenue Project

1 INTRODUCTION

1.1 Purpose

This technical report evaluates noise impacts of the project, including demolition, construction, and operation. Noise sources from future implementation of the project include traffic, mechanical equipment, and short-term construction operations. The results of this analysis are intended for use in the environmental impact report being prepared by the City in accordance with CEQA.

1.2 Project Location and Description

The project consists of a mixed-use development located at 233 North Hudson Avenue, Pasadena, California, which is on the corner of North Hudson Avenue and East Walnut Street. (Figure 1, Project Location). The property is located approximately 500 feet south of Interstate 134. The property is east of the Pasadena Civic Center District and Fuller Theological Seminary. South of the project site is the Pasadena Playhouse District.

Residential uses are located to the north and east of the project site across North Hudson Avenue. West and south of the project site are commercial uses. The project site is approximately 0.37 acre in size and used as a surface parking lot.

The proposed mixed-use development would remove the existing empty lot and replace it with a single five-story mixed-use building. The project would consist of residential and commercial land uses, as well as underground parking. The entire project would be built as one structure with three levels of subterranean parking that would provide 78 parking spaces. The first floor (ground floor) of the proposed structure would be a mixture of approximately 5,835 square feet of commercial space and a lobby area to service the residential component of the project. The next four floors would consist of 42 residential units. The structure would total 47,670 square feet of development divided among the five aboveground stories. The project's residential density is approximately 113.5 dwelling units per acre (Tyler Gonzalez Architects 2017).

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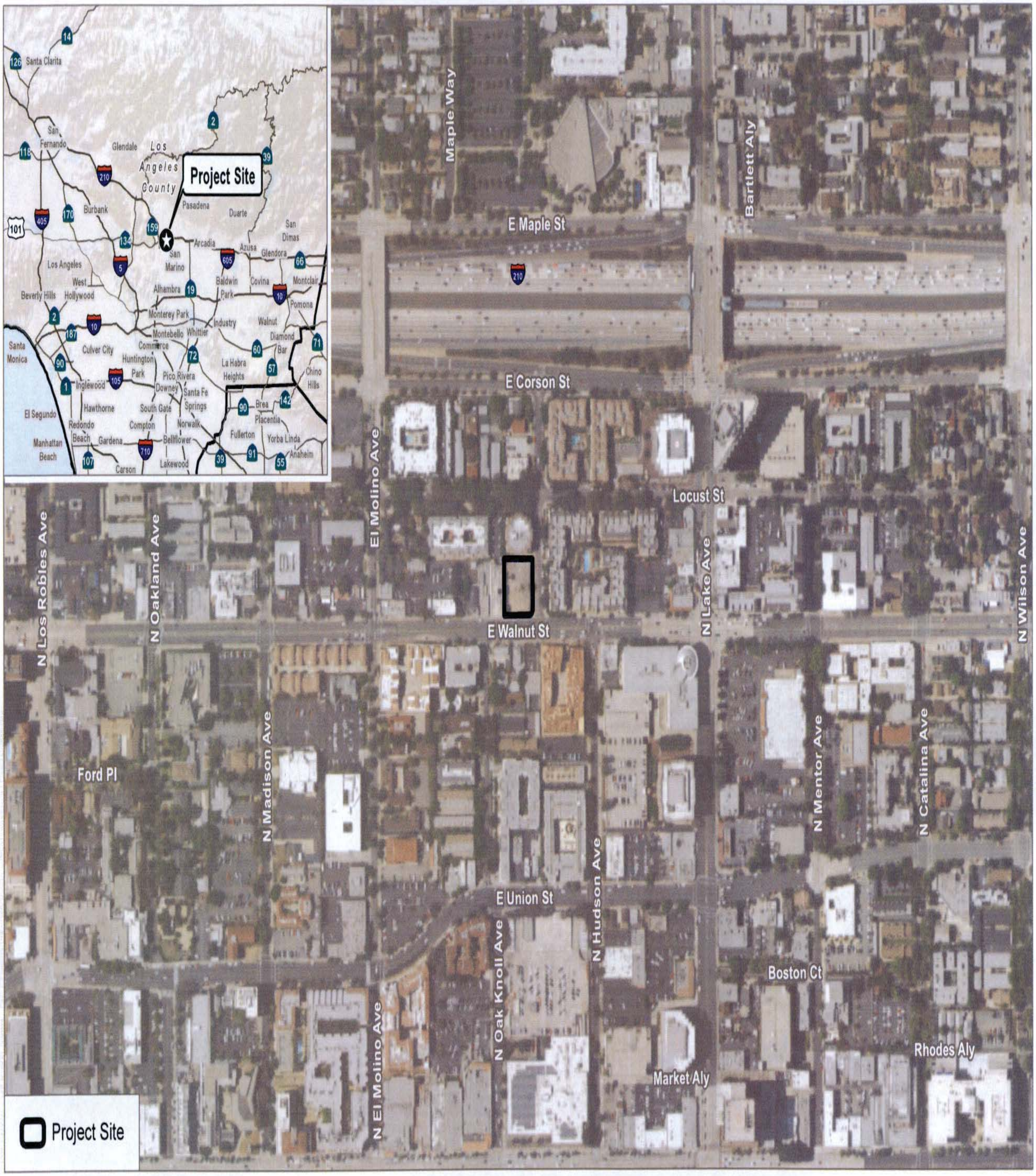

SOURCE: NAIP 2016

DUDEK

0 210 420 Feet

FIGURE 1

Project Location

233 North Hudson Avenue Project

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1.3 Noise Background and Terminology

Fundamentals of Environmental Noise

Vibrations, traveling as waves through air from a source, exert a force perceived by the human ear as sound. Sound pressure level (referred to as sound level) is measured on a logarithmic scale in decibels (dB) that represent the fluctuation of air pressure above and below atmospheric pressure. Frequency, or pitch, is a physical characteristic of sound and is expressed in units of cycles per second, or hertz. The normal frequency range of hearing for most people extends from approximately 20 to 20,000 hertz. The human ear is more sensitive to middle and high frequencies, especially when the noise levels are quieter. As noise levels become louder, the human ear starts to hear the frequency spectrum more evenly. To accommodate for this phenomenon, a weighting system to evaluate how loud a noise level is to a human was developed. The frequency weighting, called "A" weighting, is typically used for quieter noise levels, which de-emphasizes the low frequency components of the sound in a manner similar to the response of a human ear. This A-weighted sound level is called the "noise level" and is referenced in units of dBA.

According to the California Department of Transportation, "it is generally accepted that the average healthy ear . . . can barely perceive a noise level change of 3 dB" (Caltrans 2013). A change of 5 dBA is readily perceptible, and a change of 10 dBA is perceived as twice or half as loud. A doubling of sound energy results in a 3 dBA increase in sound, which means that a doubling of sound energy (e.g., doubling the average daily numbers of traffic on a road) would result in a barely perceptible change in sound level.

An individual's noise exposure occurs over a period of time. Being the product of many noise sources at various distances, all of which constitute a relatively stable background or ambient noise environment, community noise sources continuously vary. The background, or ambient, noise level gradually changes throughout a typical day, corresponding to distant noise sources, such as traffic, as well as changes in atmospheric conditions.

Noise levels are generally higher during the daytime and early evening when traffic (including airplanes), commercial, and industrial activity is the greatest. However, noise sources experienced during nighttime hours when background levels are generally lower can be potentially more conspicuous and irritating to the receiver. To evaluate noise in a way that considers periodic fluctuations experienced throughout the day and night, a concept termed "community noise equivalent level" (CNEL) was developed, wherein noise measurements are weighted, added, and averaged over a 24-hour period to reflect magnitude, duration, frequency, and time of occurrence.

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels

(L_{min} and L_{max}), percentile-exceeded sound levels (L_{xx}), the day–night sound level (L_{dn}), and the CNEL. The following are brief definitions of these measurements and other terminology used in this technical report:

- **Decibel (dB).** A unitless measure of sound on a logarithmic scale that indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals.
- **A-weighted decibel (dBA).** An overall frequency-weighted sound level in dB that approximates the frequency response of the human ear.
- **Equivalent sound level (L_{eq}).** The constant level that, over a given time period, transmits the same amount of acoustic energy as the actual time-varying sound. L_{eq} are the basis for the L_{dn} and CNEL scales.
- **Maximum sound level (L_{max}).** The maximum sound level measured during the measurement period.
- **Minimum sound level (L_{min}).** The minimum sound level measured during the measurement period.
- **Percentile-exceeded sound level (L_{xx}).** The sound level exceeded x percent of a specific time period. For example, L_{10} is the sound level exceeded 10% of the time.
- **Day–night average sound level (L_{dn}).** The City has historically described community noise levels in terms of the L_{dn}. The L_{dn} is a 24-hour average A-weighted sound level with a 10 dB penalty added to the nighttime hours from 10:00 p.m. to 7:00 a.m. The 10 dB penalty is applied to account for increased noise sensitivity during the nighttime hours. In the City's Noise Element (City of Pasadena 2002), noise guidelines are described in terms of L_{dn} or CNEL (see definition below); resulting values from application of L_{dn} versus CNEL rarely differ by more than 1 dB; therefore, these two methods of describing average noise levels are often considered interchangeable.
- **Community noise equivalent level (CNEL).** The City's Noise Element (2002) describes community noise levels in terms of the CNEL. The CNEL is the average equivalent A-weighted sound level during a 24-hour day. CNEL accounts for the increased noise sensitivity during the evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours (10:00 p.m. to 7:00 a.m.) by adding 5 dB to the sound levels in the evening and 10 dB to the sound levels at night. CNEL and L_{dn} are often considered equivalent descriptors.

Exterior Noise Distance Attenuation

Noise sources are generally classified in two forms: (1) point sources, such as stationary equipment or a group of construction vehicles and equipment working within a spatially limited area at a given time; and (2) line sources, such as a roadway with a large number of pass-by sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6.0 dBA for each doubling of distance from the source to the receptor at acoustically "hard" sites and at a rate of 7.5 dBA for each doubling of distance from source to receptor at acoustically "soft" sites. Sound generated by a line source (i.e., a roadway) typically attenuates at a rate of 3 dBA and 4.5 dBA per doubling distance for hard and soft sites, respectively. Sound levels can also be attenuated by constructed or natural barriers. For the purpose of a sound attenuation discussion, a "hard" or reflective site does not provide any excess ground-effect attenuation and is characteristic of asphalt or concrete ground surfaces, as well as very hard-packed soils. An acoustically "soft" or absorptive site is characteristic of unpaved loose soil or vegetated ground.

Structural Noise Attenuation

When just breaking the line of site between a source and a receiver, approximately 5 dB of attenuation can be expected. Typical California Department of Transportation noise barriers provide approximately 10 dB of noise reduction. An upper limit for sound reduction due to added wall barriers is approximately 20 dB (Caltrans 2009). Structures can also provide noise reduction by insulating interior spaces from outdoor noise. The outside-to-inside noise attenuation provided by typical structures in California ranges between 17 and 30 dBA with open and closed windows, respectively, as shown in Table 1.

Table 1
Outside-to-Inside Noise Attenuation (dBA)

Building Type	Open Windows	Closed Windows[a]
Residences	17	25
Schools	17	25
Churches	20	30
Hospitals/offices/hotels	17	25
Theaters	17	25

Source: Transportation Research Board 2000
Notes dBA = A-weighted decibel
[a] As shown, structures with closed windows can attenuate exterior noise by 25 to 30 dBA

Fundamentals of Vibration

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. The response of humans to vibration is very complex. However, it is generally accepted that human response is best approximated by the vibration velocity level associated with the vibration occurrence.

Heavy equipment operation, including stationary equipment that produces substantial oscillation or construction equipment that causes percussive action against the ground surface, may be perceived by building occupants as perceptible vibration. It is also common for groundborne vibration to cause windows, pictures on walls, or items on shelves to rattle. Although the perceived vibration from such equipment operation can be intrusive to building occupants, the vibration is seldom of sufficient magnitude to cause even minor cosmetic damage to buildings unless the receptors are in proximity to heavy equipment.

When evaluating human response, groundborne vibration is usually expressed in terms of root mean square vibration velocity. Root mean square is defined as the average of the squared amplitude of the vibration signal. As for sound, it is common to express vibration amplitudes in terms of dB defined as:

$$L_v = 20 \log \left(\frac{v_{rms}}{v_{ref}} \right)$$

where v_{rms} is the root mean square vibration velocity amplitude in inches/second, and v_{ref} is the dB reference of 1×10^{-6} inches/second.

To avoid confusion with sound dB, the abbreviation VdB is used for vibration dB. The vibration threshold of perception for most people is approximately 65 VdB. Vibration levels in the 70 to 75 VdB range are often noticeable but generally deemed acceptable, and levels in excess of 80 VdB are often considered unacceptable (FTA 2006).

When evaluating the response of buildings, groundbourne vibration is typically expressed as peak particle velocity (PPV). This value represents the greatest instantaneous particle velocity during a given time interval, and applies to earth materials in contact with the structure of concern.

1.4 Noise Regulations

1.4.1 Federal

Federal Transit Administration and Federal Railroad Administration Standards

Although the Federal Transit Administration (FTA) standards are intended for federally funded mass transit projects, the impact assessment procedures and criteria included in the FTA *Transit Noise and Vibration Impact Assessment* (FTA 2006) are routinely used for projects evaluated by local jurisdictions. The FTA and Federal Railroad Administration have published guidelines for assessing the impacts of groundborne vibration associated with rail projects, which have been applied by other jurisdictions to other types of projects. Table 2 shows the FTA building categories along with construction vibration damage criteria.

**Table 2 (Table 12-3 in FTA Manual)
Construction Vibration Damage Criteria**

Building Category	PPV (in/sec)	Approximate L_v *
I. Reinforced-concrete, steel or timber (no plaster)	0 5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0 2	94
IV Buildings extremely susceptible to vibration damage	0 12	90
*RMS velocity in decibels (VdB) re 1 micro-inch/second, Assumed crest factor of 4, corresponding to an PPV-rms difference of 12 VdB		

For fragile historic buildings, the maximum PPV for transient sources is 0.12 inches/second. Other buildings have PPV criteria as high as 0.5 inches / second PPV. The buildings in the site vicinity are expected to be in the reinforced-concrete, steel or timber (no plaster) building category. Thus, 0.5 inches /second PPV is the threshold for a significant construction vibration impact for evaluation of the project construction-related vibration.

1.4.2 State

California Noise Control Act of 1973

Sections 46000 through 46080 of the California Health and Safety Code, known as the California Noise Control Act of 1973, declares that excessive noise is a serious hazard to the public health and welfare, and exposure to certain levels of noise can result in physiological, psychological, and economic damage. It also identifies a continuous and increasing bombardment of noise in the urban, suburban, and rural areas. The act declares that the State of California has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the state to provide an environment for all Californians free from noise that jeopardizes their health or welfare.

Noise Insulation Standards

In 1974, the California Commission on Housing and Community Development adopted noise insulation standards for hotels, motels, dormitories, and multifamily residential buildings (24 CCR Part 2). Title 24 establishes standards for interior room noise (attributable to outside noise sources). The regulations also specify that acoustical studies must be prepared whenever a multifamily residential building or structure is proposed to be located in an area with CNEL (or L_{dn}) of 60 dBA or greater. Such acoustical analysis must demonstrate that the residence has been designed to limit intruding noise to an interior CNEL (or L_{dn}) of 45 dBA (24 CCR Part 2).

The 2013 California Green Building Standards Code includes Section 5.507.4, Acoustical Control. This section dictates that, within 65 CNEL contours, a prescriptive or performance method of noise control must be used to assure interior levels are acceptable. The prescriptive method requires a composite sound transmission class rating of at least 50 or outside inside transmission class rating of no less than 40, with exterior windows a minimum of sound transmission class 40 or outside inside transmission class 30 when within the 65 CNEL noise contour of a transportation source. When the contours are not available, the building is exposed to a noise level of 65 dBA L_{eq}—1 hour—during any hour of operation is an acceptable criterion for analysis and mitigation. The prescriptive or performance method applies to the same noise contour areas. However, the interior noise environment attributable to exterior sources has a higher threshold at 50 dBA 1 hour L_{eq} during any hour of operation (24 CCR Part 11).

The 2013 California Green Building Standards Code also addresses interior sound transmission. It states that "wall and floor-ceiling assemblies separating tenant spaces . . . shall have an STC [sound transmission class] of at least 40" (24 CCR Part 11).

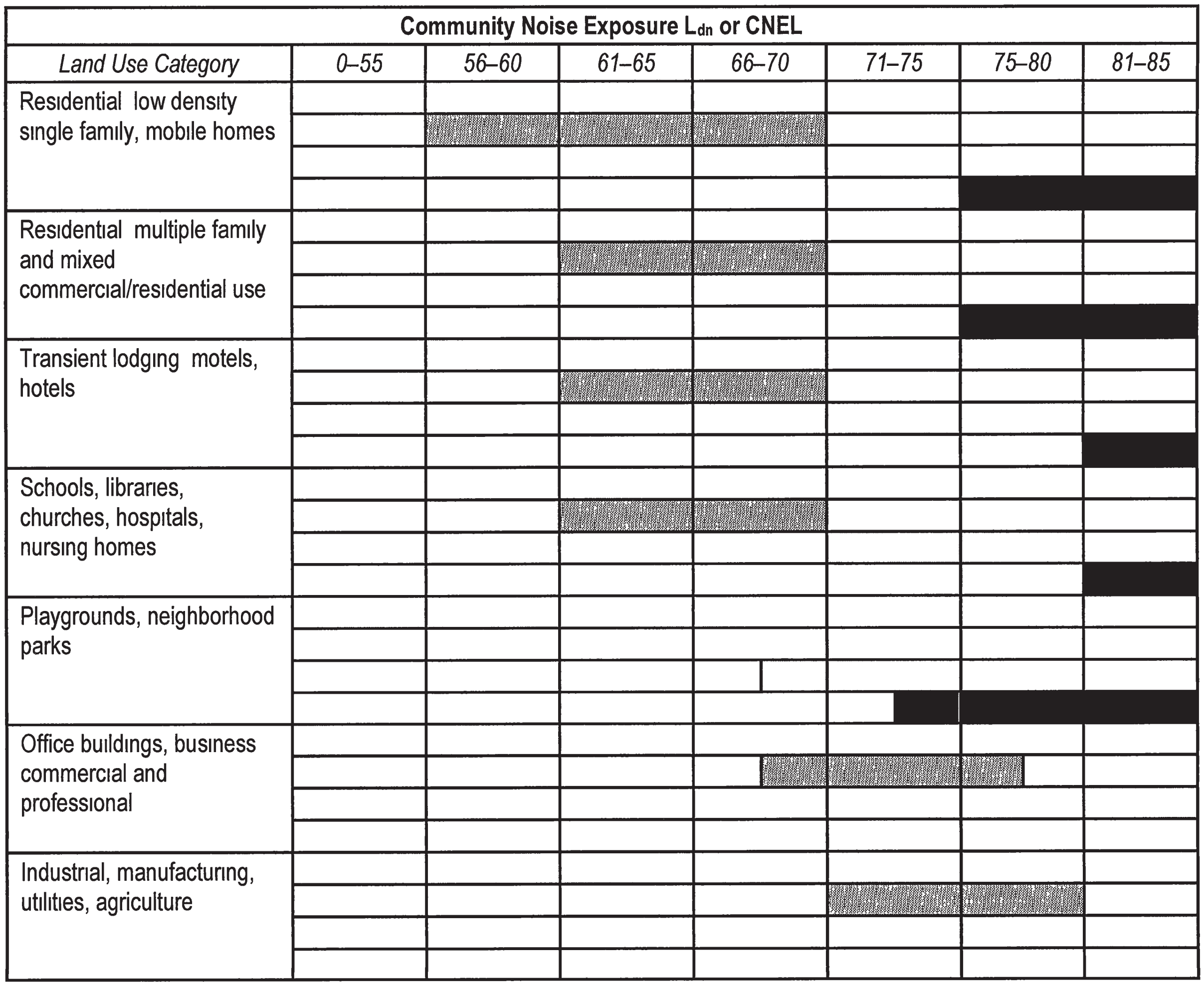
1.4.3 Pasadena

The City established guidelines and standards in the City's Noise Element and in the Pasadena Municipal Code.

Pasadena General Plan

The City adopted a revised General Plan Noise Element in December 2002. The Noise Element includes objective, policies, and implementation details. Furthermore, the Noise Element includes Table 3 (City of Pasadena 2002). This table shows acceptable, normally acceptable, conditionally acceptable, and normally unacceptable CNEL ranges for various types of land uses. Refer to Table 3 for this noise compatibility guideline information.

Table 3
Guidelines for Noise Compatible Land Use



Source: City of Pasadena 2002
Notes: CNEL = community noise equivalent level, L_{dn} = day–night sound level

Clearly Acceptable. Specified land use is satisfactory, based on the assumption that any buildings involved are of normal, conventional construction, without any special noise insulation requirements

Normally Acceptable. New construction or development should be undertaken after an analysis of the noise reduction requirements is made, and needed insulation features have been included in the design Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice

Conditionally Acceptable. If new construction or development proceeds, an analysis of the noise reduction requirements should be made and needed noise insulation features included in the design

Normally Unacceptable. New construction or development should generally not be undertaken, unless it can be demonstrated that an interior level of 45 dBA can be achieved

The project site and vicinity are composed of multifamily residential, a college (Fuller Theological Seminary), and commercial uses. Based on these uses, the guidelines dictate "normally acceptable" ranges of up to 70 dBA CNEL. Multifamily residential levels up to 65 dBA CNEL are "clearly acceptable."

Implementation measures are also included in the Noise Element. Relevant implementation measures are listed below (City of Pasadena 2002):

- **Measure 1:** The City will consult the guidelines for noise compatible land use shown on [Table 3 of this technical report] to guide the appropriateness of land uses relative to roadway noise. (Policies 1a, 2a)
- **Measure 2:** An acoustical study showing the ability to meet state noise insulation standards may be required for any development proposed in an area where the noise level . . . exceeds the "clearly acceptable level" as determined by the City and shown [in Table 3 of this technical report]. (Policies 1a, 2a)
- **Measure 3:** The City will enforce the California Noise Insulation Standards (Title 25 California Administration Code for future development and redevelopment) to ensure an acceptable interior noise level of 45 dBA L_{dn} in habitable rooms. (Policies 1a, 2a)
- **Measure 21:** The City will encourage new developments to site outdoor commercial areas and gathering places, loading areas, parking lots, driveways, trash enclosures, mechanical equipment, and other noisier components away from residential zones and other sensitive uses . . . to the extent feasible, unless the siting of such components near to noise-sensitive uses provides transportation or other benefits. (Policies 7a, 7b, 7c)
- **Measure 23:** The City will encourage commercial and/or industrial uses abutting residential zones to limit deliveries and trash pickups from 7:00 a.m. to 9:00 p.m. Monday through Saturday, unless there are substantial transportation or other benefits for different times. (Policy 6c)
- **Measure 26:** The City will warn new residents and other sensitive noise receptors . . . about the potential for noise in the Central District and other mixed-use areas. (Policies 6a, 6b, 6c, 7a)

City of Pasadena Noise Ordinance

The Pasadena Municipal Code, Chapter 9.36, includes noise restrictions (Noise Ordinance). It states that "it is unlawful for any person to create, cause, or make or continue to make or permit to be made or continued any noise or sound which exceeds the ambient noise level at the property line of any property by more than 5 decibels" (City of Pasadena 2017b).

Section 9.36.060 addresses multifamily residential property. It is unlawful to produce sounds at a level greater than those shown in Table 4 when measured inside any dwelling unit on the same property or 20 feet from the outside of the source dwelling unit (City of Pasadena 2017b).

Table 4
Interior Noise Standard

Time Interval	Interior Noise Standard (dBA)
7.00 a.m. to 10.00 p.m	60
10:00 p m to 7 00 a m	50

Source: City of Pasadena 2017b
Notes: dBA = A-weighted decibel

Noise impacts from construction and stationary sources are regulated through the City's Noise Ordinance. The Pasadena Municipal Code, Section 9.36.070, Construction Projects, limits typical construction hours within a residential district or within 500 feet of a residential district to certain hours depending on the day. On weekdays (Monday through Friday), allowable construction hours are from 7:00 a.m. to 7:00 p.m. On Saturdays, construction can occur between 8:00 a.m. and 5:00 p.m. On Sundays and holidays, construction is prohibited (City of Pasadena 2017b).

In addition to construction hour restrictions, Pasadena Municipal Code, Section 9.36.080, further limits the noise level of powered construction equipment. It states that it is unlawful for construction equipment to emit noise levels exceeding 85 dBA when measured at 100 feet from the equipment (City of Pasadena 2017b).

The Pasadena Municipal Code also limits "any person to operate any machinery, equipment, pump fan, air condition apparatus, or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient noise level by more than 5 dB" (City of Pasadena 2017b).

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2 EXISTING NOISE CONDITIONS

2.1 Surrounding Uses

The project site is located at 233 North Hudson Avenue. The site is bounded to the south by East Walnut Street and to the east by North Hudson Avenue. Residential land uses exist immediately north of the site and east across North Hudson Avenue. Commercial land uses exist immediately west of the site and across East Walnut Street.

A sound-level survey was conducted on July 12, 2017, to evaluate existing sound levels and assess potential project noise impacts on the surrounding area. Short-term (1 hour or less) attended sound-level measurements were taken with a Rion NL-32 sound-level meter. This instrument is categorized as type 1, precision grade.

Short-term sound levels were measured at five locations in the project vicinity, as shown on Figure 2, Noise Measurement Locations. Noise measurements were taken along East Walnut Street and North Hudson Avenue. The microphone height was 5 feet above the ground on a tripod, and the microphone was equipped with a windscreen.

The sound-measuring instrument used for the survey was set to the "slow" time response and the A-weighting scale for all noise measurements. To ensure accuracy, the calibration of the instrument was field checked before the measurements using a portable acoustical calibrator.

During the field measurements, physical observations of the predominant noise sources were noted. The major noise source in the project area was vehicle traffic. Other secondary noise sounds included rustling leaves, birds, distant aircraft overflights, and other community noises. Appendix A includes a field data sheet from the measurements conducted in the site vicinity. The results of the sound-level measurements are summarized in Table 5. As shown in Table 5, measured noise levels varied from 68 dBA L_{eq} at ST4 to 61 dBA L_{eq} at ST2.

For the purpose of establishing an ambient existing sound level, the measurements show that existing daytime levels range between 61 and 68 dBA L_{eq}. Thus, calculated expected levels due to mechanical equipment greater than between 66 and 73 dBA L_{eq} could be considered significant per the Noise Ordinance, depending on the actual ambient noise level at the proposed location of such mechanical equipment.

Table 5
Existing Ambient Noise Measurement Results

Site ID	Begin (Time)	End (Time)	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	Primary Noise Source	Other Noise Sources (Background)	Other Noise Sources/Additional Description
ST1	12 24	12.34	65	73	50	58	64	69	Traffic	Distant traffic, rustling leaves	Back-up alarm
ST2	11 38	11:53	61	71	50	54	60	64	Traffic	Distant aircraft, distant conversations/yelling, distant traffic, rustling leaves	N/A
ST3	12:11	12:21	67	86	51	54	63	69	Traffic	Distant traffic	Horn honk
ST4	11:55	12:05	68	80	56	60	66	70	Traffic	Distant conversations/yelling, distant traffic	Forklifts and back-up alarms
ST5	10:54	11:14	63	78	49	53	58	66	Traffic	Birds, distant aircraft, distant traffic, rustling leaves	Back-up alarm and car door slam

Notes: L_{eq} = equivalent sound level, L_{max} = maximum sound level; L_{min} = minimum sound level, L_{xx} = percentile-exceeded sound levels, N/A = not applicable

SOURCE: Bing Maps (Accessed 2017)

DUDEK

FIGURE 2

Noise Measurement Locations

233 North Hudson Avenue Project

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3 SIGNIFICANCE CRITERIA

Based on the criteria identified in Appendix G of the CEQA Guidelines, the project would have a significant impact on noise if it would result in:

1. The exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
2. The exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
3. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
4. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

3.1 Evaluation Criteria for Project

Based on the City's Noise Element (City of Pasadena 2002) and Municipal Code (City of Pasadena 2017b), the following criteria are used in this assessment to evaluate the project against the significance thresholds listed above:

- Project operation-generated noise levels causing an increase in ambient noise of greater than 3 dB where existing levels are above 65 dBA CNEL at multi-family residential uses in the project vicinity is considered significant based on the Guidelines for Noise Compatible Land Use Table.
- For demolition and construction, groundborne vibrations greater than the FTA Noise and Vibration Assessment (2006) construction vibration criterion, which includes 0.5 inch per second PPV for conventional structures.
- An increase of 5 dB in ambient noise levels at the property line because of on-site project operational activities based on the Pasadena Municipal Code (City of Pasadena 2017b).
- Operation of individual pieces of construction equipment that would generate noise in excess of 85 dBA at a distance of 100 feet based on the City's Noise Ordinance (City of Pasadena 2017b).

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4 IMPACTS ANALYSIS

4.1 Transportation Noise Exposure

4.1.1 Roadway Noise

The primary noise-related effect that most non-industrial projects produce is a potential for on-site and off-site increases in traffic, which is the main source of noise in most urban areas. Acoustical calculations were performed for existing traffic levels because traffic is often a major contributor to the ambient or community noise level; therefore, it is helpful to quantify existing traffic-related noise levels. Existing calculated traffic noise levels are compared to existing plus project calculated noise levels based on the traffic data available in the Transportation Analysis (City of Pasadena 2017c).

Increases in Ambient Noise Levels Due to Traffic

Dudek analyzed the traffic noise (CNEL\L_{dn}) from vicinity roadways using data from the Transportation Analysis. The Transportation Analysis includes existing and project traffic volumes for intersections near the project site (City of Pasadena 2017c).

Table 6 shows existing ADT data for the street segments in the project vicinity.

Table 6
Existing and Project Average Daily Traffic

Street Segment	ADT Calculations From Transportation Analysis		
	Existing ADT	*Project ADT*	*Existing Plus Project*
Locust Street between El Molino Avenue and North Hudson Avenue	1,052	48	1,100
Locust Street between North Hudson Avenue and Lake Street	1,978	0	1,978
North Hudson Avenue between Locust Street and East Walnut Street	2,201	477	2,678
East Walnut Street	22,583	0	22,583

Source: City of Pasadena 2017c
Notes: ADT = average daily traffic

Existing and existing plus project traffic numbers are used in traffic noise modeling to assess current and future noise levels from the roadways in the project vicinity. The modeling includes both existing and future residential receptors in the project vicinity. Based on the traffic data, residential receptors were located in the model where the greatest noise impacts were expected. The modeled traffic noise receivers are described as follows:

- **M1:** Southeastern corner of the intersection of North Hudson Avenue and Locust Street; worst-case location; second (15 feet), third (25 feet), and fourth levels (35 feet (10.67 meters)); approximately 25 feet (from each road edge)
- **M2:** Lower-level open space for the project approximately 35 feet (10.67 meters) off of North Hudson Avenue; second level (approximately at 45-foot (13.72-meter) height), third level (assumed 55 feet (16.76 meters)), and fourth level (assumed 65 feet (19.81 meters))
- **M3:** Corner of proposed property at same heights as M2
- **M4:** Proposed balcony areas approximately 13 feet off of East Walnut Street; same heights as M2

Data for the ADT on East Walnut Street were not available in the Transportation Analysis. To ensure the accuracy of the noise model, data were required for East Walnut Street adjacent to the project site. East Walnut Street data were obtained from a website suggested by City staff as a reliable source of traffic data (City of Pasadena 2017a). For East Walnut Street, ADT was calculated from the average peak-hour data available at the nearest intersection to the west (East Walnut Street and El Molino Avenue). It was assumed that peak-hour traffic would be approximately 10% of the ADT. Since the Transportation Analysis does not include East Walnut Street data, these ADT numbers remain the same in both the existing and existing plus project traffic noise models.

Using the traffic data in Table 6, a noise model of the vicinity roads was created in CadnaA. Figure 2 shows the locations of the measurements and existing and future representative receiver locations. Measurements with traffic counts were used to calibrate the noise model before analyzing existing and existing plus project traffic noise levels. The results of the noise modeling are summarized in Table 7.

Table 7
Traffic Noise Modeling Results

Location	Description	Existing Calculated Traffic Noise Levels (dBA CNEL)	Existing with Project Calculated Traffic Noise Levels (dBA CNEL)
M1	Hudson and Locust 2nd Level	63	63
	Hudson and Locust 3rd Level	64	64
	Hudson and Locust 4th Level	64	64
M2	Proposed Hudson 2nd Level	64	65
	Proposed Hudson 3rd Level	65	65
	Proposed Hudson 4th Level	65	65
M3	Proposed Walnut 2nd Level	68	68
	Proposed Walnut 3rd Level	68	68
	Proposed Walnut 4th Level	69	69
M4	Proposed Walnut 2nd Level	69	69
	Proposed Walnut 3rd Level	69	69
	Proposed Walnut 4th Level	69	69

Notes: dBA = A-weighted decibel, CNEL = community noise equivalent level

The traffic noise modeling results show that project-generated traffic noise level increases at residences in the project vicinity would be less than 1 dBA CNEL. Regarding noise increases due to the project, it was concluded that the increase in traffic noise would be less than 3 dBA L_{dn}, and therefore, traffic noise impacts associated with the project would be less than significant. However, all modeled locations along East Walnut Street have traffic noise levels exceeding 65 dBA CNEL. Therefore, the proposed habitable rooms would require an acoustic review of the building plans to ensure that the building shell noise reduction would be adequate to achieve compliance with the interior criterion of 45 dBA CNEL. Measure 2 in the City's Noise Element states that an acoustical study is required for developments proposed where the noise level exceeds the "clearly acceptable level." Measure 3 further states that habitable rooms should achieve a 45 dBA L_{dn} to be acceptable (City of Pasadena 2002).

Based on the Guidelines for Noise Compatible Land Use Table (City of Pasadena 2002), conventional construction with closed windows and fresh air supply systems or air conditioning will normally suffice. Balconies will require a barrier. The noise barriers may be constructed of materials such as tempered glass, acrylic glass, solid metal (e.g., minimum 6-gage-thick steel, aluminum), or any masonry material with a surface density of at least 3 pounds per square foot. The barriers may also be constructed using a combination of materials, such as a stucco-based component topped with glass or plexiglass or a solid metal base topped with glass or plexiglass. The noise barriers should have no openings or cracks.

Based on the Transportation Analysis, the project would require a fresh air supply system or air conditioning for each proposed residence. Since the HVAC noise analysis is part of this technical report, the project already includes this required feature, and no additional mitigation is required.

4.2 Operational Noise Generation

4.2.1 Impact Analysis

The implementation of the project would result in changes to existing noise levels in the project vicinity by developing new stationary sources of noise. Operational noise sources for the project include HVAC equipment and an elevator mechanical room.

Mechanical equipment noise was analyzed based on common residential HVAC units and distances to the property lines. Standard acoustic distance calculations were performed to determine the attenuated noise level at the property line location for each cluster of mechanical noise sources.

Based on the most recent plan set provided by the applicant (Tyler Gonzales Architects 2017), HVAC equipment (i.e., the condenser units) would be mounted on the rooftops. Exact specifications and locations for the equipment are not yet available. General assumptions regarding the HVAC are used to analyze the potential for operational noise impacts from the HVAC equipment. Based on noise emission data from a representative residential condenser model line (Trane 4DCY4024 through 4DCY4060), the sound power levels would range from 68 to 71 dBA (Trane 2013).

Heating, Ventilation, and Air Conditioning Mechanical

Based on the estimated 42 residential units and commercial space for the project, it is assumed that approximately 45 HVAC units would be located on the roof. The nearest property line is 50 feet from the approximate center of where the HVAC units are expected to be placed. The calculated exterior L_{eq} is approximately 53 dBA. The nearest noise measurement location is ST5, where the L_{eq} was 63 dBA. The measured existing ambient level is approximately 10 dB above the calculated noise levels due to the mechanical equipment. Therefore, operational noise levels from the expected mechanical equipment in this area would be less than significant.

Elevator Mechanical

There is an elevator mechanical area expected for the rooftop. This mechanical room is approximately 95 feet from the northern site boundary (where the closest noise-sensitive receptors exist). It is expected that elevator equipment noise would be between 71 and 76 dBA at 3 feet

(ThyssenKrupp Elevator 2005). At the property line, the expected noise from the elevator is estimated to be less than 55 dBA L_{eq}. All measured areas in the project vicinity had L_{eq} above 60 dBA. Therefore, the potential elevator mechanical noise is considered less than significant.

These calculated operational noise levels of mechanical equipment (based on the general assumptions described herein) would be less than the noise level criteria established in the Pasadena Municipal Code. Thus, the proposed mechanical equipment would be expected to have a less-than-significant noise impact.

Since this analysis is based on generic data and not project specific details, follow-up analysis is recommended. Prior to approval of the plans and specifications for the project, City staff should review and approve the proposed HVAC and outdoor mechanical equipment specifications to ensure that the on-site stationary equipment does not exceed municipal code requirements. If necessary, enclosures shall be included in the mechanical designs to reduce the noise impacts to less than significant.

4.3 Construction Noise

Construction noise and vibration are temporary phenomena. Construction noise and vibration levels vary from hour-to-hour and day-to-day, depending on the equipment in use, the operations being performed, and the distance between the source and receptor.

Construction of the development proposed in the project would generate noise that could expose nearby receptors to elevated noise levels that may disrupt communication and routine activities. The magnitude of the impact would depend on the type of construction activity, equipment, duration of the construction, distance between the noise source and receiver, and intervening structures. This section discusses the calculated construction noise levels at nearby sensitive receptors (i.e., residences).

Residences exist immediately north of the project site. Religious, institutional, and commercial land uses also exist in the project vicinity. Despite these noise-sensitive land uses in the immediate proximity of the project site, it is understood that the City examines construction noise impacts at 100 feet to compare these noise levels to the 85 dBA limitation in the Noise Ordinance exemption.

4.3.1 Construction – Equipment Data and Description

Equipment operates in alternating cycles of full power and low power, producing noise levels less than the maximum level. The typical noise levels for various pieces of construction equipment at a distance of 50 feet are presented in Table 8.

Table 8
Typical Construction Equipment Noise Emission Levels and Usage Factors

Equipment Description	Impact Device?	Acoustical Use Factor (%)	Spec 721.560 L_{max} @ 50 Feet (dBA, Slow)	Actual Measured L_{max} @ 50 Feet (dBA, Slow) Samples Averaged*	Number of Actual Data Samples (Count)
All other equipment > 5 horsepower	No	50	85	N/A	0
Auger drill rig	No	20	85	84	36
Backhoe	No	40	80	78	372
Bar bender	No	20	80	N/A	0
Compressor (air)	No	40	80	78	18
Concrete pump truck	No	20	82	81	30
Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Dump truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flatbed truck	No	40	84	74	4
Front-end loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (<25 kilovolt-amps)	No	50	70	73	74
Hydra break ram	Yes	10	90	N/A	0
Man lift	No	20	85	75	23
Pickup truck	No	40	55	75	1
Pneumatic tools	No	50	85	85	90
Pumps	No	50	77	81	17
Roller	No	20	85	80	16
Sand blasting (single nozzle)	No	20	85	96	9
Scraper	No	40	85	84	12
Tractor	No	40	84	N/A	0
Welder/torch	No	40	73	74	5

Source: FHWA 2006
Notes: dBA = A-weighted decibel, L_{max} = maximum sound level, N/A = not applicable

As shown in Table 8, measured backhoe L_{max} are 78 dBA at a distance of 50 feet; with outdoor attenuation rates, this level would be reduced to 66 dBA at 200 feet.

Comparing the measured levels in Table 8 with the City's 85 dBA at 100 feet criterion reveals the project construction equipment would comply with the City's Noise Ordinance.

4.3.2 Construction Noise Assessment

A noise analysis was performed using the RCNM model developed by the Federal Highway Administration (FHWA 2008). Input variables for RCNM consist of the receiver/land use types, the equipment type (e.g., backhoe, crane, truck), the number of equipment pieces, the duty cycle for each piece of equipment (i.e., percentage of hours the equipment typically works per day), and the distance from the sensitive noise. Table 9 provides a summary of the assumed construction equipment used for the different phases of construction based on the air quality analysis (Dudek 2017).

Table 9
Construction Scenario Assumptions

Construction Phase	Equipment		
	Equipment Type	*Quantity*	*Usage Hours*
Grading	Rubber-tired dozers	1	4
	Bore rig	1	4
Building construction	Cranes	2	6
	Forklifts	2	6
	Tractors/loaders/backhoes	2	6
	Welders	6	8
Paving	Cement and mortar mixers	2	6
	Pavers	2	6
Architectural coating	Air compressors	2	6

The various construction equipment types and quantities (as described previously) were used for this analysis. The RCNM has default duty cycle values for the various pieces of equipment, which were derived from an extensive study of typical construction activity patterns. Those default duty cycle values were used for this analysis. Appendix B provides more information on the construction noise analysis.

Table 10 shows the results from the RCNM analysis. R1 represents a receiver only 13 feet from the construction operations. This receiver analysis is intended to represent a worst-case scenario when construction operations are occurring near the site boundary with the existing residential land use to the north. R2 represents the distance from the nearest residential receiver to the acoustic center of the project. The distance is 60 feet for the multifamily residence to the north. Noise levels at 100 feet are shown in the final column.

Table 10
Construction Noise Analysis Results (dBA L_{eq})

Construction Phase	L_{eq} (dBA)		
	R1 – Nearest Source-Receiver Noise Level (13 Feet)	*R2 – Typical Source-Receiver Noise Level (60 Feet)*	*100-Foot Contour*
Grading	92	80	76
Building construction	90	83	78
Paving	87	79	75
Architectural coating	86	75	71

Notes: dBA = A-weighted decibel, L_{eq} = equivalent sound level

The project would be required to comply with the City's Noise Ordinance by adhering to the following construction schedule (City of Pasadena 2002):

> Construction activity shall be consistent with City noise ordinance requirements, which limits construction activities to the hours between 7:00 a.m. and 7:00 p.m., on weekdays. Saturday construction can occur between 8:00 a.m. and 5:00 p.m. Construction on Sundays and holidays is prohibited.

Average noise levels from construction activities may be annoying since levels are high and above the 5 dB above ambient limit set for other noise sources. However, restricting construction activities to the daytime period will avoid disruption of evening relaxation and overnight sleep periods.

4.3.3 Construction Techniques

Based on the construction equipment list, the equipment meets the City's construction noise requirement. With adherence to the limited construction hours, the project would result in a less-than-significant short-term construction noise impact based on the City's Noise Ordinance. However, due to the close proximity of noise-sensitive receptors, the following recommendations are provided to reduce the potential of noise-related annoyance during construction.

Recommended Construction Techniques to Reduce the Potential for Construction Noise Disruption

- Construction hours, allowable workdays, and the phone number of the job superintendent should be clearly posted at all construction entrances to allow surrounding property owners/users to contact the job superintendent if necessary. In the event the City receives a complaint, appropriate corrective actions should be implemented, and a report of the action should be provided to the reporting party.

- The project contractor should, to the extent feasible, schedule construction activities to avoid the simultaneous operation of construction equipment to minimize noise levels resulting from operating several pieces of high noise level emitting equipment.
- All construction equipment, fixed or mobile, should be equipped with properly operating and maintained mufflers. Enforcement shall be accomplished by random field inspections by applicant personnel during construction activities to the satisfaction of the City's Engineering Division.
- Construction noise reduction methods such as shutting off idling equipment, constructing a temporary noise barrier, maximizing the distance between construction equipment staging areas and residences and the seminary, and using electric air compressors and similar power tools rather than diesel equipment should be used where feasible.
- During construction, stationary construction equipment should be placed so emitted noise is directed away or shielded from noise-sensitive receptors, including residences.
- During construction, stockpiling and vehicle staging areas should be located as far as practical from noise-sensitive receptors, including adjacent residences.
- If equipment that can cause hearing damage at adjacent noise receptor locations (distance attenuation shall be taken into account) is being used, portable noise barriers should be installed that are demonstrated to be adequate to reduce noise levels at receptor locations below hearing damage thresholds. This may include erection of temporary plywood barriers to create a break in the line of sight or erection of a heavy vinyl tent around the noise source.

Significance After Mitigation

Mitigation is not required because impacts would be less than significant without mitigation based on the interpretation of the construction noise regulations. However, the recommended construction techniques are provided to reduce construction-related noise levels since noise-sensitive receptors are in proximity of the project site.

4.4 Groundborne Vibration

4.4.1 Impact Analysis

Operation of the project does not include any heavy rotating or impact equipment. Thus, significant groundborne vibration is not expected from general operations of the project.

The main concern associated with groundborne vibration is annoyance; however, in extreme cases, vibration can cause damage to buildings, particularly those that are old or otherwise fragile. Some common sources of groundborne vibration are construction activities such as blasting, pile driving, and heavy earth-moving equipment activities. The proposed project would include neither blasting nor pile driving, thus avoiding the most substantial sources for construction related vibration. Ground vibrations from construction activities do not often reach the levels that can damage structures or affect activities that are not vibration sensitive, although the vibrations may be felt by nearby persons in proximity and result in annoyance (FTA 2006). The FTA employs a significance criterion of 0.5 inches/sec PPV for standard construction buildings and reinforced masonry (brick or block) construction.

Structures adjacent to the project site that could be affected by construction-related vibration include a structure to the north that is located approximately 12 feet from the subject property line, and a structure to the west that appears to abut the subject property line. Both of these structures are classified as standard construction, for which the 0.5 inches/sec PPV significance threshold would apply.

According to the California Department of Transportation (Caltrans, 2013), the highest measured vibration level during highway construction was 2.4 inches/second PPV at 25 feet from a pavement breaker. While pavement does exist on certain portions of the project site, a pavement breaker is not included on the equipment list provided with the project application. Because pavement can be removed using a "lifting fork" extension for front-end loader, a pavement breaker is not necessary or anticipated for use in pavement removal at the site.

The proposal includes three levels of below-grade parking, which will require excavation of the building footprint to a depth of 25 to 30 feet below grade. To stabilize the walls of the excavation, we assume that a soldier pile retaining wall will be constructed. This method involves drilling and insertion of steel I-beams before excavation begins, and then as soil is excavated, steel panels are inserted between the steel beams to hold the wall of the excavation in place. According to Caltrans (2013), using cast-in-place or auger cast piles limits vibration generation to the small amount generated by drilling, which is negligible. Consequently, drilling to install the I-beams for the soldier pile retaining wall, even within one foot of the structure west of the project, would not result in vibration levels that could cause building damage.

The project applicant has indicated that vibratory rollers and large bulldozers would not be required, and would not be employed, in construction of the project. Dudek evaluated the equipment with the highest level of vibration generation that would be employed in the project construction. The following assumptions were used with respect to the closest distance of operation for the equipment, relative to the commercial building on the west.

1. A small bulldozer, used for levelling and compaction, would not operate any closer than one foot from the neighboring building (due to the presence of the soldier pile wall). The compaction would also occur at approximately 25 to 30 feet below grade, increasing the effective separation distance between bulldozer activity and the adjacent structure.

2. Jackhammers would not be used to break up pavement along the property boundaries, this activity would be accomplished using lifting forks. Jackhammers might be used not closer than 6 feet from the adjacent structure to the west.

3. Loaded trucks would not be maneuvered within 8 feet of the excavation wall along the west side of the property, because clearance for excavation must be provided and trucks would be loaded from the excavation wall side of the trucks.

Table 11 shows a construction vibration impact summary for the project based on the FTA's 2006 Noise and Vibration Manual data and methodology. The equipment is shown along with the reference data (PPV_{ref}) from the Manual. Calculations were conducted to assess the vibration PPV at the closest separation distance from the western building for the specific piece of equipment; at 12 feet (the minimum separation distance to the existing building to the north of the site); and, at 50 feet (approximately the distance from the center of the project site to both the residential building to the north and the commercial building to the west).

Table 11
Construction Vibration PPV

Equipment	Closest Distance Between Equipment & Western Building	Reference PPV for Equipment	At Closest Distance to Western Building PPV (in/s)	PPV (in/s)	PPV (in/s)
	(ft)	at 25 ft	-	at 12 ft	at 50 ft
Loaded Trucks	1	0.076	0.42	0.23	0.027
Jackhammer	6	0.035	0.29	0.11	0.012
Small Bulldozer	8	0.003	0.375	0.009	0.001

Based on the above analysis, construction-related vibration impacts would be less than significant. None of the anticipated vibration levels would exceed the 0.5 inches/sec significance threshold at the closest off-site building to the west.

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5 REFERENCES

14 CCR 15000–15387 and Appendices A–L. Guidelines for Implementation of the California Environmental Quality Act, as amended.

24 CCR Part 2. California Building Code.

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APPENDIX A

Field Noise
Measurement Data

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Field Noise Measurement Data

Record: 650	
Project Name	Hudson pasadena
Observer(s)	Connor Burke
Date	2017-07-12
Comments	
autoemail	cburke@dudek.com

Meteorological Conditions	
Temp (F)	80
Humidity % (R.H.)	51
Wind	Light
Wind Speed (MPH)	4
Wind Direction	South West
Sky	Sunny

Instrument and Calibrator Information	
Instrument Name List	(SJC) Rion NL-32
Instrument Name	(SJC) Rion NL-32
Instrument Name Lookup Key	(SJC) Rion NL-32
Manufacturer	Rion
Model	NL-32
Serial Number	1030561
Calibration Date	5/17/2013
Calibrator Name	(SJC) Rion NC-74
Calibrator Name	(SJC) Rion NC-74
Calibrator Name Lookup Key	(SJC) Rion NC-74
Calibrator Manufacturer	Rion
Calibrator Model	NC-74
Calibrator Serial #	35125809
Pre-Test (dBA SPL)	94
Post-Test (dBA SPL)	94
Windscreen	Yes
Weighting?	A-WTD
Slow/Fast?	Slow
ANSI?	Yes

Recordings	
Record #	1
Site ID	ST5
Site Location	Latitude:34.150096, Longitude:-118.134637, Altitude:252.639648, Speed:0.400000, Horizontal Accuracy:10.000000, Vertical Accuracy:6.000000, Time:10:56:07 AM PDT
Begin (Time)	10:54:00
End (Time)	11:14:00
Leq	62.7
Lmax	78.3
Lmin	48.7
Other Lx?	L90, L50, L10
L90	52.5
L50	58.4
L10	66.1

FIELD DATA REPORT

Other (Specify Metric)	
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Distant Traffic, Rustling Leaves*
Other Noise Sources Additional Description	*Back up alarm. Car door slam*
Is the same instrument and calibrator being used as previously notated?	*Yes*
Are the meteorological conditions the same as previously notated?	*Yes*

Source Info and Traffic Counts	
Distance to Roadway (feet)	*25*
Distance to Roadway - Centerline/Edge of Pavement	*Edge of Pavement*
Estimated Vehicle Speed (MPH)	*25*
Count Duration (Min)	*20*

Traffic Counts	
Counting Both Directions?	*Yes*
Autos	*1*
Number of Vehicles - Autos	*45*

Description / Photos

Site Photos	
Photo	
Comments / Description	*Facing east towards Hudson.*

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Recordings	
Record #	*2*
Site ID	*ST2*
Site Location	*Latitude:34.149881, Longitude:-118.134563, Altitude:258.304852, Speed:0.000000, Horizontal Accuracy:10.000000, Vertical Accuracy:4.000000, Time:11:38:15 AM PDT*
Begin (Time)	*11:38:00*
End (Time)	*11:53:00*
Leq	*60.8*
Lmax	*70.9*
Lmin	*50.1*
Other Lx?	*L90, L50, L10*
L90	*53.6*
L50	*59.8*
L10	*63.5*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Distant Aircraft, Distant Conversations / Yelling, Distant Traffic, Rustling Leaves*
Is the same instrument and calibrator being used as previously notated?	*Yes*
Are the meteorological conditions the same as previously notated?	*Yes*

Source Info and Traffic Counts	
Distance to Roadway (feet)	*20*
Estimated Vehicle Speed (MPH)	*25*
Count Duration (Min)	*15*

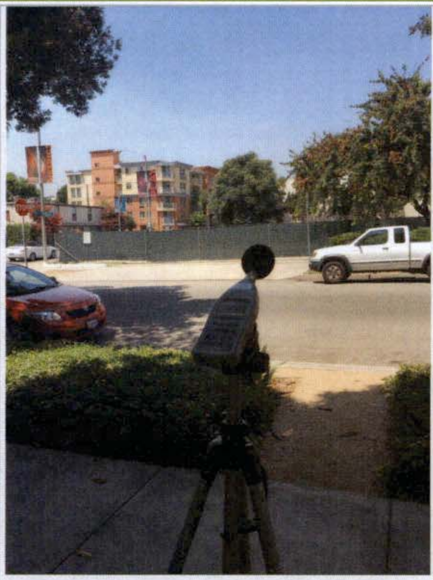
Traffic Counts	
Counting Both Directions?	*Yes*
Autos	*1*
Number of Vehicles - Autos	*25*

Description / Photos

Site Photos

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Photo	
Comments / Description	*Facing west towards Hudson*

Recordings	
Record #	*3*
Site ID	*ST4*
Site Location	*Latitude:34.149624, Longitude:-118.134190, Altitude:260.265362, Speed:0.000000, Horizontal Accuracy:10.000000, Vertical Accuracy:4.000000, Time:11:55:15 AM PDT*
Begin (Time)	*11:55:00*
End (Time)	*12:05:00*
Leq	*67.5*
Lmax	*79.6*
Lmin	*56.3*
Other Lx?	*L90, L50, L10*
L90	*60.2*
L50	*65.9*
L10	*70.2*
Other (Specify Metric)	
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Distant Conversations / Yelling, Distant Traffic*
Other Noise Sources Additional Description	*Forklifts. Back up alarms*
Is the same instrument and calibrator being used as previously notated?	*Yes*
Are the meteorological conditions the same as previously notated?	*Yes*

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Source Info and Traffic Counts	
Distance to Roadway (feet)	*20*
Distance to Roadway - Centerline/Edge of Pavement	*Edge of Pavement*
Estimated Vehicle Speed (MPH)	*35*
Count Duration (Min)	*10*

Traffic Counts	
Counting Both Directions?	*Yes*
Autos	*1*
Number of Vehicles - Autos	*203*
Medium Trucks	*1*
Number of Vehicles - Medium Trucks	*3*

Description / Photos

Site Photos	
Photo	
Comments / Description	*Facing south towards walnut.*

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Recordings	
Record #	4
Site ID	ST3
Site Location	Latitude:34.149571, Longitude:-118.135985, Altitude:256.715557, Speed:0.460000, Horizontal Accuracy:10.000000, Vertical Accuracy:4.000000, Time:12:11:01 PM PDT
Begin (Time)	12:11:00
End (Time)	12:21:00
Leq	67.2
Lmax	85.5
Lmin	50.5
Other Lx?	L90, L50, L10
L90	54
L50	63.4
L10	69
Other (Specify Metric)	
Primary Noise Source	Traffic
Other Noise Sources (Background)	Distant Traffic
Other Noise Sources Additional Description	Horn honk.
Is the same instrument and calibrator being used as previously notated?	Yes
Are the meteorological conditions the same as previously notated?	Yes

Source Info and Traffic Counts	
Distance to Roadway (feet)	15
Distance to Roadway - Centerline/Edge of Pavement	Edge of Pavement
Estimated Vehicle Speed (MPH)	35
Count Duration (Min)	10

Traffic Counts	
Counting Both Directions?	Yes
Autos	1
Number of Vehicles - Autos	190
Medium Trucks	1
Number of Vehicles - Medium Trucks	1
Heavy Trucks	1
Number of Vehicles - Heavy Trucks	1

Description / Photos

DUDEK
CREATOR OF KERATA TECHNOLOGY

FIELD DATA REPORT

Site Photos	
Photo	
Comments / Description	*Facing north towards walnut*

Recordings	
Record #	*5*
Site ID	*ST1*
Site Location	*Latitude:34.149650, Longitude:-118.134734, Altitude:259.338970, Speed:0.000000, Horizontal Accuracy:10.000000, Vertical Accuracy:4.000000, Time:12:24:05 PM PDT*
Begin (Time)	*12:24:00*
End (Time)	*12:34:00*
Leq	*65.4*
Lmax	*73.3*
Lmin	*50.3*
Other Lx?	*L90, L50, L10*
L90	*57.5*
L50	*63.5*
L10	*69.1*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Distant Traffic, Rustling Leaves*
Other Noise Sources Additional Description	*Back up alarm.*
Is the same instrument and calibrator being used as previously notated?	*Yes*
Are the meteorological conditions the same as previously notated?	*Yes*

FIELD DATA REPORT

DUDEK
CREATOR OF KERATA TECHNOLOGY

Source Info and Traffic Counts	
Distance to Roadway (feet)	*15*
Estimated Vehicle Speed (MPH)	*35*
Count Duration (Min)	*10*

Traffic Counts	
Counting Both Directions?	*Yes*
Autos	*1*
Number of Vehicles - Autos	*128*

Description / Photos

Site Photos	
Photo	
Comments / Description	*Facing south towards Walnut.*

APPENDIX B

Roadway Noise Construction Model (RNCM)

Data Sheets

Report date: 8/30/2017	Case Description: Grading			*Calculated Lmax is the Loudest value.								
Description:	Land Use:Residential		Daytime Baseline (dBA): 60	Evening Baseline (dBA): 60	Night Baseline (dBA): 60							
Description	# of Devices	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)		Calculated Lmax* (dBA)			Calculated Leq (dBA)		
						Receptor Distance:	13-20 ft	60 ft	100 ft	13-20 ft	60 ft	100 ft
Dozer	1	No	40		81.7		93.4	80.1	75.6	89.4	76.1	71.7
Boring Jack Power Unit	1	No	50		83		91	81.4	77	87.9	78.4	74
						Total	93.4	81.4	77	91.7	80.4	76

Report date: 8/30/2017	Case Description: Building Construction			*Calculated Lmax is the Loudest value.								
Description:	Land Use: Residential		Daytime Baseline (dBA): 60	Evening Baseline (dBA): 60	Night Baseline (dBA): 60							
Description	# of Devices	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)		Calculated Lmax* (dBA)			Calculated Leq (dBA)		
						Receptor Distance:	13-60 ft	60 ft	100 ft	13-60 ft	60 ft	100 ft
Crane	1	No	16		80.6		92.3	79	74.5	84.3	71	66.6
Crane	1	No	16		80.6		79	79	74.5	71	71	66.6
Man Lift	1	No	20		74.7		86.4	73.1	68.7	79.4	66.1	61.7
Front End Loader	1	No	40		79.1		77.5	77.5	73.1	73.5	73.5	69.1
Backhoe	1	No	40		77.6		89.3	76	71.5	85.3	72	67.6
Tractor	1	No	40	84			82.4	82.4	78	78.4	78.4	74
Welder/Torch	1	No	40		74		85.7	72.4	68	81.7	68.4	64
Welder/Torch	1	No	40		74		72.4	72.4	68	68.4	68.4	64
Welder/Torch	4	No	40		74		74	72.4	68	70	68.4	64
						Total	92.3	82.4	78	90	82.5	78.1

Report date: 8/30/2017	Case Description: Paving			*Calculated Lmax is the Loudest value.								
Description:	Land Use: Residential		Daytime Baseline (dBA): 60	Evening Baseline (dBA): 60	Night Baseline (dBA): 60							
Description	# of Devices	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)		Calculated Lmax* (dBA)			Calculated Leq (dBA)		
						Receptor Distance:	13-75 ft	60 ft	100 ft	13-60 ft	60 ft	100 ft
Concrete Mixer Truck	1	No	40		78.8	60	77.2	77.2	72.8	73.2	73.2	68.8
Concrete Mixer Truck	1	No	40		78.8	75	75.3	77.2	72.8	71.3	73.2	68.8
Paver	1	No	50		77.2	13	88.9	75.6	71.2	85.9	72.6	68.2
Paver	1	No	50		77.2	60	75.6	75.6	71.2	72.6	72.6	68.2
						Total	88.9	77.2	72.8	86.5	79	74.5

Report date: 8/30/2017	Case Description: Architectural Coatings			*Calculated Lmax is the Loudest value.								
Description:	Land Use: Residential		Daytime Baseline (dBA): 60	Evening Baseline (dBA): 60	Night Baseline (dBA): 60							
Description	# of Devices	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)		Calculated Lmax* (dBA)			Calculated Leq (dBA)		
						Receptor Distance:	13-25 ft	60 ft	100 ft	13-25 ft	60 ft	100 ft
Compressor (air)	1	No	40		77.7	13	89.4	76.1	71.6	85.4	72.1	67.7
Compressor (air)	1	No	40		77.7	25	83.7	76.1	71.6	79.7	72.1	67.7
						Total	89.4	76.1	71.6	86.4	75.1	70.7